The 45th

Congress on

Science and Technology of Thailand

การประชุมวิชาการวิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย ครั้งที่ 45 (วทท45)

ABSTRACT BOOK

"Seedling Innovation
For Sustainable Development"

"ต้นกล้านวัตกรรมสู่การพัฒนาอย่างยั่งยืน"

7 – 9 October 2019
Mae Fah Luang University, Chiang Rai
THAILAND

ทรงพระเจริญ

ABSTRACT BOOK

The 45th Congress on Science and Technology of Thailand (STT45)

Seedling Innovation for Sustainable Development

October 7-9, 2019

Mae Fah Luang University,
Chiang Rai, Thailand

Organized by:
The Science Society of Thailand under the
Patronage of His Majesty the King
In Association with
Mae Fah Luang University

บทคัดย่อ
การประชุมวิชาการวิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย
ครั้งที่ 45

ISBN 978-616-8155-08-0

จัดทำโดย
สมาคมวิทยาศาสตร์แห่งประเทศไทยในพระบรมราชูปถัมภ์
และมหาวิทยาลัยแม่ฟ้าหลวง
พิมพ์ครั้งแรก **ตุลาคม พ.ศ. 2562**

CONTENTS

Message from the President of the Science Society of Thailand under the Patronage of His Majesty the King 3

Message from the Dean of School of Science, Mae Fah Luang University 4

Report from the Chairperson of STT45 Organizing Committee 5

History of the Congress on Science and Technology of Thailand 8

Program Overview 9

Maps 10

Program for Grand Opening Ceremony of STT45 13

Abstract of Keynote Speaker 14
Professor Dr.Robert H. Grubbs
2005 Nobel Laureate in Chemistry

Abstract of Plenary Speaker 15
Assistant Professor Dr.Montree Sawangphruk
2019 Thailand Outstanding Scientist

Program for Special Sessions, Invited Lectures, Oral Presentations, Meetings and Sponsored Sessions

7th October 2019 16

8th October 2019 20

9st October 2019 33

Abstracts for Invited Lectures 37

Poster Sessions 69

CONTENTS

SESSION A: AGRICULTURAL SCIENCE & BIOTECHNOLOGY	84
SESSION B1: BIOCHEMISTRY	123
SESSION B2: MICROBIOLOGY	131
SESSION B3: MOLECULAR BIOLOGY	147
SESSION B4: BIOMEDICAL SCIENCE	161
SESSION B5: BIODIVERSITY	173
SESSION C1: ANALYTICAL CHEMISTRY	204
SESSION C2: INORGANIC CHEMISTRY	220
SESSION C3: ORGANIC & MEDICINAL CHEMISTRY	233
SESSION C4: PHYSICAL & THEORETICAL CHEMISTRY	255
SESSION D: POLYMER & MATERIALS SCIENCE_NANOTECHNOLOGY	262
SESSION E: ENERGY_ENVIRONMENTAL & EARTH SCIENCE	326
SESSION F: PHYSICS & APPLIED PHYSICS	356
SESSION G: MATHEMATICS / STATISTICS / COMPUTER SCIENCE	366
SESSION H: FOOD SCIENCE & TECHNOLOGY	369
SESSION SP1: CRYSTALLOGRAPHY	384
Organizing Committee of 45th Congress on Science And Technology of Thailand	407
Acknowledgement for the Sponsors of STT45	415
Exhibition Booths	417
Author Index	419

MESSAGE FROM THE PRESIDENT OF THE SCIENCE SOCIETY OF THAILAND UNDER THE PATRONAGE OF HIS MAJESTY THE KING

The Congress on Science and Technology of Thailand (STT) is the largest national annual science conference in Thailand, organized by the Science Society of Thailand under the Patronage of His Majesty the King since 1971. Thai scientists utilize this meeting as a forum to exchange their knowledge and to update frontier research in the fields with peers from various institutes in Thailand and from abroad.

Every year, each of the 30 well-known public universities in Thailand, both in Bangkok and in the provinces, takes turn in co-hosting this prestigious conference and the year 2019, the conference is co-hosted by Mae Fah Luang University. The theme of this 45th Congress on Science and Technology of Thailand (STT45) is "Seedling Innovation for Sustainable Development".

We are most privileged and honored to have Her Royal Highness Princess Maha Chakri Sirindhorn graciously presides over the Opening Ceremony of this Congress.

We would like to thank all supports from various organizations, the President, the Dean of School of Science and the staff of Mae Fah Luang University, the Chairperson of the Organizing Committee, distinguished guests and all participants for supporting this STT45 Congress.

Associate Professor Dr. Napavarn Noparatnaraporn
President
The Science Society of Thailand
under the Patronage of His Majesty the King

MESSAGE FROM THE DEAN OF SCHOOL OF SCIENCE, MAE FAH LUANG UNIVERSITY

On behalf of the School of Science, Mae Fah Luang University, it is our great pleasure to welcome you to the 45th of Congress on Science and Technology of Thailand (STT45) being held in Chiang Rai, Thailand during 7-9th October 2019 to celebrate the 20th anniversary of the School of Science The Congress on Science and Technology of Thailand (STT) is one of the biggest science and technology conference in Thailand with around a thousand participants from local and overseas attending each year. With the theme of "Seedling Innovation for Sustainable Development", the congress aims to build up a platform for sharing and exchange the knowledge and experiences among national and international expertise scientists and technologists as well as the young one in various field of Science and Technology.

On the auspicious occasion for the 20th anniversary of the establishment of the School of Science and the 21st anniversary of Mae Fah Luang University. We are honored to host this 45th Congress on Science and Technology of Thailand together with the Science Society of Thailand under the Patronage of His Majesty the King. In this conference, we are honored to have Professor Robert H. Grubbs, the Nobel Laureate in Chemistry in 2005 as the keynote speaker on the topic "Discovery and Applications of Selective Olefin Metathesis Catalysts". In addition, Thailand Outstanding Scientists, and numerous eminent scientists are present to share their latest research. For such a successful accomplishment, we would like to cordially thank our sponsors, advisory boards, invited speakers, reviewers, authors, and all participants. We sincerely hope that the presentations and discussions during the conference will lead to further academic development and fruitful collaboration in this region and worldwide.

Assistant Professor Dr. Uraiwan Intatha
Dean of School of Science
Mae Fah Luang University

REPORT FROM THE CHAIRPERSON OF STT45 ORGANIZING COMMITTEE

The 45th Congress on Science and Technology of Thailand (STT45) is jointly organized by the Science Society of Thailand under the Patronage of His Majesty the King and the School of Science, Mae Fah Luang University under the theme "Seedling Innovation for Sustainable Development" held at the main auditorium Mae Fah Luang University during October 7-9, 2019.

We are most privileged and honored to have Her Royal Highness Princess Maha Chakri Sirindhorn graciously preside over the Opening Ceremony ad attend the Keynote Lecture by the 2005 Nobel Laureate in Chemistry, Professor Dr. Robert H. Grubbs from California Institute of Technology in Pasadena, California, USA, Plenary Lecture by 2019 Outstanding Scientist of Thailand, Assistant Professor Dr. Montree Sawangphruk, School of Energy Science and Engineering, Vidyasirimedhi Institute of Science and Technology.

This year the Congress is arranged into 8 sessions on various topics in science and technology with two special sessions on Crystallography, Cannabinoids: From biosynthesis to medical applications. In addition there are two joint conferences and workshops on the Integrative medicine, and on the Cosmetic and beauty. Workshops on Fungal evolution, classification and role in plant evolution, and response to climate change, and Texture analysis for quality measurement of products will also be included.

I would like to take this opportunity to thank all those who provide support to STT45 to promote the highest quality of the Congress, the Office of the National Higher Education, Science, Research and Innovation Policy Council, Thailand Science Research and Innovation (TSRI) and Foundation for the Promotion of Science and Technology under the Patronage of H.M. the King.

Lastly, I wish to thank Professor Dr. Robert H. Grubbs, the 2005 Nobel Laureate in Chemistry, all invited speakers, and committees especially the scientific committee to make this congress an international standard. The Scientific Committee chaired by Professor Dr. Pranut Potiyaraj, co-chaired by Associate Professor Dr. Surat Laphookhieo and Associate Professor Dr. Onruthai Pinyakong are greatly acknowledged. Last but not least my special thanks go to all participants for attending and sharing your research work to make the STT45 success.

Saiwarun Chaiwanichsiri

Associate Professor Dr. Saiwarun Chaiwanichsiri
Chairperson, STT45

ประวัติการประชุมวิชาการวิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย
โดยสมาคมวิทยาศาสตร์แห่งประเทศไทยในพระบรมราชูปถัมภ์

HISTORY OF THE CONGRESS ON SCIENCE AND TECHNOLOGY OF THAILAND

ครั้งที่ ปี / วันที่ เดือน	ชื่อการประชุม	สถาบันเจ้าภาพร่วม	ประธาน (จำนวนผลงานวิจัย)
1. พ.ศ. 2514 26-27 พฤศจิกายน	การวิจัยทางวิทยาศาสตร์ กรุงเทพฯ 2514	คณะวิทยาศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย	ศ.ดร. ประชุมสุข อาชวอำรุง (83 เรื่อง)
2. พ.ศ. 2516 30 พฤศจิกายน -2 ธันวาคม	การวิจัยทางวิทยาศาสตร์ กรุงเทพฯ 2516	คณะวิทยาศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย	ศ.ดร. ประชุมสุข อาชวอำรุง (219 เรื่อง)
3. พ.ศ. 2518 12-13 ธันวาคม	การวิจัยทางวิทยาศาสตร์ กรุงเทพฯ 2518	คณะวิทยาศาสตร์ คณะแพทยศาสตร์ มหาวิทยาลัยมหิดล	ศ.ดร. กำจร มนูญปิจุ (249 เรื่อง)
4. พ.ศ. 2520 16-17 ธันวาคม	การวิจัยทางวิทยาศาสตร์ กรุงเทพฯ 2520	คณะวิทยาศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย	รศ.ดร. กำจัด มงคลกุล (344 เรื่อง)
5. พ.ศ. 2521 22-24 ธันวาคม	วิทยาศาสตร์และเทคโนโลยี เพื่อการพัฒนาภาคเหนือ	คณะวิทยาศาสตร์ มหาวิทยาลัยเชียงใหม่	ศ.ดร. พรชัย มาตังคสมบัติ (232 เรื่อง)
6. พ.ศ. 2522 21-23 ธันวาคม	วิทยาศาสตร์และเทคโนโลยี เพื่อการพัฒนาประเทศ	คณะวิทยาศาสตร์ มหาวิทยาลัยศรีนครินทรวิโรฒ บางแสน	ศ.ดร. พรชัย มาตังคสมบัติ (232 เรื่อง)
7. พ.ศ. 2523 4-6 ธันวาคม	วิทยาศาสตร์และเทคโนโลยี เพื่อการพัฒนาประเทศ	คณะวิทยาศาสตร์ คณะแพทยศาสตร์ มหาวิทยาลัยมหิดล	รศ.ดร. นัยพินิจ คชภักดี (233 เรื่อง)
8. พ.ศ. 2525 28-30 ตุลาคม	วิทยาศาสตร์และเทคโนโลยี เพื่อการพัฒนาประเทศ	คณะวิทยาศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย	รศ.ดร. สัณห์ พณิชยกุล (245 เรื่อง)
9. พ.ศ. 2526 27-29 ตุลาคม	วิทยาศาสตร์และเทคโนโลยี เพื่อการพัฒนาภาคตะวันออกเฉียงเหนือ	คณะวิทยาศาสตร์ มหาวิทยาลัยขอนแก่น	รศ.ดร. สัณห์ พณิชยกุล (174 เรื่อง)
10. พ.ศ. 2527 25-27 ตุลาคม	วิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย	คณะวิทยาศาสตร์ มหาวิทยาลัยเชียงใหม่	ศ.ดร. มนตรี จุฬาวัฒนทล (280 เรื่อง)
11. พ.ศ. 2528 24-26 ตุลาคม	วิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย	คณะวิทยาศาสตร์ มหาวิทยาลัยเกษตรศาสตร์	ศ.ดร. มนตรี จุฬาวัฒนทล (251 เรื่อง)
12. พ.ศ. 2529 20-22 ตุลาคม	วิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย	คณะวิทยาศาสตร์ มหาวิทยาลัยศรีนครินทรวิโรฒ ประสานมิตร	รศ.ดร. ภิญโญ พานิชพันธ์ (277 เรื่อง)
13. พ.ศ. 2530 20-22 ตุลาคม	วิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย	คณะวิทยาศาสตร์ มหาวิทยาลัยสงขลานครินทร์ วิทยาเขตหาดใหญ่	รศ.ดร. ภิญโญ พานิชพันธ์ (420 เรื่อง)
14. พ.ศ. 2531 19-21 ตุลาคม	วิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย	คณะวิทยาศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย	ศ.ดร. จริยา บรอคเคลแมน (259 เรื่อง)
15. พ.ศ. 2532 18-20 ตุลาคม	วิทยาศาสตร์และเทคโนโลยี เพื่อการพัฒนาทรัพยากรภาคเหนือ	คณะวิทยาศาสตร์ มหาวิทยาลัยเชียงใหม่	ศ.ดร. จริยา บรอคเคลแมน (394 เรื่อง)
16. พ.ศ. 2533 25-27 ตุลาคม	วิทยาศาสตร์และเทคโนโลยี เพื่อการพัฒนาประเทศ	คณะวิทยาศาสตร์ สถาบันเทคโนโลยี พระจอมเกล้า เจ้าคุณทหารลาดกระบัง	ศ.ดร. วิชัย ริ้วตระกูล (369 เรื่อง)
17. พ.ศ. 2534 24-26 ตุลาคม	วิทยาศาสตร์และเทคโนโลยี เพื่อการพัฒนาทรัพยากรภาคเหนือ	คณะวิทยาศาสตร์ มหาวิทยาลัยขอนแก่น	ศ.ดร. วิชัย ริ้วตระกูล (349 เรื่อง)
18. พ.ศ. 2535 27-29 ตุลาคม	วิทยาศาสตร์และเทคโนโลยี เพื่อการพัฒนาประเทศ	คณะวิทยาศาสตร์ มหาวิทยาลัยเกษตรศาสตร์ ณ ศูนย์การประชุมแห่งชาติสิริกิติ์	ศ.ดร. สุชาติ อุปถัมภ์ (297 เรื่อง)
19. พ.ศ. 2536 27-29 ตุลาคม	วิทยาศาสตร์และเทคโนโลยี เพื่อการพัฒนาชายฝั่ง	คณะวิทยาศาสตร์ มหาวิทยาลัยสงขลานครินทร์ ณ โรงแรมดุสิต เจ.บี.หาดใหญ่	ศ.ดร. สุชาติ อุปถัมภ์ (438 เรื่อง)
20. พ.ศ. 2537 19-21 ตุลาคม	วิทยาศาสตร์และเทคโนโลยี เพื่อการพัฒนาเศรษฐกิจ สังคม และสิ่งแวดล้อม	คณะวิทยาศาสตร์และเทคโนโลยี มหาวิทยาลัยธรรมศาสตร์ ณ เซ็นทรัลพลาซ่า	ศ.ดร. สมศักดิ์ พันธุวัฒนา (252 เรื่อง)
21. พ.ศ. 2538 25-27 ตุลาคม	วิทยาศาสตร์และเทคโนโลยี เพื่อการพัฒนาอุตสาหกรรม	คณะวิทยาศาสตร์ มหาวิทยาลัยบูรพา ณ โรงแรมแอมบาสซาเอร์ซิตี้ จอมเทียน ชลบุรี	ศ.ดร. สมศักดิ์ พันธุวัฒนา (354 เรื่อง)
22. พ.ศ. 2539 16-18 ตุลาคม	วิทยาศาสตร์และเทคโนโลยี เพื่อพัฒนาทรัพยากรมนุษย์	คณะวิทยาศาสตร์ มหาวิทยาลัยรามคำแหง ณ บางกอกคอนเวนชั่นเซ็นเตอร์ เซ็นทรัลพลาซา ลาดพร้าว	รศ.ดร. พิณทิพ รื่นวงษา (333 เรื่อง)
23. พ.ศ. 2540	วิทยาศาสตร์และเทคโนโลยี	คณะวิทยาศาสตร์ มหาวิทยาลัยเชียงใหม่	รศ.ดร. พิณทิพ รื่นวงษา

ครั้งที่	ปี / วันที่ เดือน	ชื่อการประชุม	สถาบันเจ้าภาพร่วม	ประธาน (จำนวนผลงานวิจัย)
	20-22 ตุลาคม	เพื่อพัฒนาคุณภาพชีวิตในภูมิภาค	ณ โรงแรมโลตัส ปางสวนแก้ว	(495 เรื่อง)
24.	พ.ศ. 2541 19-21 ตุลาคม	วิทยาศาสตร์และเทคโนโลยี เพื่อการพัฒนาเศรษฐกิจที่ยั่งยืน	คณะวิทยาศาสตร์ มหาวิทยาลัยมหิดล ณ ศูนย์การประชุมแห่งชาติสิริกิติ์	ผศ.ดร. ทิพาพร ลิมปเสนีย์ (463 เรื่อง)
25.	พ.ศ. 2542 20-22 ตุลาคม	วิทยาศาสตร์และเทคโนโลยี เพื่อการ พัฒนาทรัพยากรท้องถิ่น	คณะวิทยาศาสตร์ มหาวิทยาลัยนเรศวร ณ โรงแรมอมรินทร์ลากูน พิษณุโลก	ผศ.ดร. ทิพาพร ลิมปเสนีย์ (581 เรื่อง)
26.	พ.ศ. 2543 18-20 ตุลาคม	วิทยาศาสตร์และเทคโนโลยีสู่ สหัสวรรษใหม่	คณะวิทยาศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย ณ ศูนย์การประชุมแห่งชาติสิริกิติ์	รศ.ดร. ศุภวรรณ ตันตยานนท์ (739 เรื่อง)
27.	พ.ศ. 2544 16-18 ตุลาคม	วิทยาศาสตร์และเทคโนโลยี เพื่อการฟื้นฟูเศรษฐกิจไทย	มหาวิทยาลัยสงขลานครินทร์ โรงแรม ลี การ์เดนส์ พลาซ่า	รศ.ดร. ศุภวรรณ ตันตยานนท์ (921 เรื่อง)
28.	พ.ศ. 2545 24-26 ตุลาคม	วิทยาศาสตร์และเทคโนโลยี เพื่อการพัฒนาเศรษฐกิจที่ยั่งยืน	คณะวิทยาศาสตร์ประยุกต์ สถาบันเทคโนโลยีพระจอมเกล้าพระนครเหนือ ณ ศูนย์การประชุมแห่งชาติสิริกิติ์	รศ.ดร. สุรินทร์ เหล่าสุขสถิตย์ (834 เรื่อง)
29.	พ.ศ. 2546 20-22 ตุลาคม	วิทยาศาสตร์และเทคโนโลยี เพื่อการพัฒนาท้องถิ่น	คณะวิทยาศาสตร์ มหาวิทยาลัยขอนแก่น ณ ศูนย์ประชุมอเนกประสงค์กาญจนาภิเษก	รศ.ดร. สุรินทร์ เหล่าสุขสถิตย์ (1039 เรื่อง)
30.	พ.ศ. 2547 19-21 ตุลาคม	วิทยาศาสตร์และเทคโนโลยี เพื่อสังคมและเศรษฐกิจฐานความรู้	คณะวิทยาศาสตร์ มหาวิทยาลัยศรีนครินทรวิโรฒ ณ ศูนย์แสดงสินค้าและการประชุมอิมแพ็ค เมืองทองธานี	รศ.ดร. สุรินทร์ เหล่าสุขสถิตย์ (854 เรื่อง)
31.	พ.ศ. 2548 18-20 ตุลาคม	วิทยาศาสตร์และเทคโนโลยี เพื่อการพัฒนาที่ยั่งยืน	เทคโนธานี มหาวิทยาลัยเทคโนโลยีสุรนารี	รศ.ดร. สุรินทร์ เหล่าสุขสถิตย์ (1021 เรื่อง)
32.	พ.ศ. 2549 10-12 ตุลาคม	วิทยาศาสตร์และเทคโนโลยีเพื่อการ เศรษฐกิจพอเพียง เฉลิมฉลองการครองสิริราชสมบัติ ครบ 60 ปี ของพระบาทสมเด็จพระ เจ้าอยู่หัว	คณะวิทยาศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย ศูนย์การประชุมแห่งชาติสิริกิติ์	รศ.ดร. นภาวรรณ นพรัตนราภรณ์ (927 เรื่อง)
33.	พ.ศ. 2550 18-20 ตุลาคม	วิทยาศาสตร์และเทคโนโลยีเพื่อโลก ยั่งยืน เฉลิมฉลองมหามงคล เฉลิม พระชนมพรรษาครบ 80 พรรษา ของ พระบาทสมเด็จพระเจ้าอยู่หัว	มหาวิทยาลัยวลัยลักษณ์ จังหวัดนครศรีธรรมราช	รศ.ดร. นภาวรรณ นพรัตนราภรณ์ (802 เรื่อง)
34.	พ.ศ. 2551 31 ตุลาคม-2 พฤศจิกายน	วิทยาศาสตร์และเทคโนโลยี สำหรับโลกแห่งความท้าทาย	คณะวิทยาศาสตร์ สถาบันเทคโนโลยี พระจอมเกล้า เจ้าคุณทหารลาดกระบัง	รศ.ดร. นภาวรรณ นพรัตนราภรณ์ (777 เรื่อง)
35.	พ.ศ. 2552 15-17 ตุลาคม	วิทยาศาสตร์และเทคโนโลยีเพื่อ อนาคตที่ดีขึ้น	คณะวิทยาศาสตร์ มหาวิทยาลัยบูรพา	รศ.ดร. นภาวรรณ นพรัตนราภรณ์ (854 เรื่อง)
36.	พ.ศ. 2553 26-28 ตุลาคม	วิทยาศาสตร์และเทคโนโลยีเพื่อสังคม ที่ดีขึ้น	คณะวิทยาศาสตร์และเทคโนโลยี มหาวิทยาลัยธรรมศาสตร์	รศ.ดร. ธารารัตน์ ศุภศิริ (582 เรื่อง)
37.	พ.ศ. 2554 10-12 ตุลาคม	วิทยาศาสตร์สร้างสรรค์ เพื่อสรรค์ สร้างอนาคต	คณะวิทยาศาสตร์ มหาวิทยาลัยมหิดล	รศ.ดร. ธารารัตน์ ศุภศิริ (699 เรื่อง)
38.	พ.ศ. 2555 17-19 ตุลาคม	วิทยาศาสตร์เพื่ออนาคตของมวล มนุษยชาติ	คณะวิทยาศาสตร์ มหาวิทยาลัยเชียงใหม่	รศ.ดร. ธารารัตน์ ศุภศิริ (690 เรื่อง)
39.	พ.ศ. 2556 21-23 ตุลาคม	นวัตกรรมวิทยาศาสตร์ เพื่อชีวิตที่ดี ขึ้น	คณะวิทยาศาสตร์ มหาวิทยาลัยเทคโนโลยีพระจอมเกล้าธนบุรี	รศ.ดร. ธารารัตน์ ศุภศิริ (495 เรื่อง)
40.	พ.ศ. 2557 2-4 ธันวาคม	วิทยาศาสตร์และเทคโนโลยีสู่วิถี พัฒนาอาเซียน	คณะวิทยาศาสตร์ มหาวิทยาลัยขอนแก่น	ศ.ดร. เปี่ยมสุข พงษ์สวัสดิ์ (543 เรื่อง)
41.	พ.ศ. 2558 6-8 ธันวาคม	ประตูสู่อาเซียนด้วยวิทยาศาสตร์และ เทคโนโลยี	มหาวิทยาลัยเทคโนโลยีสุรนารี	ศ.ดร. เปี่ยมสุข พงษ์สวัสดิ์ (384 เรื่อง)
42.	พ.ศ. 2559 30 พฤศจิกายน – 2 ธันวาคม	ศาสตร์แห่งแผ่นดิน สู่นวัตกรรม เพื่อ อนาคตที่ยั่งยืน	คณะวิทยาศาสตร์ มหาวิทยาลัยเกษตรศาสตร์ ณ เซ็นทาราแกรนด์ แอท เซ็นทรัลพลาซา ลาดพร้าว	ศ.ดร. เปี่ยมสุข พงษ์สวัสดิ์ (290 เรื่อง)
43.	พ.ศ. 2560 17-19 ตุลาคม	เข้าใจวิทยาศาสตร์ เข้าถึงเทคโนโลยี สร้างนวัตกรรม นำสังคมยั่งยืน	คณะวิทยาศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย ณ อาคารจามจุรี 10 จุฬาลงกรณ์มหาวิทยาลัย	ศ.ดร. เปี่ยมสุข พงษ์สวัสดิ์ (327 เรื่อง)

ครั้งที่ ปี / วันที่ เดือน	ชื่อการประชุม	สถาบันเจ้าภาพร่วม	ประธาน (จำนวนผลงานวิจัย)
44. พ.ศ. 2561 29-31 ตุลาคม	วิทยาศาสตร์ และเทคโนโลยีในยุคพลิกผัน	ณ ศูนย์นิทรรศการและการประชุมไบเทคบางนา	รศ.ดร. สายวรุฬ ชัยวานิชศิริ (270 เรื่อง)

PROGRAM OVERVIEW

	7 October 2019		8 October 2019		9 October 2019	
	AM	PM	AM	PM	AM	PM
OPENING CEREMONY	Main Auditorium (C4)					
Keynote Speaker: Professor Robert H. Grubbs 2005 Nobel Laureate in Chemistry	Main Auditorium (C4)					
Plenary Speaker : Assistant Professor Dr. Montree Sawangphruk 2019 Thailand Outstanding Scientist	Main Auditorium (C4)					
A: AGRICULTURAL SCIENCE / BIOTECHNOLOGY			E4A-618			
B: BIOLOGICAL SCIENCE Biochemistry / Microbiology / Molecular biology / Biomedical science / Biodiversity		E4A-607 / E4A-608	E4A-617			
C: CHEMISTRY Analytical Chemistry / Inorganic Chemistry / Organic & Medicinal Chemistry / Physical & Theoretical Chemistry			E4A-616			
D: POLYMER & MATERIALS SCIENCE / NANOTECHNOLOGY				E4A-609		
E: ENERGY / ENVIRONMENTAL & EARTH SCIENCE				E4A-608		
F: PHYSICS / APPLIED PHYSICS					E4A-607	
G: MATHEMATICS / STATISTICS / COMPUTER SCIENCE			E4A-608			
H: FOOD SCIENCE & TECHNOLOGY						
POSTER SESSION		E4A-515 / E4A-516 / E4A-517				
SP1: CRYSTALLOGRAPHY			E4A-607			
SP2: CANNABINOIDS: FROM BIOSYNTHESIS TO MEDICAL APPLICATIONS		E4A-618				
DP1: EXPLORING THE KNOWLEDGE BOUNDARY OF HAZE: FROM SCIENTIFIC FINDINGS TO ACTIONABLE INTELLIGENCE POLICY			E4A-615			
DP2: INNOVATION IN APPLIED BIOMEDICAL SCIENCE			E4A-614			
DP3: DIALOGUE FOR ECOLOGICAL REGENERATION: ENGAGING WITH ENVIRONMENTAL KNOWLEDGE IN THE NORTH OF THAILAND					E4A-618	
DP4: BORDER DEVELOPMENT						E4A-618
ST1: NMR APPLICATION FOR MEDICINAL HERB-METABOLOMICS APPROACH		E4A-617	E4A-609			
ST2: TOTAL SOLUTION FOR CANNABIS TESTING				E4A-608 (Lunch Talk)		
ST3: NGS SOLUTION FOR YOUR ANSWER				E4A-609 (Lunch Talk)		
ST4: OVERVIEW OF MEDICINAL CANNABIS SOLUTIONS				Kham Mok Luang		
STT Annual Meeting		Kham Mok Luang				
STT46 Meeting		Kham Mok Luang				
Deans of Science Meeting						
BMB Thailand Annual Meeting		E4A-618				
Conference Banquet				HRH Princess Srinagarindra Courtyard		

Remarks : E4A Rooms - General Sampao Choosri Building / Kham Mok Luang Room - M-Square Building

MAE FAH LUANG UNIVERSITY GUIDE MAP

AD1 อาคารวันชัย ศิริชนะ (Vanchai Sirichana Building)
AD2 สำนักงานบริหารกลาง (Central Administration Building)

AS อาคารบริการวิชาการ (Academic Services Building)
AV ศูนย์บรรณสารและสื่อการศึกษา (ห้องสมุด) (Learning Resources and Educational Media Center : Library)
C1 อาคารเรียนรวม 1 (Lecture Hall Building 1)
C2 อาคารเรียนรวม 2 (Lecture Hall Building 2)
C3 อาคารเรียนรวม 3 (Lecture Hall Building 3)
C4 หอประชุมสมเด็จย่า (Main Auditorium)
C5 อาคาร พลตำรวจเอก เภา สารสิน (Police Genaral Pow Sarasin Building)
D1 อาคารโรงอาหาร (Students' Activity Building and Canteen)
D2 โครงการจัดตั้งพิพิธภัณฑ์อารยธรรมลุ่มน้ำโขง มหาวิทยาลัยแม่ฟ้าหลวง (The Project on Establishment of Mekong Basin Civilization Museum)
E1 อาคารสำนักวิชา 1 (Faculty Office Building 1)
E2 อาคารสำนักวิชา 2 (Faculty Office Building 2)
E3 อาคารสำนักวิชา 3 (Faculty Office Building 3)
E4 อาคาร พลเอก สำเภา ชูศรี (General Sampao Choosri Building)
M3 อาคารปรีคลินิก (Pre-Clinic Building)

กลุ่มอาคาร M-Square
- E-Park : Education Park Building | ศูนย์หนังสือมหาวิทยาลัยแม่ฟ้าหลวง (M-Store)
- I-Park : Innovation Park Building
- L-Park : Lifestyle Park Building

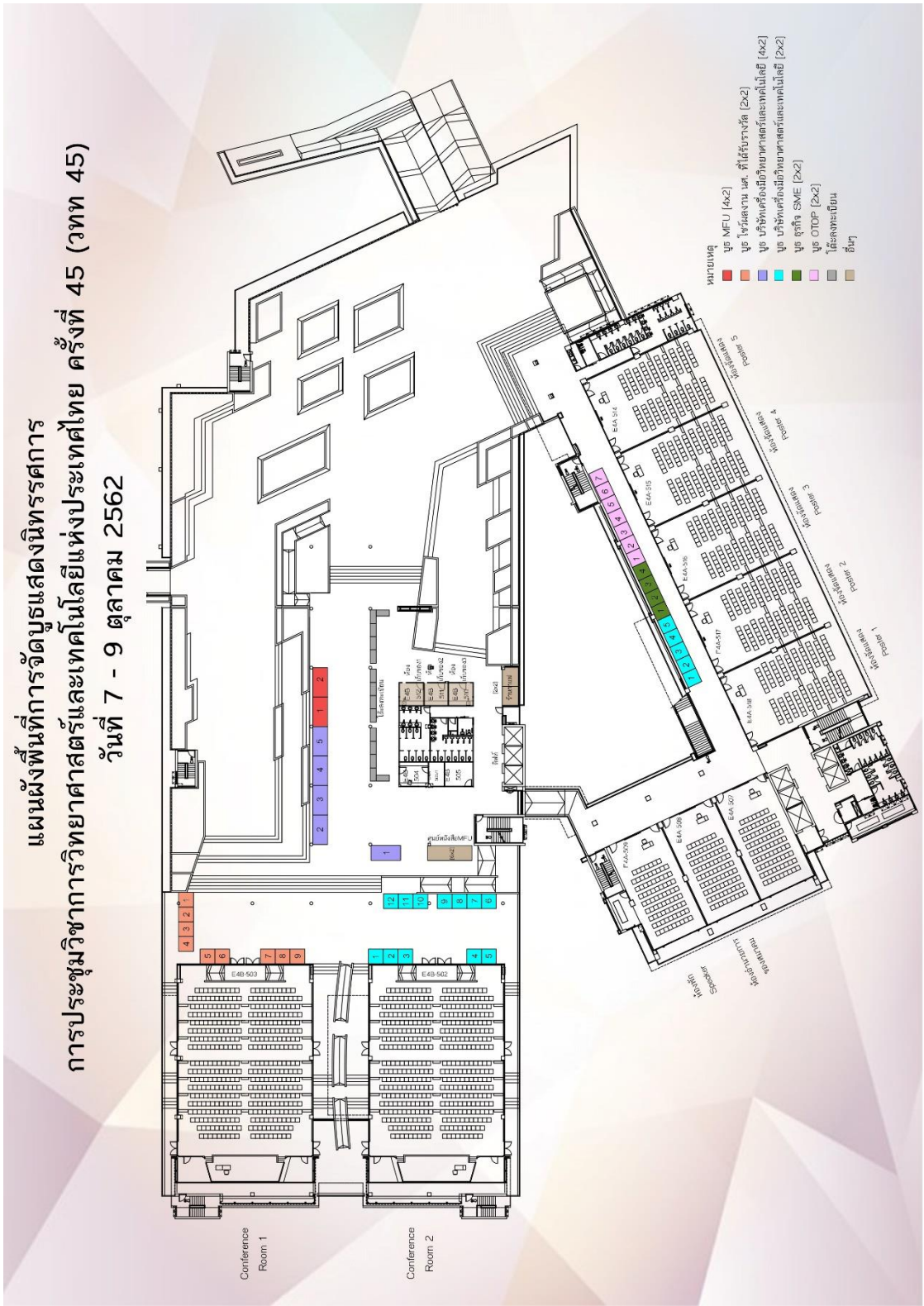
A1-5 อาคารรับรองและบ้านพักพนักงาน (Staff Residence)
F1-6 กลุ่มหอพักหญิง (Female Dormitory 1-6)
0 บ้านพักรับรองอธิการบดี (President's Residence)
1 อาคารประเสริฐ-ทัศนีย์ พุ่งกุมาร (หอพักนักศึกษาจีน 1) (Prasert-Tassanee Poongkumarn International Dormitory 1)
2 อาคารบุญทรง-เพียงใจ (หาญพาณิชย์) อัศวโภคิน (หอพักนักศึกษาจีน 2) (Boonsong-Piengjai (Harnpanich) Asavabhokin International Dormitory 2)
3 อาคารพลตำรวจเอกเภา สารสิน (หอพักนักศึกษาต่างชาติ) (Police Genaral Pow Sarasin International Dormitory)
4-5 หอพักสักทอง 1-2 (Sakthong Dormitory 1-2)
6-12 กลุ่มหอพักนักศึกษาชายสำดวนและนักศึกษาปี 2-4 (Male Dormitory & Senior Dormitory)
13 อาคารที่พักบุคลากรทางการแพทย์ (Medical Staff Residence)

S1-S6
อาคารปฏิบัติการทางวิทยาศาสตร์และเทคโนโลยี
(Sciencific & Technological Laboratory Buildings)
S7-A
อาคารศูนย์การเรียนรู้ภาษา
(Language Learning Center)
S7-B
อาคารศูนย์วิจัย (Research Center)

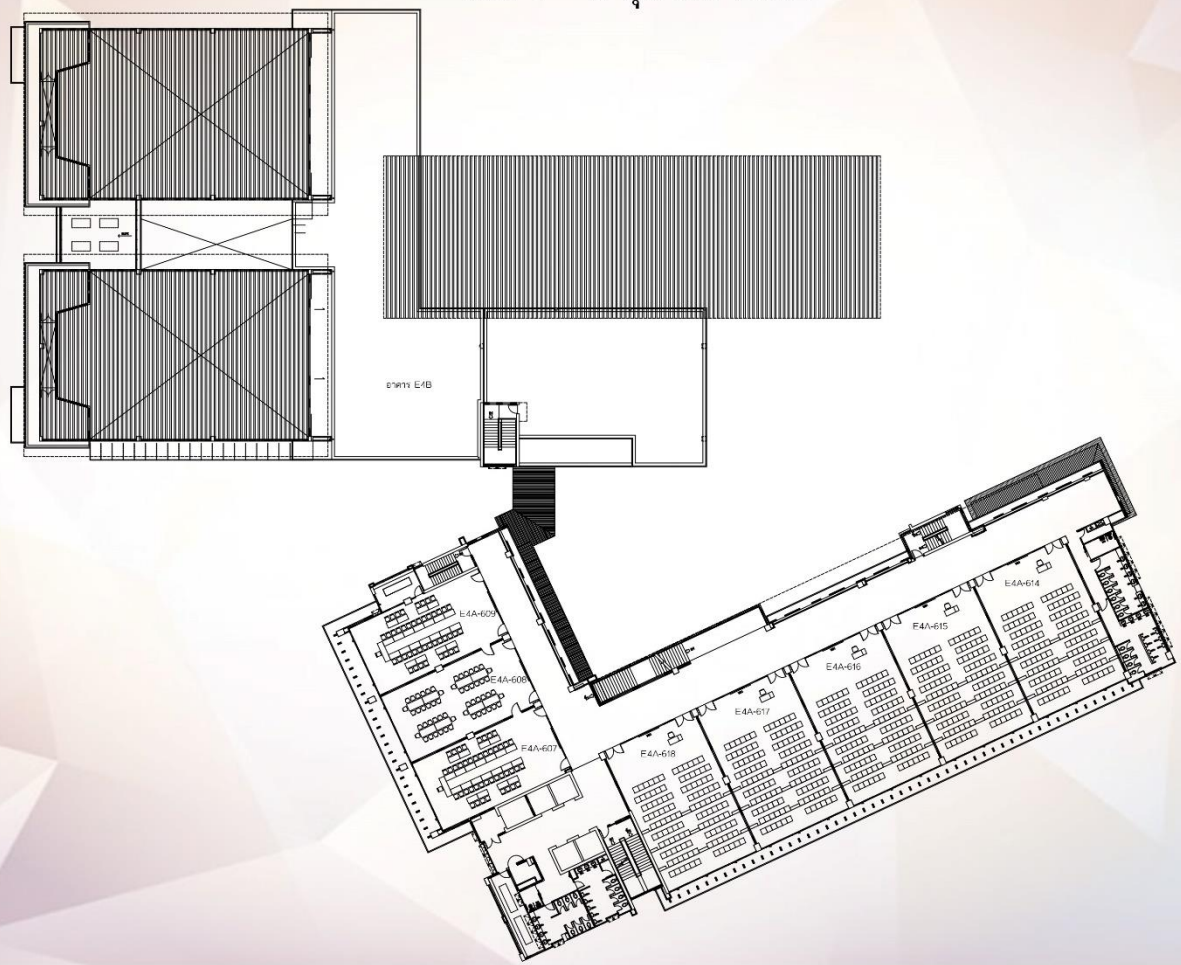
A. พระราชานุสาวรีย์สมเด็จพระศรีนครินทราบรมราชชนนี (HRH Princess Srinagarindra Statue)
B. วิหารพระเจ้าล้านทอง (Lan Thong Chaloem Phra Kiat Vihara)
C. สวนพฤกษศาสตร์ เฉลิมพระเกียรติ 80 พรรษา (MFU Botanical Garden)
D. โรงพยาบาลมหาวิทยาลัยแม่ฟ้าหลวง (Mae Fah Luang University Hospital)
E. ศูนย์ภาษาและวัฒนธรรมจีนสิรินธร (Sirindhorn Chinese Language and Culture Center)

F. สวนสุขภาพ (Exercise Park)
G. สนามเทนนิส (MFU Tennis Courts)
H. สระว่ายน้ำ (MFU Swimming Pool)
I. ลานกีฬาอเนกประสงค์ (MFU Sports Field)
J. อาคารกีฬาเฉลิมพระเกียรติ 72 พรรษาฯ (Queen Sirikit 72nd Jubilee Sport Arena)
K. สนามฟุตบอล (MFU Football Stadium)
L. อาคารกีฬาอเนกประสงค์ (MFU Sport Stadium)

W. วนาศรม (Wanasom Wellness Resort)
V. วนาเวศน์ (Wanawes Inn)


แผนผังพื้นที่การจัดนิทรรศการ
การประชุมวิชาการวิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย ครั้งที่ 45 (วทท 45)
วันที่ 7 - 9 ตุลาคม 2562
หมายเหตุ
บูธ MFU (4x2)
บูธ ใช้ร่มสบาย มศ. ที่ได้รับรางวัล (2x2)
บูธ บริษัทเครื่องมือวิทยาศาสตร์และเทคโนโลยี (4x2)
บูธ บริษัทเครื่องมือวิทยาศาสตร์และเทคโนโลยี (2x2)
บูธ ธุรกิจ SME (2x2)
บูธ OTOP (2x2)
โต๊ะลงทะเบียน
อื่นๆ
E4B-503
E4B-502
Conference Room 1
Conference Room 2
ศูนย์หนังสือMFU
Foyer 1
Foyer 2
Foyer 3
Foyer 4
Foyer 5
Speaker
ห้องน้ำ

แผนผังพื้นที่อาคารพลเอกสำเภา ชูศรี (E4) ชั้น 6
การประชุมวิชาการวิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย ครั้งที่ 45 (วทท 45)
วันที่ 7 - 9 ตุลาคม 2562



PROGRAM FOR GRAND OPENING CEREMONY OF STT45

7th OCTOBER 2019

Time	Events
8:00	All guests are seated in the Main Auditorium, Mae Fah Luang University
9:00	- Arrival of Her Royal Highness Princess Maha Chakri Sirindhorn - Presentation of Souvenirs and Program Book from Associate Professor Dr.Napavarn Noparatnaraporn (President of The Science Society of Thailand under the Patronage of His Majesty the King), Associate Professor Dr.Chayaporn Wattanasiri (President of Mae Fah Luang University) and Professor Dr.Pranut Potiyaraj (Chairperson of Academic Affairs of STT45) - Report on STT45 by Associate Professor Dr.Saiwarun Chaiwanichsiri (Chairperson of STT45) - Her Royal Highness Princess Maha Chakri Sirindhorn graciously presents plaques to the Keynote Speaker, 2019 Senior Scientists, 2019 Thailand Outstanding Scientist, 2019 Outstanding Technologist, 2019 Young Scientists, 2019 Outstanding Science Teachers, Winners of 2018 National Science Projects Competition, and STT45 Premium Sponsors - Grand Opening Address by Her Royal Highness Princess Maha Chakri Sirindhorn
9:45	- Brief introduction of the Keynote Speaker, Professor Dr.Robert H. Grubbs, 2005 Nobel Laureate in Chemistry by Associate Professor Dr.Napavarn Noparatnaraporn (President of The Science Society of Thailand under the Patronage of His Majesty the King) - Keynote Lecture: "Design and Applications of Selective Olefin Metathesis Catalysts" by Professor Dr.Robert H. Grubbs
10:20	- Brief introduction of the Plenary Speaker, Assistant Professor Dr.Montree Sawangphruk, 2019 Thailand Outstanding Scientist by Assistant Professor Dr.Uraiwan Intatha (Dean of School of Science, Mae Fah Luang University) - Plenary Lecture: "Electrochemical Energy Storage Technologies: Now and Future" by Assistant Professor Dr.Montree Sawangphruk
10.40	Her Royal Highness Princess Maha Chakri Sirindhorn visits MFU Exhibition, "Waste to Wealth" and Students' Science Projects
11.40	- Her Royal Highness Princess Maha Chakri Sirindhorn presides at photo sessions with - Administrative Committee of the Science Society of Thailand under the Patronage of His Majesty the King - The Council of Science Dean of Thailand - Administrative and STT45 Organizing Committees of Mae Fah Luang University - Her Royal Highness Princess Maha Chakri Sirindhorn presides at Grand Lunch
12.45	Her Royal Highness Princess Maha Chakri Sirindhorn departs from Mae Fah Luang University

KEYNOTE SPEAKER

Robert H. Grubbs

Division of Chemistry and Chemical Engineering
California Institute of Technology
Pasadena, CA 91125
e-mail: rhg@caltech.edu

DESIGN AND APPLICATIONS OF SELECTIVE OLEFIN METATHESIS CATALYSTS

Olefin Metathesis has become a tool for the synthesis of complex organic molecules and materials. The key to the development of these applications has been the discovery and study of organometallic complexes that will efficiently catalyze the reaction in the presence of standard functional groups. The next advances resulted from the development of more selective catalysts and complexes that show high turn over numbers in important transformations. Over the past several years two families of complexes have been developed that produce high Z selectivity in the cross metathesis of terminal olefins. Some of these catalysts now produce Z olefins in >95 Z at >95% conversions with high turn over numbers. The next challenge is to produce a catalyst that produces olefins with high E selectivity. A number of strategies are being developed for the construction of such catalysts.

In addition to the synthesis of complex organic molecules, the catalysts can be used to construct well defined polymer structures that have an array of functions. Key to the synthesis of these materials has been the understanding of the mechanisms of the polymerization process and the development of catalysts that allow careful control of the microstructure of the materials.

Although there are now a number of commercial processes based on olefin metathesis, others will only become possible with even more selective and efficient catalysts.

Robert H. Grubbs earned a Ph.D. in chemistry from Columbia University in 1968. He continued postdoctoral work at Stanford University (1968-1969) before joining the faculty of Michigan State University in 1969 where his academic mentors were Harold Hart, Gerasimos J.Karabatsos, Gene LeGoff, Don Farnum, Bill Reusch and Pete Wagner. At MSU he began his work on olefin metathesis. In 1978 he moved to California Institute of Technology as a professor of chemistry and became the Victor and Elizabeth Atkins Professor of Chemistry in 1990. Grubbs' main research interests are in organometallic chemistry and synthetic chemistry, especially the development of novel catalysts for olefin metathesis. He has been instrumental in developing a family of ruthenium catalyst including Grubbs catalyst for olefin metathesis, and also contributed to the development of "living polymerization". In 2005, Grubbs received the Nobel Prize in Chemistry along with Richard R. Schrock and Yves Chauvin for the introduction of olefin metathesis method to organic chemistry.

PLENARY SPEAKER

Montree Sawangphruk

Centre of Excellence for Energy Storage Technology (CEST)
School of Energy Science and Engineering
Vidyasirimedhi Institute of Science and Technology (VISTEC)
Rayong 21210, Thailand
e-mail: montree.s@vistec.ac.th

ELECTROCHEMICAL ENERGY STORAGE TECHNOLOGIES: NOW AND FUTURE

Electrochemical energy storage technologies such as Li-ion batteries and supercapacitors are of interest since they are electrical energy carriers widely used in many applications e.g., mobile phones, electric vehicles, smart grids. The Li-ion batteries have high energy density while the supercapacitors provide high power density. However, the current Li-ion batteries storing charges via the intercalation-based chemistry are almost at their thermodynamics limits. High-energy batteries such as Li-S and Metal-Air batteries with phase changes during charging/discharging believed to be the future energy storage technologies have been extensively investigated. By the way, conventional electrochemical double-layer capacitors (EDLC) or supercapacitors storing charges via a physisorption in a microporous activated carbon are practically at the storage limit of the EDLC technology. On the other hand, hybrid battery/EDLC materials are believed to be the future energy storage technology providing both high power and energy densities. More interestingly, a new concept of hybrid energy conversion and storage (HECS) technology has been recently discovered by our research team at VISTEC. The HECS, which can convert photon to photoelectron via the photoelectric effect and store the electron within the HECS material, is rather impressive in term of high coulombic efficiency and capacity retention.

Assistant Professor Dr.Montree Sawangphruk obtained his D.Phil. from University of Oxford, England. He is currently a Director of Centre of Excellence for Energy Storage Technology (CEST) at VISTEC. He received many awards in Thailand e.g. Thailand Outstanding Scientist Award from the Foundation for the Promotion of Science and Technology under the Patronage of His Majesty the King in 2019, TRF-OHEC-Scopus Research Award in Physical Sciences in 2018, National Invention Award from NRCT in 2017-18, and National Young Scientist Award from the Foundation for the Promotion of Science and Technology under the Patronage of His Majesty the King in 2014. He has authored over 90 peer-reviewed papers and 50 patents (pending).

PROGRAM FOR SPECIAL SESSIONS, INVITED LECTURES, ORAL PRESENTATIONS, MEETINGS AND SPONSORED SESSION

7th October 2019

SPECIAL SESSION (SP2: CANNABINOIDS: FROM BIOSYNTHESIS TO MEDICAL APPLICATIONS)

ROOM: E4A-618 General Sampao Choosri Building

Chairperson:		Associate Professor Dr.Rudee Surarit	
Time	**ID**	**Title**	**Speaker**
13:30-14:00	SP2_INV001	BIOTECHNOLOGICAL PRODUCTION OF CANNABINOIDS: WHERE ARE WE NOW AND WHERE ARE WE GOING?	Supaart Sirikantaramas
14:00-14:30	SP2_INV002	MEDICAL APPLICATIONS AND MECHANISM OF ACTION OF CANNABINOIDS	Bungorn Sripanidkulchia
14:30-15:00	SP2_INV003	INNOVATION IN CANNABIS TO REACH INTERNATIONAL STANDARD	Kornkanok Ingkaninan
15:00-15:20		OPEN DISCUSSION	

SESSION B: BIOLOGICAL SCIENCE

ROOM: E4A-607 General Sampao Choosri Building

Chairperson:		Professor Dr.Supachitra Chadchawan	
Time	ID	Title	Speaker
13:00-13:30	B_INV001	REGULARTORY microRNAs IN SHRIMP IMMUNITY	Kunlaya Somboonwiwat
13:30-13:50	B3_010_OA	*In vivo* TRANSFER OF PLASMID DNA EXPRESSING dsVP28 FROM RECOMBINANT *Bacillus subtilis* TO PROTECT SHRIMP FROM WHITE SPOT SYNDROME VIRUS	Hirun Saelim
13:50-14:10	B3_008_OA	BIOLOGICAL ACTIVITIES OF EPIDERMAL GROWTH FACTOR DOMAIN FROM THROMBOSPONDIN OF BANANA SHRIMP (*Fennerpenaeus merguensis*)	Monwadee Wonglapsuwan
14:10-14:30	B3_006_OA	DEVELOPMENT OF A NON-LETHAL DETECTION METHOD OF TILAPIA LAKE VIRUS IN NILE TILAPIA	Chutipong Jeamkunakorn
14:50-15:20	B3_005_OA	ASSESSMENT OF THE INHIBITORY EFFECT OF THAI PLANTS ON THE INTERACTION BETWEEN *Plasmodium falciparum* AND HUMAN RECEPTORS	Todsaporn Bunpote

ROOM: E4A-608 General Sampao Choosri Building

Chairperson:		Assistant Professor Dr.Noppadon Kitana	
Time	ID	Title	Speaker
13:30-14:00	B_INV002	SLOPE ECO-ENGINEERING-TOWARDS SUSTAINABLE AND GREEN LANDSCAPES	Normaniza Binti Osman
14:00-14:20	B5_006_OF	OVIPOSITIONAL PREFERENCES AND LARVAL DEVELOPMENT OF TAWNY COSTER *Acraea terpsicore* (LINNAEUS, 1758) (LEPIDOPTERA: NYMPHALIDAE) ON FOUR PASSION VINES	Chitsanuphong Phanthian
14:20-14:40	B5_004_OF	EFFECTS OF HYPER-OSMOTIC SHOCK ON THE RESPONSE OF HEMOLYMPH OSMOLALITY IN THE MUD CRAB *Scylla olivacea* (HERBST, 1796)	Phurich Boonsanit
15:00-15:20	B5_002_OF	GENETIC DIVERSITY AND REINTRODUCTION SOURCE OF THE COMMON BUTTERFLY LIZARD, *Leiolepis belliana* (SQUAMATA: AGAMIDAE), ON PHRA ISLAND, CHON BURI PROVINCE	Nutthanun Khantasup
15:20-15:40	B5_008_OF	AVIFAUNA IN PUBLIC PARKS IN BANGKOK AND THE EFFECTS OF PARK AREA	Sutanan Pinmaneenopparat
15:40-16:00	B5_030_OF	GENETIC DIVERSITY OF THE ISLAND FLYING-FOX, *Pteropus hypomelanus* (CHIROPTERA: PTEROPODIDAE), IN THAILAND	Patcharapon Jumsri
16:00-16:20	B5_029_OA	ADVANCES IN THE TAXONOMY OF PHYTOPATHOGENIC FUNGI	Yasmina Marin Felix

BMB MEETING

ROOM: E4A-618 General Sampao Choosri Building

Chairperson:	Associate Professor Dr.Tuangporn Suthiphongchai
Time	Title
15:30-16:30	ANNUAL GENERAL MEETING OF BIOCHEMISTRY AND MOLECULAR BIOLOGY SECTION

DEANS MEETING

ROOM: Kham Mok Luang Room, M-Sqaure Building

Time	Title
14:00-16:30	MEETING OF THE COUNCIL OF SCIENCE DEAN OF THAILAND

STT MEETING

ROOM: Kham Mok Luang Room, M-Sqaure Building

Time	Title
16:30-17:30	The 1st MEETING OF STT46

SPONSORED SESSION

ROOM: E4A-617 General Sampao Choosri Building

Time	ID	Title	Presenter
13:30-16:00	ST1	NMR APPLICATION FOR MEDICINAL HERB-METABOLOMICS APPROACH	Bruker Switzerland AG

PROGRAM FOR SPECIAL SESSIONS, INVITED LECTURES, ORAL PRESENTATIONS, DISCUSSION PANELS, MEETING, SPONSORED SESSIONS AND BANQUET

8th October 2019

SPECIAL SESSION (SP1: CRYSTALLOGRAPHY)

ROOM: E4A-607 General Sampao Choosri Building

Chairperson:	Professor Dr.Nongnuj Muangsin
Co-Chairperson:	Assistant Professor Dr.Kittipong Chainok

Time	ID	Title	Speaker
8:30-9:00	SP1_INV001	SNAP FROZEN METASTABLE POLYMORPHS – A STORY OF A TETRAMORPHIC ONE-DIMENSIONAL COORDINATION POLYMER	Edward R. T. Tiekink
9:00-9:15	SP1_001_OA	A SUPRAMOLECULAR Cd(II) FRAMEWORK: A SOLID-STATE LUMINESCENT SENSOR FOR AMINE VAPORS	Sujitra Tunsrichon
9:15-9:30	SP1_015_OA	POROUS-NONPOROUS STRUCTURAL PHASE TRANSFORMATIONS IN MOLECULAR SCHIFF BASE NICKEL(II) COMPLEXES: CRYSTAL STRUCTURE AND HIRSHFELD SURFACE ANALYSIS	Siripak Jittirattanakun
9:30-9:45	SP1_019_OA	ANIONS AND SOLVENT CONTROL SPIN CROSSOVER PROPERTIES OF Iron(II) IMIDAZOLYLIMINE COMPLEXES	Darunee Sertphon
9:45-10:30		FLASH PRESENTATIONS	

Chairperson:	Associate Professor Dr.Kuakarun Krusong
Co-Chairperson:	Dr.Urarika Luesakul

Time	ID	Title	Speaker
10:40-11:10	SP1_INV002	CRYSTAL STRUCTURE OF VP37 FROM WSSV REVEALS HEPARIN BINDING SITE IMPORTANT FOR WSSV INFECTION	Pongsak Khunrae
11:10-11:35	SP1_INV003	CRYSTALLOGRAPHIC EXAMINATION OF CYSTEINE BEHAVIORS UPON METAL COMPLEXATIONS IN DE NOVO METALLOPROTEINS	Leela Ruckthong
11:35-12:00	SP1_INV004	LATTIC TRANSLOCATION DISORDER COUPLED WITH PSEUDOTRANSLATION IN *Klebsiella pneumoniae* UDP-GALACTOPYRANOSE MUTASE CRYSTAL	Kittikhun Wangkanont

Chairperson:		Assistant Professor Dr.Kittipong Chainok	
Co-Chairperson:		Dr.Orrasa In-noi	
Time	ID	Title	Speaker
13:00-13:30	SP1_INV005	IN DEPTH INTO THE STRUCTURES OF MOLECULAR FUNCTIONAL MATERIALS	Arnaud Grosjean
13:30-13:45	SP1_016_OA	SEQUENTIAL SINGLE-CRYSTAL-TO-SINGLE-CRYSTAL TRANSFORMATIONS OF ERBIUM COORDINATION POLYMERS TRIGGERED BY SOLVENT EXCHANGE	Suwadee Jiajaroen
13:45-14:00	SP1_002_OA	SYNTHESIS, STRUCTURE, STRUCTURAL TRANSFORMATION AND VAPOCHROMISM OF AN IMINODIACETATO Ni(II) COMPLEX	Jitti Suebphanpho
14:00-14:30		FLASH PRESENTATIONS	
Chairperson:		Assistant Professor Dr.Supakorn Boonyuen	
Co-Chairperson:		Dr.Winya Dungkaew	
Time	ID	Title	Speaker
14:45-15:15	SP1_INV006	CRYSTAL ENGINEERING OF LANTHANIDE-AZO-4,4'-BENZENE TETRACARBOXYLATE FRAMEWORKS	Kitt Panyarat
15:15-15:30	SP1_012_OA	CRYSTAL ENGINEERING OF ZINC(II) COORDINATION POLYMERS BASED ON TRITOPIC AND N-DONOR MIXED LIGANDS	Kenika Khotchasanthong
15:30-15:45	SP1_003_OA	EFFECT OF POSITION ON IMIDAZOLYIMINE LIGAND ON THE CONTROL OF SPIN CROSSOVER PROPERTIES IN Iron(II) COMPLEXES	Saruda Yokputtaraksa
15:45-16:00	SP1_014_OA	CRYSTALLOGRAPHIC INVESTIGATION OF REVERSIBLE CRYSTTAL-TO-CRYSTAL TRANSFORMATION OF NEW COPPER(II) COORDINATION POLYMERS	Kodchakorn Samakun
16:00-16:30		FLASH PRESENTATIONS	

SESSION A: AGRICULTURAL SCIENCE / BIOTECHNOLOGY

ROOM: E4A-618 General Sampao Choosri Building

Chairperson:	Dr.Somrudee Nilthong
Co-Chairperson:	Dr.Niramon Suntipabvivattana

Time	ID	Title	Speaker
9:00-9:30	A_INV001	CARBON AND NITROGEN METABOLISM IN *Curcuma alismatifolia* GAGNEP USING 13C AND 15N STUDY	Soraya Ruamrungsri
9:30-9:50	A_001_OF	COMPARISON OF ANTIOXIDANT ACTIVITY AND STILBENE COMPOUNDS PRODUCED BY TAINAN9 AND KALASIN9 PEANUT HAIRY ROOT CULTURE ELICITED WITH A COMBINATION OF METHYL JASMONATE, CYCLODEXTRIN AND PARAQUAT	Pakwuan Wongshaya
9:50-10:10	A_002_OA	COLORIMETRIC LOOP-MEDIATED ISOTHERMAL AMPLIFICATION ASSAY FOR VISUAL DETECTION OF SCALE DROP DISEASE VIRUS IN ASIAN SEABASS	Sirintip Dangtip
10:10-10:30	A_007_OF	PROTEIN HYDROLYSATE PRODUCTION FROM DEFATTED RICE BRAN BY INNER ENZYME OF RICE MALT PLUS BROMELAIN	Yupakanit Puangwerakul
10:50-11:10	A_013_OF	EVALUATION OF THE CYTOTOXICITY AND GENOTOXICITY OF THE EXTRACTS FROM *Halymenia durvillei*	Athit Chaiwichien
11:10-11:30	A_016_OA	ROBUST BIOPROCESS FOR THE SUSTAINABLE PRODUCTION OF THE FUNGAL ANTI-CANCER LEAD COMPOUND ILLUDIN M	Lillibeth Chaverra-Muñoz
11:30-11:50	A_017_OF	DATA REDUNDANCY IN PAIRED-END DNA SEQUENCE ALIGNMENTS	Eliot M Cline
11:50-12:10	A_018_OF	SAFETY ASSESSMENT OF THE ETHANOLIC EXTRACT OF *Caulerpa lentillifera Invitro* SYSTEM	Supawadee Osotprasit

Chairperson:	Dr.Somrudee Nilthong		
Co-Chairperson:	Dr.Niramon Suntipabvivattana		
Time	ID	Title	Speaker
13:30-14:00	A_INV002	MOLECULAR PHARMING: HOW PLANTS CAN PRODUCE THE BIOPHARMACEUTICALS OF TOMORROW	Waranyoo Phoolcharoen
14:00-14:20	A_019_OF	EFFICIENCY OF *Caulerpa lentillifera* AND *Halymenia durvillei* EXTRACTED SUBSTANCES IN ANTI-OXIDATION	Tepparit Samrit
14:20-14:40	A_022_OF	TOTAL PHENOLIC CONTENT, TOTAL FLAVONOID CONTENT AND ANTIOXIDANT ACTIVITY OF THE CULTURE FILTRATE EXTRACT FROM *Ganoderma lucidum*	Puttachard Hensanghong
14:40-15:00	A_026_OA	PROTEIN ENGINEERING IN THE MAKING OF SUPER XYLANASE FOR ANIMAL FEED APPLICATIONS	Harit Boonyaputthikul
15:20-15:40	A_028_OA	EVALUATION OF SEGMENT 5 AND 6 PROTEINS FORM LiLV AS A POTENTIAL VACCINE CANDIDATE	Apisit Luengyangyuen
15:40-16:00	A_030_OA	DEVELOPMENT OF MUTATED ENHANCE GREEN FLUORESCENCE PROTEIN (mtEGFP) BASED ON SENSOR FOR DETECTION OF HEAVY METAL IONS IN THE ENVIRONMENT	Wasusit Somsoros
16:00-16:20	A_031_OF	STUDIES ON MICROBIAL BIOMASS CARBON AND NITROGEN TURNOVER DERIVED FROM SUGARCANE RESIDUES INCORPORATED INTO A SANDY LAOM SOIL	Walaiphan Chuwongpanich
16:20-16:40	A_037_OA	THE UTILIZATION OF PHOSPHATE CONTAINING WASTE WATER FROM SHRIMP PROCESSING FACTORY FOR REARING MARINE MICROALGAE, *Tetraselmis*, AND *Chaetoceros* sp.	Chonlatee Cheewasedtham

SESSION B: BIOLOGICAL SCIENCE

ROOM: E4A-617 General Sampao Choosri Building

Chairperson:	Associate Professor Dr.Tuangporn Suthiphongchai		
Co-Chairperson:	Associate Professor Dr.Rutaiwan Tohtong		
Time	**ID**	**Title**	**Speaker**
9:00-9:30	B_INV003	THE SECRETORY LEUKOCYTE PROTEASE INHIBITOR (SLPI): AN OLD FRIEND WITH NEW ROLES IN CARDIOVASCULAR DISEASES	Sarawut Kumphune
9:30-9:50	B4_001_OA	ESTROGENIC ACTIVITY OF EIGHT COMMERCIAL TRADITIONAL WOMEN REMEDIES ANALYZED BY YEAST TWO HYBRID SYSTEM	Palita Paewthaisong
9:50-10:10	B4_007_OF	PLASMA EXOSOME miR-21 AS THE INTERSTITIAL FIBROSIS AND TUBULAR ATROPHY(IF/TA) BIOMARKER IN KIDNEY TRANSPLANTATION	Sunaree Saejong
Chairperson:	Associate Professor Dr.Tuangporn Suthiphongchai		
Co-Chairperson:	Associate Professor Dr.Rutaiwan Tohtong		
10:30-11:00	B_INV004	METABONOMICS: THE 21ST CENTURY BIOCHEMISTRY-BASED TOOL FOR RESEARCH AND ENTERPRISE	Jutarop Phetcharaburanin
11:00-11:20	B1_003_OA	c-Myc DIRECTLY TARGETS AN OVEREXPRESSION OF PYRUVATE CARBOXYLASE IN HIGHLY INVASIVE BREAST CANCER	Sarawut Jitrapakdee
11:20-11:40	B1_001_OA	USES OF PLASMID DNA AND OLIGONUCLEOTIDES AS BIOPOLYMERS TO ASSIST THE FORMATION OF DIFFERENT SHAPED SILVER NANOPARTICLES	Sineenat Siri
11:40-12:00	B1_004_OF	ANTIOXIDANT AND CYTOPROTECTIVE EFFECT OF *Arthrospira platensis* PROTEIN HYDROLYSATE	Nattaya Wongyai

Chairperson:	Assistant Professor Dr.Ekachai Chukeatirot
Co-Chairperson:	Dr.Pattana Kakumyan

Time	ID	Title	Speaker
13:30-14:00	B_INV005	DISCOVERY OF NOVEL FUNGAL METABOLITES WITH ANTI-INFECTIVE AND OTHER BIOLOGICAL ACTIVITIES	Marc Stadler
14:00-14:15	B2_007_OF	CHARACTERIZATIONS OF TRIMETHOPRIM-SULFAMETHOXAZOLE RESISTANCE IN ENTEROBACTERIACEAE ISOLATED FROM SONGKLANAGARIND HOSPITAL	Kalyarat Kaewnirat
14:15-14:30	B2_009_OF	TESTING THE PHENOTYPIC EFFECTS OF *Acinetobacter baumannii* ANTIBIOTIC RESISTANT GENE IN *Escherichia coli* BY USING A HIGH-THROUGHPUT CLONING APPROACH	Asmita Khaniya
14:30-14:45	B2_006_OA	PREVALENCE OF BEGOMOVIRUSES INFECTING HOT PEPPER IN THAILAND	Somrudee Nilthong
14:45-15:00	B2_001_OA	DEVELOPMENT OF SHOE DEODORIZER SPRAYS: ADDING VALUE TO TAPIOCA STARCH VIA ECO-FRIENDLY SYNTHESIS OF SILVER NANOPARTICLES	Chotikan Tungklang

Chairperson:	Assistant Professor Dr.Ekachai Chukeatirot
Co-Chairperson:	Dr.Pattana Kakumyan

Time	ID	Title	Speaker
15:15-15:45	B_INV006	BACTERIOPHAGES IN CONTROL OF LUMINOUS VIBRIOS IN SHRIMP HATCHERY	Pimonsri Mittraparp-Arthorn
15:45-16:00	B2_008_OF	CHARACTERISTICS OF BACTERIPHAGES AGAINST *Vibrio* spp.	Natwara Dangnordang
16:00-16:15	B2_005_OA	PREVALENCE OF PHAGES INFECTING *Bacillus cereus* IN THUA NAO	Ratarat Kaewnak
16:15-16:30	B2_010_OA	DEVELOPMENT OF A LOOP-MEDIATED ISOTHERMAL AMPLIFICATION ASSAY FOR DETECTION OF THE PATHOGENIC OOMYCETE PYTHIUM INSIDIOSUM	Zin Mar Htun
16:30-16:45	B2_004_OA	PHYLOGENY OF *Bacillus* STRAINS OBTAINED FROM ASIAN FERMENTED SOYBEAN FOOD PRODUCTS	Kanjana Soodpakdee

SESSION C: CHEMISTRY

ROOM: E4A-616 General Sampao Choosri Building

Chairperson:	Professor Dr.Orawan Chailapakul
Co-Chairperson:	Dr.Chadin Kulsing

Time	ID	Title	Speaker
9:00-9:30	C_INV001	TOWARDS SEPARATION OF TEN THOUSAND COMPOUNDS WITH COMPREHENSIVE MULTIDIMENSIONAL GAS CHROMATOGRAPHY	Chadin Kulsing
9:30-9:50	C1_001_OF	FLUORESCENT DETERMINATION OF SOLUBLE PYROPHOSPHATE LEVEL IN SYNOVIAL FLUID AS A MARKER OF PSEUDOGOUT DISEASE	Nattha Yongwattana
9:50-10:10	C1_006_OF	SPECIFIC AND SENSITIVE DETECTION METHOD FOR CHROMIUM (VI) IN ORANGE JUICE USING DOUBLE REACTIONS	Indiah Ratna Dewi
10:10-10:30	C1_015_OA	PORTABLE AND INEXPENSIVE SPECTROMETER WITH LIGHT EMITTING DIOED FOR STUDY OF STABILITY OF GOLD NANOPARTICLES	Porawach Chinorn

Chairperson:	Professor Dr.Thawatchai Tuntulani
Co-Chairperson:	Associate Professor Dr.Apinpus Rujiwatra

Time	ID	Title	Speaker
10:50-11:20	C_INV002	LANTHANIDE COORDINATION FRAMEWORKS: FROM STRUCTURE TO FUNCTION	Apinpus Rujiwatra
11:20-11:40	C2_002_OA	AMINO-DECORATING MOF AS A DUAL TURN-ON/TURN-OFF FLUORESCENT SENSOR FOR TNP DETECTION	Theanchai Wiwasuku
11:40-12:00	C2_004_OA	A FLUORESCENT SENSOR FOR THE DETECTION OF COBALT(II) IONS BASED ON GRAPHENE QUANTUM DOTS	Wissuta Boonta

Chairperson:	Professor Dr.Tirayuth Vilaivan
Co-Chairperson:	Assistant Professor Dr.Chittreeya Tansakul

Time	ID	Title	Speaker
13:00-13:30	C_INV003	PHENANTHRO[1,2-*b*:8,7-*b*']DITHIOPHENE (PDT): APPLICATION TO ORGANIC FIELD-EFFECT TRANSISTORS AND ORGANIC PHOTOVOLTAICS	Yasushi Nishihara
13:30-13:50	C3_013_OA	DESIGN, SYNTHESIS AND STRUCTURE-PROPERTIES STUDIES OF CATIONIC STYRYL DYES FOR DNA SENSING APPLICATIONS	Kotchakorn Supabowornsathit
13:50-14:10	C3_010_OF	KINETIC STUDY OF CONJUGATE ADDITION OF AMINES INTO ALKYNOIC ESTER	Peerawat Saejong
14:10-14:30	C3_005_OF	THE PRELIMINARY STUDIES ON THE SYNTHESIS AND THE CYTOTOXICITY TOWARDS HepG2 AND Huh7 OF A NEW SERIES OF SORAFENIB ANALOGUES: REPLACEMENT OF ARYL UREA WITH A TRIAZOLE RING	Panupun Limpachayaporn

Chairperson:	Professor Dr.Pornthep Sompornpisut
Co-Chairperson:	Associate Professor Dr.Viwat Vchirawongkwin

Time	ID	Title	Speaker
14:50-15:20	C_INV004	NORMAL MODE ANALYSIS VIA EXPANDED MOMENT OF INTERIA TENSOR	Viwat Vchirawongkwin
15:20-15:40	C4_001_OA	EXCITED-STATE TORSIONAL ROTATION OF THIOFLAVIN T BINDING TO VARIANT HUMAN TELOMERIC G-QUADRUPLEX DNA: A QM/MM STUDY	Wutthinan Thongyod
15:40-16:00	C4_003_OF	ENHANCING SENSITIVITY AND SELECTIVITY OF SURFACE-ENHANCED RAMAN SCATTERING DETECTION BY CHEMOMETRIC METHOD	Nontawat Sricharoen

SESSION D: POLYMER & MATERIALS SCIENCE / NANOTECHNOLOGY

ROOM: E4A-609 General Sampao Choosri Building

Chairperson:	Assistant Professor Dr.Taweechai Amonsakchai
Co-Chairperson:	Professor Dr.Supon Ananta

Time	ID	Title	Speaker
13:00-13:30	D_INV001	BIOPLASTIC FROM STARCH AND WHEAT GLUTEN: MATERIALS OF THE FUTURE	Kaewta Kaewtatip
13:30-13:50	D_002_OF	MODIFICATION OF PECTIN BY 3-(DIMITHYLAMINO) PROPYLAMINE	Nootcharee kunkit
13:50-14:10	D_048_OA	PREPARATION AND PROPERTIES OF CASSAVA STARCH / MODIFIED SUGAR CANE FIBER COMPOSITE	Lalisa Bunmechimma
14:10-14:30	D_057_OA	EFFECTS OF PROCESSING STEP AND FIBER VOLUME FRACTION ON RICE STRAW/UNSATURATED POLYESTER BIOCOMPOSITES	Thanatorn Thanyapanich
14:30-14:50	D_028_OF	NATURAL RUBBER FILM MODIFIED BY METHYLTRICHLOROSILANE FOR CREATING SUPERHYDROPHOBIC SURFACE	Patchararujee Ngamdee

Chairperson:	Associate Professor Dr.Wisanu Pecharapa
Co-Chairperson:	Associate Professor Dr.Darunee Wattanasiriwech

Time	ID	Title	Speaker
15:10-15:40	D_INV002	RECENT DEVELOPMENT OF NiTi SHAPE MEMORY ALLOYS CATHETER DEVICES FOR MEDICAL APPLICATIONS IN THAILAND	Anak Khantachawana
15:40-16:00	D_032_OA	PREPARATION OF HETEROGENEOUS CATALYSTS OF PLATINUM@MESOPOROUS CARBON VIA SELF-ASSEMBLY METHOD FOR FURTURAL HYDROGENATION REACTION	Piyamit Toumsri
16:00-16:20	D_059_OA	COMPARISON OF MOLDED PULPS FROM RICE STRAW, PINEAPPLE LEAF AND BANANA STEM PULPS	Thawan Chotimarnon
16:20-16:40	D_056_OA	EFFECT OF SHORT PULPING TIME ON SODA PULPING PROCESS OF BANANA STEM AND PINEAPPLE LEAF	Bussayapat Phanyot
16:40-17:00	D_058_OA	EFFECT OF POST-CURING ON RICE STRAW/UNSATURATED POLYESTER BIOCOMPOSITES	Thanaphat Boonpet

SESSION E: ENERGY / ENVIRONMENTAL & EARTH SCIENCE

ROOM: E4A-608 General Sampao Choosri Building

Chairperson:	Associate Professor Dr.Prasert Reubroycharoen
Co-Chairperson:	Associate Professor Dr.Pitsanupong Kanjanapayont

Time	ID	Title	Speaker
13:00-13:30	E_INV001	GEOLOGY IN THE VICINITY OF CHINESE GREAT WALL STATION, KING GEORGE ISLAND, ANTARCTICA	Pitsanupong Kanjanapayont
13:30-13:50	E_006_OF	THE STUDY OF BASEFLOW SEPARATION AT WATERSHEDS IN CHIANG RAI, THAILAND	Prach Sukkavee
13:50-14:10	E_009_OA	STRUCTURAL STYLE AND TECTONIC EVOLUTION OF THE TARANAKI BASIN, NEW ZEALAND: INTERPRETATION FROM THE PARIHAKA SEISMIC DATA	Piyaphong Chenrai
14:10-14:30	E_012_OF	ORGANIC GEOCHEMICAL CHARACTERISTICS OF COAL DEPOSITS IN LAMPANG PROVINCE	Patthapong Chaiseanwang

Chairperson:	Associate Professor Dr.Prasert Reubroycharoen
Co-Chairperson:	Associate Professor Dr.Pitsanupong Kanjanapayont

Time	ID	Title	Speaker
14:40-15:00	E_013_OF	RECONSTRUCTION OF SEA LEVEL FLUCTUATION AND PALEOENVIRONMENTAL CHANGES IN KHAO SAM ROI YOT NATIONAL PARK, CHANGWAT PRACHUAP KHIRI KHAN DURING THE LATE HOLOCENE	Worakamon Nudnara
15:00-15:20	E_024_OF	PALEOSEISMIC EVIDENCES OF THE DOI WIANG LA FAULT SEGMENT, MAE HONG SON FAULT, NORTHERN OF THAILAND	Chanista Chansom
15:20-15:40	E_028_OF	SIMULATION OF SHALLOW LANDSLIDES SUSCEPTIBILITY MAP IN THE TOP OF PHU TUB BERK MOUNTAIN, PHETCHABUN, THAILAND	Apiwat Intiyakoset

SESSION G: MATHEMATICS / STATISTICS / COMPUTER SCIENCE

ROOM: E4A-608 General Sampao Choosri Building

Chairperson:	Associate Professor Dr.Chartchai Leenawong
Co-Chairperson:	Assistant Professor Dr.Nifatamah Makaje

Time	ID	Title	Speaker
9:00-9:30	G_INV001	DEVELOPMENT OF CONSENSUS CLUSTERING AND APPLICATIONS IN THE LAST DECADE	Tossapon Boongoen
9:30-10:00	G_INV002	THE INVASION OF RECOMMENDERS	Ponrudee Netisopakul
10:00-10:20	G_002_OF	EXPLORING DATA CLASSIFICATION MODELS FOR IDENTIFICATION OF CKD PROGRESSION INTERVAL: A CASE STUDY	Theeranai Sangjan

Chairperson:	Associate Professor Dr.Chartchai Leenawong
Co-Chairperson:	Dr.Chanin Srisuwannapa

Time	ID	Title	Speaker
10:40-11:10	G_INV003	DYNAMIC PRICING OR DYNAMIC LOGISTICS?	Thunyarat Amornpetchkul
11:10-11:40	G_INV004	A COMBINED BENDERS DECOMPOSITION AND COLUMN GENERATION TECHNIQUE FOR ONE DIMENSIONAL CUTTING STOCK PROBLEM AND PERSONNEL SCHEDULING PROBLEM WITH DISCRETE UNCERTAIN REQUIREMENTS	Peerayuth Charnsethikul

SESSION DP1: EXPLORING THE KNOWLEDGE BOUNDARY OF HAZE: FROM SCIENTIFIC FINDINGS TO ACTIONABLE INTELLIGENCE POLICY

ROOM: E4A-615 General Sampao Choosri Building

Time	Panelists
9:00-12:00	Associate Professor Dr.Sermkiat Jomjunyong *Director of Haze Free Thailand Project* *Department of Industrial Engineering* *Faculty of Engineering, Chiang Mai University* Assistant Professor Dr.Sombat Yumuang *Director of GIS Thai Center*

SESSION DP2: INNOVATION IN APPLIED BIOMEDICAL SCIENCE

ROOM: E4A-614 General Sampao Choosri Building

Time	Panelists
9:00-12:00	Associate Professor Dr.Nipon Theera-Umpon *Department of Electrical Engineering* *Faculty of Engineering, Chiang Mai University* Associate Professor Dr.Sittiporn Punyanitya *BioMedical Engineering Center, Chiang Mai University* Associate Professor Dr. Surapun Yimman *Department of Industrial Physics and Medical Instrumentation* *Faculty of Applied Science, King Mongkut's University of Technology North Bangkok*

ANNUAL MEETING

ROOM: Kham Mok Luang Room, M-Sqaure Building

Time	Title
12:00-13:30	ANNUAL MEETING OF THE SCIENCE SOCIETY OF THAILAND UNDER THE PATRONAGE OF HIS MAJESTY THE KING

SPONSORED SESSIONS

ROOM: E4A-609 General Sampao Choosri Building

Time	ID	Title	Presenter
09:00-12:00	ST2	TOTAL SOLUTION FOR CANNABIS TESTING	Bara Scientific Co., Ltd.
12:00-12:45	ST4	OVERVIEW OF MEDICINAL CANNABIS SOLUTIONS	A.T. Science Trading Ltd., Part.

ROOM: E4A-608 General Sampao Choosri Building

Time	ID	Title	Presenter
12:00-12:45	ST3	NGS SOLUTION FOR YOUR RESEARCH - From sample-to-answer: Find the right NGS solution for your project - Cast study: Translational microbiome as applied to health care	Getz Healthcare (Thailand) Ltd.

CONFERENCE BANQUET

ROOM: HRH Princess Srinagarindra Courtyard

Time	Title
17:30-20:15	CONFERENCE BANQUET

9th October 2019

SESSION D: POLYMER & MATERIALS SCIENCE / NANOTECHNOLOGY

ROOM: E4A-609 General Sampao Choosri Building

Chairperson:	Professor Dr.Supon Ananta
Co-Chairperson:	Associate Professor Dr.Naratip Vittayakorn

Time	ID	Title	Speaker
9:00-9:30	D_INV003	SYNCHROTRON X-RAY ABSORPTION SPECTROSCOPY INVESTIGATION ON TEMPERATURE- AND FIELD-DEPENDENT LOCAL STRUCTURE IN BTO AND PZT PEROVSKITE MATERIALS	Rattikorn Yimnirun
9:30-9:50	D_034_OA	PHOTOLUMINESCENCE AND X-RAY PHOTOELECTRON SPECTROSCOPIC STUDY OF MILLED ZINC OXIDE MATERIAL PREPARED BY HIGH ENERGY BALL MILLING TECHNIQUE	Wisanu Pecharapa
9:50-10:10	D_014_OA	SUPERHYDROPHOBIC GOLD FILM EMBEDDED ON PDMS AS A POTENTIAL SUBSTRATE FOR MAGNETOWETTING	Kanet Wongravee
10:10-10:30	D_024_OA	ENHANCED PHOTOCATALYTIC EFFICIENCY USING NATURAL LAC-DYE MODIFIED TITANIUM DIOXIDE PHOTOCATALYST	Cheewita Suwanchawalit

Chairperson:	Associate Professor Dr.Naratip Vittayakorn
Co-Chairperson:	Associate Professor Dr.Darunee Wattanasiriwech

Time	ID	Title	Speaker
10:40-11:00	D_012_OA	ENHANCED DIELECTRIC CONSTANT OF BARIUM TITANATE–EPOXY COMOSITES THROUGH A 3D CERAMIC NETWORK STRUCTURE	Gasidit Panomsuwan
11:00-11:20	D_037_OF	ENHANCING HYDROPHOBICITY OF PVDF HOLLOW FIBER MEMBRANE BY PLASMA INDUCED AND GRAFTED WITH CHLOROALKYLSILANES	Hanh Le Thi My
11:20-11:40	D_063_OA	EFFECT OF SURFACE TREATMENTS ON MICRO-SHEAR BOND STRENGTH OF RESIN CEMENT TO A NEWLY DEVELOPED LITHIUM DISILICATE GLASS CERAMIC	Teerapong Mamanee
11:40-12:00	D_054_OF	SYNTHESIS AND STRUCTURAL PROPERTIES OF METAL DOPED Li NIKEL-RICH NMC MATERIALS FOR HIGH SPECIFIC CAPACITY	Jaruwan Kanthachan

SESSION E: ENERGY / ENVIRONMENTAL & EARTH SCIENCE

ROOM: E4-608 General Sampao Choosri Building

Chairperson:		Associate Professor Dr.Prasert Reubroycharoen	
Co-Chairperson:		Associate Professor Dr.Kraichat Tantrakarnapa	
Time	ID	Title	Speaker
9:00-9:30	E_INV002	AIR POLLTUION AND HEALTH IMPACT ASSESSMENT IN THAILAND	Kraichat Tantrakarnapa
9:30-9:45	E_014_OF	USING INFORMATION AND COMMUNICATION TECHNOLOGY TO SUPPORT THE MANAGEMENT OF HOUSEHOLD HAZARDOUS WASTE: A CASE OF CHIANG RAI PROVINCIAL ADMINISTRATIVE ORGANIZATION	Mudchima Unmuang
9:45-10:00	E_015_OF	ESTIMATING LONG-TERM GROUND-LEVEL PM10 CONCENTRATIONS OVER NORTHERN THAILAND USING A SATELLITE-BASED	Saran Panjaruang
10:00-10:15	E_016_OA	POTENTIAL BIOFERTILIZER FROM HEAVY METAL CONTAMINATED AREA FOR SUSTAINABLE AGRICULTURE	Thitinun Sumranwanich
Chairperson:		Associate Professor Dr.Prasert Reubroycharoen	
Co-Chairperson:		Associate Professor Dr.Kraichat Tantrakarnapa	
10:30-10:45	E_027_OF	PHYSICOCHEMICAL CHARACTERIZATION OF SLOW PYROLYSIS BIOCHAR FROM ROBUSTA SPENT COFFEE GROUNDS FOR UTILIZATION IN SOIL AMENDMENT	Naeem Hussain
10:45-11:00	E_022_OF	CHARACTERISTICS OF BIOCHAR FROM TEA RESIDUAL FOR SOIL AMENDMENT	Patsara Danwittayakul
11:00-11:15	E_011_OA	HYDROGEN ADSORPTION ON MODIFIED ACTIVATED LUFFA CARBON	Sukanya Meethom
11:15-11:30	E_021_OF	DEVELOPMENT OF LITHIUM METAL OXIDE AS A CATHODE MATERIAL FOR LITHIUM ION BATTERIES	Piyaphat Sunthi
11:30-11:45	E_003_OA	ELECTROCHEMICAL PERFORMANCE OF CU-MN-S/CARBON NANOTUBES COMPOSITE AS ELECTRODE MATERIAL FOR COIN CELL SUPERCAPACITORS	Siriwimol Noymak
11:45-12:00	E_025_OA	DIRECT ACTIVATION OF *Samanea saman* LEAVES TO NITROGEN SELF-DOPED ACTIVATION CARBONS FOR HIGH ENERGY DENSITY SUPERCAPACITORS	Vichuda Sattayarut

SESSION F: PHYSICS / APPLIED PHYSICS

ROOM: E4A-607 General Sampao Choosri Building

Chairperson:	Associate Professor Dr.Pisith Singjai
Co-Chairperson:	Dr.Somwan Chumphongphan

Time	ID	Title	Speaker
9:00-9:30	F_INV001	DEVELOPMENT OF PYTHON-BASED SOFTWARE FOR RESEARCH AND EDUCATION	Supagorn Rugmai
9:30-9:50	F_004_OF	FLOW CROSSOVER DURING COLLISIONLESS MAGNETIC RECONNECTON	Pakkapawn Prapan
9:50-10:10	F_005_OF	VERIFICATION OF CURLING PROBE MEASUREMENT IN DC PLASMA	Chatchai Sirithipvanich
10:10-10:30	F_009_OF	MONITORING PAINT AND PRIMER SAMPLES USING MULTISPECTRAL AND HYPERSPECTRAL IMAGING TECHNIQUES	Nawarat Kaew-on

SESSION DP3: DIALOGUE FOR ECOLOGICAL REGENERATION: ENGAGING WITH ENVIRONMENTAL KNOWLEDGE IN THE NORTH OF THAILAND

ROOM: E4A-618 General Sampao Choosri Building

Time	Panelists
9:00-12:00	Dr.Stephen Elliott *Department of Biology* *Faculty of Science, Chiang Mai University*

SESSION DP4: BORDER DEVELOPMENT

ROOM: E4A-618 General Sampao Choosri Building

Time	Panelists
13:00-16:00	Dr.Pornwasin Sirisawat School of Management, Mae Fah Luang University Dr. Narat Hasachoo School of Management, Mae Fah Luang University

ABSTRACTS

FOR

SPECIAL SESSIONS AND INVITED LECTURES

A_INV001

Soraya Ruamrungsri
Department of Plant and Soil Science,
Faculty of Agriculture, Chiang Mai University,
Chiangmai 50200, Thailand.
e-mail: sorayaruamrung@gmail.com

CARBON AND NITROGEN METABOLISM IN *CURCUMA ALISMATIFOLIA* GAGNEP USING 13C AND 15N STUDY

Curcuma alismatifolia Gagnep. is one of high potential flower bulb crop in Thailand. It was in family Zingiberaceae and its native was in South East Asia and some are found in sub tropical zone. Nowadays, growers have grown this plant for cut flower and sale in domestic market and rhizomes were exported to many countries such as The Netherlands and some European countries. Carbon and nitrogen play an important role in plant metabolism. Old storage roots organ is a major organ for carbon source and old rhizome played an important role of N source during initial growth. At dormancy stage, arginine and glutamic acid is major free amino acid in rhizome and storage roots, respectively. Soluble sugar in old storage roots increase after planting to initial growth and transport to newly organs such as shoots. Carbon stored in old storage roots were rapidly use during 10 weeks after planting (WAP) and daily gain of carbon accumulation was high at 10-13 WAP. After rhizome harvest, rhizome and storage root contained starch approximately 91 and 68 mg g^{-1} FW, respectively. The high N supply increase growth and development of plant, including the number of inflorescences and the new rhizome formation. The protein and free amino acids also increased in both rhizome and storage roots at harvest. Reduced N supply increased the accumulation of carbohydrate in rhizome and storage roots.

Professor Dr.Soraya Ruamrungsri graduated Ph.D. from Niigata University, Japan. She is now a Professor at Department of Plant and Soil Science, Faculty of Agriculture, Chiang Mai University. Her interested research field is plant nutrition and physiology of flower bulbs.

Waranyoo Phoolcharoen
Faculty of Pharmaceutical Sciences, Chulalongkorn University
e-mail: Waranyoo.P@chula.ac.th

MOLECULAR PHARMING: HOW PLANTS CAN PRODUCE THE BIOPHARMACEUTICALS OF TOMORROW

Molecular Pharming is a recent technology that uses plant biotechnology to produce large quantities of recombinant therapeutic proteins. This technology represents an unprecedent opportunity to manufacture affordable modern medicine and make these available at a global scale. Recently, transient plant-based expression was developed to produce recombinant protein, offering several advantages over the traditional systems, such as low production cost, lack of animal and human pathogens, scalability, speed, post-translational modification[1]. Our research group focuses on using transient plant-based technology to produce monoclonal antibodies (mAbs) against infectious diseases, such as Rabies[2], EV71, Ebola, etc. Our group also produces the immune checkpoint inhibitors for cancer, such as anti-PD1 mAb, anti-PD-L1 mAb, and anti-CTLA4 mAb. Moreover, several recombinant proteins were produced with this platform. For example, plant-produced osteopontin protein was shown to induce the osteogenic related genes and also induce the calcification[3,4]. It has potential to use to induce bone production in tissue engineering. Our research's strategy is to develop affordable medicines for Thailand and other developing countries

References:

1. Komarova TV, Baschieri S, Donini M, Benvenuto E, Dorokhov YL. 2010;9:859-76.
2. Phoolcharoen W, Banyard AC, Prehaud C, Selden D, Wu G, Birch CPD, Szeto TH, Lafon M, Fooks AR, Ma JK. 2019;37:4673-4680.
3. Rattanapisit K, Abdulheem S, Chaikeawkaew D, Kubera A, Mason HS, MA JK, PAvasant P, Phoolcharoen W. 2017;7:17358.
4. Rattanapisit L, Srifa S, Kaewpungsup P, Pavasant P, Phoolcharoen W. 2019;21:e00312.

Assoc. Prof. Waranyoo Phoolcharoen finished her PhD in Arizona State University in 2010 and started working in Faculty of Pharmaceutical Sciences, Chulalongkorn University. In 2013, she got the Newton International Fellowship to do postdoctoral research in St. George's Medical School, University of London. She has published more than 20 papers on the subject of molecular pharming of plant-produced biopharmaceuticals in many international journals such as PNAS, Scientific Reports, Plant Biotechnology Journal, etc.

B_INV001

Kunlaya Somboonwiwat
Center of Excellence for Molecular Biology and Genomics of Shrimp, Department of Biochemistry, Faculty of Science, Chulalongkorn University, Thailand
e-mail: kunlaya.s@chula.ac.th

REGULATORY microRNAs IN SHRIMP IMMUNITY

Infectious diseases are the most devastating problem in shrimp culture. Upon infection, bacterial and viral pathogens activate immune pathways resulting in the production of various immune effectors that have roles in combating the disease. At the same time, those pathogens hijack the host to allow the invasion. Our studies focus on functional characterization of microRNAs (miRNAs) in shrimp immune responses against major shrimp pathogens, *Vibrio parahaemolyticus* causing early mortality syndrome (VP_{AHPND}) and white spot syndrome virus (WSSV). Transcriptomic analysis revealed the regulatory role of miRNAs on key genes of immune pathways as a result of fine-tuning the shrimp immune responses. Upon WSSV infection, several miRNAs were differentially expressed. Among them, pmo-miR-315, was up-regulated and targeted *PmPPAE3*, and subsequently, inhibit the prophenoloxidase (proPO) activity in shrimp hemocyte. The reduction of proPO activity caused an increase of WSSV replication. Our recent study showed that non-lethal heat stress (NLHS) could enhance shrimp survival upon VP_{AHPND} infection. Herein, the NLHS-induced differentially expressed genes, differentially expressed miRNAs, and the miRNA-mRNA regulatory network were identified. Focusing on immune responses, NLHS induces changes in expression of genes involved in the prophenoloxidase system, hemocyte homeostasis and antimicrobial peptide production of VP_{AHPND}-infected *P. vannamei*. The VP_{AHPND}-responsive miRNAs targeting immune genes, lva-miR-4850 was further functional characterized. The role of lva-miR-4850 in suppressing *PO2* gene expression was confirmed *in vitro* and *in vivo*. Introducing the lvamiR-4850 mimic into the VP_{AHPND}-infected shrimp caused the reduction of the *PO2* transcript and the PO activity but significantly increased the number of bacteria in the shrimp tissues. In conclusion, our study provides new insight into the roles of miRNAs in shrimp immunity against bacterial and viral infection.

References:

1. Jaree, P., Wongdontri, C., Somboonwiwat, K., 2018. Frontiers in Immunology 25;9:2184
2. Boonchuen, P., Jaree, P., Somboonwiwat, K. (submitted) Scientific Reports.

Kunlaya Somboonwiwat, Ph.D. is an Associate Professor, Biochemistry Department, Chulalongkorn University. She graduated Ph.D. from Chulalongkorn University and was a postdoctoral fellow at Bio21 Institute, University of Melbourne, Australia. Her lab focuses on shrimp immunity against pathogen infections. She published a lot of papers and received several awards such as 2015 Outstanding Royal Golden Jubilee Alumni Award and M.R. Jisnuson Svasti Young Protein Scientist of Thailand Award.

Normaniza Osman
Institute of Biological Sciences, Faculty of Science, University of Malaya
e-mail: normaniza@um.edu.my

SLOPE ECO-ENGINEERING – TOWARDS SUSTAINABLE AND GREEN LANDSCAPE

In Malaysia, slope eco-engineering has been practiced in slope stability management. However, the practice of impractical vegetation management of monoculture system has shown a deteriorating effect on slope stability and sustainability. Therefore, a mix-culture (high biodiversity) system method is proposed as an alternative slope management. This technique is proven to accelerate the process of natural succession of the slope and would ultimately improve the slope sustainability in short periods of time. Nonetheless, implementing the technique has become a challenging and crucial task. Plant-soil interactions are complex and barely being understood – slope conditions are harsh, and plants are fragile. However, with good pioneering characteristics and right mixtures of plants, the way forward in eco-engineering seems promising.

Dr. Normaniza graduated from University of Iowa, USA in 1993 and received both Master and Ph.D. from University of Malaya in 1998 and 2005, respectively. She joined the institute in December 2005 and promoted to Professor in 2018. Currently, she serves the university as Deputy Dean of Innovative Industry and Sustainability Science Research Cluster. Her research interest is Plant Eco-physiology and Slope Bio-engineering. Being a Certified Professional Erosion and Sediment Control (CPESC) since 2008, she has been awarded many research grants for slope rehabilitation program by the Ministry of Education (Malaysia) and highway operators in the country.

Sarawut Kumphune
Department of Medical Technology, Faculty of Allied Health Sciences, Naresuan University
e-mail: sarawutk@nu.ac.th

THE SECRETORY LEUKOCYTE PROTEASE INHIBITOR (SLPI): AN OLD FRIEND WITH NEW ROLES IN CARDIOVASCULAR DISEASES

Ischaemic Heart Disease is predicted to be the major cause of death among the population around the world, including Thailand. The survivors from myocardial infarction can subsequently suffer from left ventricular remodeling, which includes ventricular dilatation and hypertrophy. The latter is associated with a significant increase in risk of heart failure and arrhythmia.

During myocardial ischaemia and reperfusion, various biochemical processes occur including post-ischaemic inflammation, production of oxygen radicals, polymorphonuclear cell infiltration and protease release. These contribute to tissue damage, cell necrosis and subsequent functional impairment. Protease enzymes cause widespread destruction and have relatively long half-lives in tissue. Moreover, an increasing in the activity of proteolytic enzymes contribute to the process of cell death, leading to lethal injury. Inhibition of protease activity can therefore be considered as powerful strategies for prevention of I/R injury, as well as progression of cardiac remodeling leading to heart failure. Although many small molecule protease inhibitors have been developing, the "off-target effect" of these drug candidates seems to be seriously concerned. Alternatively, the use of broad endogenous anti-protease peptide, which is normally expressed and functions in the body, could provide more reliable and safe results.

Our study demonstrated that giving recombinant human secretory leukocyte protease inhibitor (rhSLPI) by mean of overexpression of rhSLPI gene or treatment with recombinant protein of human SLPI provides cytoprotective effects against in an *in vitro* and *ex vivo* experiments where rhSLPI was administered as a preconditioning treatment. The mechanisms of cardioprotection was elucidated through intracellular reactive oxygen species (ROS) reduction, attenuation of p38 MAPK, augment of Akt phosphorylation, and inhibition of apoptotic regulatory pathways. Furthermore, the effects of rhSLPI as a postconditioning treatment administered at the time of reperfusion in an *in vivo* model of I/R injury, the long-term effects of rhSLPI in post-MI cardiac remodeling and hypertrophy also intensively investigated. This situation is compatible with a clinical application of rhSLPI for myocardial infarction (MI) patients because it could be administered by the interventional cardiologist.

In summary, SLPI provides cytoprotective effects, especially cardioprotection against myocardial I/R injury and also could have a beneficial effect on post-ischaemic cardiac remodeling, and heart failure.

Graduated from King's College London, University of London (Ph.D. in Medicine-Cardiovascular Medicine Research), Currently an assistant professor (in Medical Technology) and Head of Biomedical Research unit in Cardiovascular Sciences (BRUCS) at Naresuan University, Research interests involving the molecular mechanism of pharmacological cardioprotection, ischaemic heart diseases, heart failure.

B_INV004

Jutarop Phetcharaburanin

Department of Biochemistry, Faculty of Medicine, Khon Kaen University & Khon Kaen University International Phenome Centre

e-mail: jutarop@kku.ac.th

METABOLOMICS: THE 21ST CENTURY BIOCHEMISTRY-BASED TOOL FOR RESEARCH, INNOVATION AND ENTERPRISE

Metabolomics is one of the latest research components in the suite of systems biology, employing both quantitative and qualitative measurement of metabolites in specimens such as urine, plasma, serum, feces and tissues. Information obtained from metabolomics study provides the insights on specific metabolism and physiology related to a disease condition or disorder. Furthermore, metabolomics is the effective analytical platform for investigating the highly specific and precise biomarkers. In addition to disease biomarker discovery, metabolomics can be applied in food systems including food resources, food processing and diet for humans, and it is, therefore, known as food metabolomics. The study of food metabolomics has increased gradually in the recent years, because food systems are directly related to nutrition and human health. Hence, the phenotyping power of metabolomics makes it a pivotal tool for understanding living systems and metabolomics applications are beneficial to consumer goods, nutrition and agriculture research, leading to the development of healthier, safer foods and personal care products.

Dr.Jutarop Phetcharaburanin obtained his Ph.D. in Clinical Medicine Research (Computational and Systems Medicine) from Imperial College London, UK in 2018. He currently works as a lecturer at Faculty of Medicine, Khon Kaen University. His research interests include 1) use of metabonomics and systems biology for investigation of disease biomarkers and for establishment of personalized medicine; 2) host-microbiota metabolic crosstalk; and 3) plant- and bacteria-derived bioactive compounds as pharmaceutical agents.

Marc Stadler
Department Microbial Drugs, Helmholtz Centre for Infection Research
e-mail: marc.stadler@helmholtz-hzi.de

DISCOVERY OF NOVEL FUNGAL METABOLITES WITH ANTI-INFECTIVE AND OTHER BIOLOGICAL ACTIVITIES

Over the past decades, fungi have already yielded numerous blockbuster drugs and commercial agrochemicals, such as penicillin, cyclosporine, the statins, strobilurins and emodepside, but many fungal genera and species still remain to be explored systematically. In the course of our ongoing search for novel anti-infective agents, we have recently come across various novel compounds with unusual chemical scaffolds and prominent biological activities. Our team consists of taxonomists and other biologists, natural product chemists, pharmacists and biotechnological engineers from around the world. Aside from conventional serial dilution assays for detection of antimicrobial effects, we are evaluating the fungal metabolites also for antiviral, anti-biofilm, cytotoxic, nematicidal and other biological activities. The discovery rate for novel compounds has increased substantially via a pre-selection process based on phylogeny and chemotaxonomy, by focusing on ecologically specialized taxa, with focus on rare and new species, and by employment of a database aided HPC-DAD/MS dereplication process. Interesting compounds were subjected to a scale up of production in bioreactors after careful optimization of culture conditions, and can now be obtained in up to multi-gram scale. From the extracts, the new biologically active metabolites were isolated to purity by preparative HPLC and other chromatographic methods. Subsequently, their structures were elucidated by NMR spectroscopy, high resolution mass spectrometry and other spectroscopic methods.

This work has led to the discovery of more than 200 new natural products over the past 5 years. Selected projects resulting from our evaluation of cultures of tropical Basidiomycota [1] or Ascomycota of the order Xylariales [2], as well as invertebrate-associated fungi [3,4], will be presented to demonstrate our rationale.

References:

1. B Sandargo, Chepkirui C, Cheng T, Chaverra-Munoz L, Thongbai B, Stadler M, Hüttel S (2019) Biotechnol Adv, in press. (DOI: 10.1016/j.biotechadv.2019.01.011)
2. SE Helaly, Thongbai B, Stadler M (2018) Nat Prod Rep 35:992-1014
3. SE Helaly SE, Ashrafi S, Teponno RB, Bernecker S, Dababat AA, Maier W, Stadler M (2018). J Nat Prod 81:2228-2234
4. W Kuephadungphan W, Helaly SE, Daengrot C, Phongpaichit S, Luangsa-ard JJ, Rukachaisirikul V, Stadler M (2017) Molecules 22(7):1202

Prof. Dr. Marc Stadler studied biotechnology at the University of Kaiserslautern and received his PhD in 1993. After a post-doctoral in natural product chemistry in Sweden, he joined the Pharma division of Bayer Healthcare (Wuppertal, Germany). In 2006 he co-founded InterMed Discovery GmbH (Dortmund, Germany). Since 2012 he is appointed as professor at the faculty of Life Sciences at Technical University of Braunschweig and Head of the Department "Microbial Drugs" at the Helmholtz Centre for Infection Research, Braunschweig.

Pimonsri Mittraparp-arthorn
Department of Microbiology, Faculty of Science,
Prince of Songkla University, Hat Yai, Songkhla 90112
e-mail: pimonsri.m@psu.ac.th

BACTERIOPHAGES IN CONTROL OF LUMINOUS VIBRIOS IN SHRIMP HATCHERY

Aquaculture, especially shrimp cultivation, is one of an economic relevance sector and has generated substantial income for Thailand and many countries. However, bacterial infections have been recognized as an important limitation to the production and trade. Disease prevention by continuous monitoring the numbers of luminous vibrios in shrimp hatchery is a primary method in shrimp health management. Based on our observation, *Vibrio campbellii* is a major luminescent bacterium found in marine shrimp hatchery and marine environments in Southern Thailand. Our study in 2009 demonstrated that some strains of *V. campbellii* are highly pathogenic to shrimp [1]. However, the impact of this bacterium in aquaculture is not well known because it was previously misidentified as *V. harveyi*.

For the development of sustainable aquaculture, an alternative approach of using lytic bacteriophages as bioagents for the treatment of bacterial infectious diseases has gained interest since it could reduce the side-effects on over-and improper use of chemicals and antibiotics. For these reasons, *V. campbellii* phage OPA17 belonging to *Siphoviridae* family were isolated. This phage could kill all *V. campbellii* (*n=107*) isolated from shrimp hatchery and various marine environments. The genome size of phage OPA17 is approximately 75,000 base pairs and it show high similarity to SSP002 phage of *V. vulnificus*. Based on one-step growth experiment, the latent time of phage OPA17 was estimated to be about 20 min, while the burst size was 35 PFU/infected cell. Phage OPA17 showed good stability during storage as suspension at room temperature (32°C) throughout the 2 months of study period. *In vitro* experiment showed that approximately 2 log CFU/ml of *V. campbellii* could be reduce when treated with phage OPA17for 4 hours. The investigation for bio-control potential revealed high efficiency of phage OPA17 based on the increasing survivability of *Artemia nauplii* at 48 hours ($p < 0.05$). These results indicated that OPA17 phage therapy might be an effective tool to control luminous vibrios in aquaculture systems.

References:

1. Rattanama P, Srinitiwarawong K, Thompson JR, Pomwised R, Supamattaya K, Vuddhakul V. 2009;86: 113–122.

Education: Ph.D. (Biomedical Sciences) Prince of Songkla University, Thailand
Academic position: Assistant Professor
Research interest: Molecular microbiology, marine pathogenic vibrios, food safety
Awards/achievements. Research Fellowship, Harvard Medical School, USA.
Medalle D'Or Silver Medal, 46th International Exhibition of Inventions of Geneva, Switzerland.

C_INV001

Chadin Kulsing

Chromatographic Separation and Flavor Chemistry Research Unit and Center of Molecular Sensory Science, Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

e-mail: ckulsing@gmail.com

TOWARDS SEPARATION OF TEN THOUSAND COMPOUNDS WITH COMPREHENSIVE MULTIDIMENSIONAL GAS CHROMATOGRAPHY

Multidimensional gas chromatography (MDGC) is a high performance separation technique with enhanced peak capacity for analysis of multi-component samples such as petroleum, essential oils, food, beverages, pharmaceutical and environmental. Hyphenation with mass spectrometry (MS) provides high confidence identification of several hundred volatiles within a single analysis. In this presentation, experimental design, instrumental and data analysis approaches in MDGC-MS comprising a range of comprehensive multiple heart-cut (H/C) and comprehensive two dimensional GC (GC×GC) techniques will be demonstrated. A special focus is on the system employing a microfluidic device called Deans Switch to perform comprehensive H/C MDGC with different H/C windows and number of injections. Data analysis approaches will be presented so that the experimental results can be represented as contour plots and evaluated according to peak capacity and the number of separated peaks. To this end, the 'continuum in MDGC' technology can be established via plots of analysis time vs separation performance. It will also be illustrated that this simple system can offer up to 10,000 analyte peak capacity which is ~10 times compared with that provided by conventional GC×GC. This work describes a proof of theoretical concept with simple configuration for effective practical application, making valuable contribution to high resolution chromatography research.

Kulsing C. has completed his PhD from Monash University, Australia, in 2015. He is currently a lecturer and the assistant director of Food Research and Testing Laboratory, Thailand. The topic of his research involves new experimental design and approach to break the limits in conventional chromatography as well as the development of fundamental concepts and theories for explanation of unexpected chromatographic phenomena. His research interests cover thermodynamics, kinetics, surface, and solution chemistry in CE, GC and LC with the application areas including analysis of fuels, foods, spices, essential oils, perfumes, pharmaceuticals, drugs and metabolomics. He has over 50 publications that have been cited over 400 times, and his publication H-index is 14.

Apinpus Rujiwatra
Department of Chemistry, Faculty to Science,
Chiang Mai University
e-mail: apinpus.rujiwatra@cmu.ac.th

LANTHANIDE COORDINATION FRAMEWORKS: FROM STRUCTURE TO FUNCTION

Thanks to the sentient coordination chemistry of lanthanides (Ln), crystal engineering of lanthanide coordination polymers especially those with functional porosity emerging only recently is challenging. A development of our expertise with lanthanide coordination chemistry, leading to meticulous choices of functional organic linkers and judicious strategies in synthesis methodologies, will be presented and discussed based on our recent results on the microporous $[Ln(L)_{0.5}(NO_2\text{-}BDC)(H_2O)]\cdot 3H_2O$ (*L*=BDC/NO_2-BDC;BDC=benzene-1,4-dicarboxylate; 4.0 × 8.0 $Å^2$ window and 25% void) and the nanoporous $[Ln_4(di\text{-}nitro\text{-}BPDC)_4(NO_3)O_4]_n\cdot(solvent)$ (*di*-NO_2-BPDC=2,2′-dinitro-1,1'-biphenyl-4,4′′-dicarboxylate; 2.1 × 1.1 nm^2 window and 60% void). Strategies employed in the design of these framework structures with also the pre-designed potential in gas adsorption, temperature and humidity sensing will be illustrated.

Graduated from Oxford University (D.Phil. in Chemistry), Currently an associate professor (in Chemistry) at Chiang Mai University, Research interests involving the crystal engineering of lanthanide coordination polymers/metal organic frameworks as functional materials (gas capturing, sensing), Young Scientist Award 2006 from The Foundation for the Promotion of Science and Technology under the Patronage of His Majesty the King and CST Distinguished Young Chemist Award 2010 (Inorganic Chemistry).

Yasushi Nishihara
Research Institute for Interdisciplinary Science, Okayama University, Japan
e-mail: ynishiha@okayama-u.ac.jp

PHENANTHRO[1,2-*b*:8,7-*b*']DITHIOPHENE (PDT): APPLICATION TO ORGANIC FIELD-EFFECT TRANSISTORS AND ORGANIC PHOTOVOLTAICS

Transition metal-catalyzed cross-coupling and cyclization reactions have been utilized to synthesize picene (Fig. 1, left), a compound consisting of five fused benzene ring with an armchair structure and its derivatives. We further designed to replace two terminal benzene rings with thiophene rings to yield phenanthro[1,2-*b*:8,7-*b*']dithiophene (PDT) (Fig. 1, center). Moreover, we synthesized its isomer, phenanthro[2,1-*b*:7,8-*b*']dithiophene (PDT-2) (Fig. 1, right), with different positions of sulfur atoms. Field-effect transistors (FETs) using thin films of these molecules substituted by linear alkyl chains were fabricated using various gate dielectrics, showing p-channel normally-off FET properties with the highest field-effect mobilities (μ) greater than 5.4 $cm^2 V^{-1} s^{-1}$, when a 150 nm-thick ZrO_2 gate dielectric was used. We also synthesized the low-band gap semiconducting polymers containing a PDT core in the polymer backbone. These PDT-based polymers have some superior features, including strong intermolecular interaction, high thermal stability, deep HOMO energy levels, and dense packing structure in their solid state. The solar cell devices using PDT-isoindigo (IID) copolymer or PDT-benzothiadiazole (BT) exhibited high power conversion efficiency (PCE) with 5.28% and 9.03%, respectively. In particular, PDT-BT copolymers formed a desirable face-on orientation, which can promote the efficient carrier transport in solar cells, reading to high PCE. From DSC measurements, these polymers showed no peak ascribed to a phase transition in the range of 50-250 °C. The thermal decomposition temperatures estimated by TG/DTA was higher than 300 °C. Its good OFET and OPV performances are fully discussed, based on electronic/topological properties and theoretical calculations.

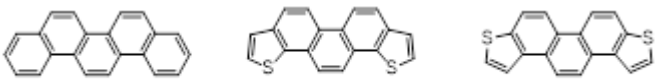


Figure. 1. Structures of picene, PDT, and PDT-2 for organic field-effect transistors

Reference:
1. Kubozono Y, Hyodo K, Hamao S, Shimo Y, Mori H, Nishihara Y, Sci. Rep. 2016;6:38535.

Yasushi Nishihara received his Ph.D. (1997) from the Graduate University for Advanced Studies and became an Assistant Professor at the Tokyo Institute of Technology in 1996; Okayama University as an associate professor in 2004 and full Professor in 2010. He was awarded Incentive Award in Synthetic Organic Chemistry, Japan (2009). His current research interests are organic synthesis mediated and/or catalyzed by organometallic compounds and their application in organic transistors and solar cells.

Viwat Vchirawongkwin
Department of Chemistry, Faculty of Science, Chulalongkorn University, Phayathai Road, Patumwan, Bangkok 10330, Thailand
e-mail: Viwat.V@Chula.ac.th

NORMAL MODE ANALYSIS VIA EXPANDED MOMENT OF INERTIA TENSOR

Normal modes have been applied in a broad range of scientific disciplines, including the identification of molecular vibrations in chemistry and their peak assignments in infrared and Raman spectra. Conventional methods to determine normal modes involve some complicated expressions of the system coordinates either in the form of coupled equations of motion or Hessian matrix. Here, we combine a traditional view of molecules in chemistry with a fundamental concept in physics to introduce a new methodology that can quickly determine a whole set of normal coordinates directly from molecular geometries, namely Expanded Moment of Inertia Tensor (EMIT). Its principle lies in the conservative expansion of angular momentum within the rigid body framework. This novel method provides normal modes that resemble those obtained from group theory and show their efficacy by accurately reproduce all characteristic frequencies in the vibrational spectra of three anions in aqueous solution. Unfortunately, the results obtained from EMIT are laborious to understand; a visualization program is needed. In this work, we have also developed a program called EMIT Studio, written in C++ and OpenGL Library, to visualize atomic displacement vectors for the normal modes. EMIT Studio assists the users to interpret the results received from the EMIT calculation effectively.

Viwat Vchirawongkwin received his B.Sc. in Chemistry with 2nd class honor and M.Sc. in Physical Chemistry from Chulalongkorn University in 1997 and 2001, respectively. He received Dr. rer. nat. (Theoretical Chemistry) from the University of Innsbruck, Austria in 2007. At present, he is Associate Professor at Department of Chemistry, Faculty of Science, Chulalongkorn University. His research interests include Computational Chemistry for aqueous solution systems, GPU software development in Quantum Chemistry and Development of IoT and electronics devices.

Kaewta Kaewtatip
Polymer Science Program, Department of Material Science and Technology, Faculty of Science, Prince of Songkla University, Hat-Yai, Songkhla, 90112 Thailand
e-mail: kaewta.k@psu.ac.th

BIOPLASTICS FROM STARCH AND WHEAT GLUTEN: MATERIALS OF THE FUTURE

The increasing costs of alternatives made from fossil sources and the environmental problems caused by synthetic plastics are now being felt worldwide. Therefore, bioplastics made from renewable resources such as starch, chitin, chitosan, cellulose and protein, have gained considerable interest in recent years. These renewable bioplastics have many advantages. They are inexpensive, renewable, fully biodegradable and the raw materials are abundant. This work is intended to provide a brief outline of research work in the area of bioplastics prepared from starch and the plant-derived protein wheat gluten. As well as discussing the properties of these bioplastics, the work looks at their transformation into 'green' composites with biofillers such as natural fibers, fish scale, eggshells, ash and alga and their blending with natural polymers, including modified starch, alginate and gelatin. Bioplastics made from starch and wheat gluten are emerging materials in polymer science, attracting attention for use in packaging, medical and agricultural applications.

Dr. Kaewta Kaewtatip is currently an assistant professor in the Polymer Science Program of the Department of Materials Science and Technology, Faculty of Science, Prince of Songkla University. Her research focuses on bioplastics from renewable resources based on starch and protein. She received the Rising Star Award from the Polymer Society of Thailand in 2017, the Distinguished Young Lecturer Award from the Faculty of Science, Prince of Songkla University in 2016 and the Distinguished Alumnus Award from Prince of Songkla University in 2016.

Anak Khantachawana
Biological Engineering / Department of Mechanical Engineering, Faculty of Engineering, King Mongkut's University of Technology Thonburi, Bangkok 10140, Thailand
e-mail: anak.kha@kmutt.ac.th

RECENT DEVELOPMENT OF N iTi SHAPE MEMORY ALLOYS CATHETER DEVICES FOR MEDICAL APPLICATIONS IN THAILAND

Superelastic NiTi wires with Ni-content of 50.7at% and various diameter between 0.05mm and 0.2mm were prepared. Many types of stent, such as retriever stent, interatrial shunt stent, Tracheobronchial stent, Endobronchial stent, etc. are designed and fabricated. In order to constrain the shape and evaluate mechanical properties, heat-treatment were carried out at temperature range from 400 to 550 ℃ for 30 and 60 mins, respectively. DSC was utilized in order to detect the transformation temperature. Standard tests such as radial force test, chronic outward force test, fatigue test, etc. were conducted following the international standard protocol. Biocompatibility test was carried out by MTT assay. Working models were also fabricated based on biomimetic and calculation in order to test the device in vitro. After In vitro test, some of devices were prepared for Cadaveric test. The testing results show that our locally made NiTi stent devices reveal good performance comparing with those of commercial products while the design is rather suitable for Asian people. It is expected that by making the locally made stent devices, the large amount of budget for import the product will be decreased and the opportunity for better medical treatment will be expanded to more level of the population. The example of how to develop these kinds of stent and medical devices will be discussed in a seminar.

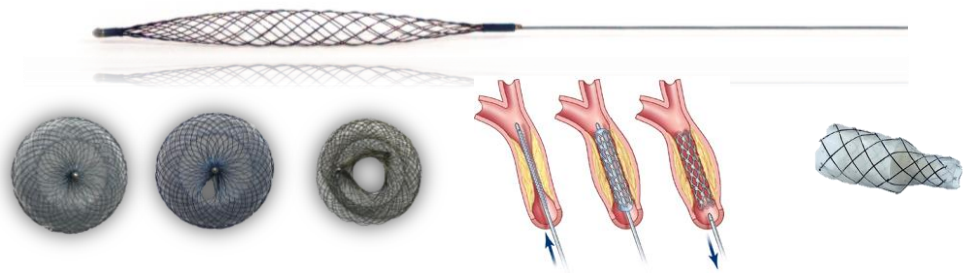


Figure 1. Various type of catheter devices made from NiTi shape memory alloys.

Anak Khantachawana is the Associate Professor in both Biological engineering program and department of Mechanical engineering at King Mongkut's University of Technology Thonburi (KMUTT), Bangkok. Currently, Dr. Anak is a head of Smart materials research laboratory and Director of Smart healthcare research cluster at KMUTT. He initiates a lot of connections with medical schools in Thailand in order to develop the locally made medical devices focusing on Smart materials. His first success was a winner of 1st Thailand Taokaenoi Technology Award. His research on NiTi and medical devices has been awarded by several organizations such as NRCT, TORAY, Hitachi foundation, TED, etc.

Rattikorn Yimnirun
Vidyasirimedhi Institute of Science and Technology (VISTEC)
e-mail: rattikorn.yimnirun@vistec.ac.th

SYNCHROTRON X-RAY ABSORPTION SPECTROSCOPY INVESTIGATION ON TEMPERATURE- AND FIELD-DEPENDENT LOCAL STRUCTURE IN BTO AND PZT PEROVSKITE MATERIALS

The local structure information in dielectric materials could be investigated by a combination of X-ray Diffraction (XRD) and Synchrotron X-ray Absorption Spectroscopy (SXAS) techniques. In this work, BaTiO3 and Pb(Zr,Ti)O3 crystals were investigated for their local structure information under the influence of temperature and electric field. The X-ray Absorption Near edge structure (XANES) and Extended X-ray absorption Fine Structure (EXAFS) spectra at the Ti K-edge were measured and compared with simulation done by FEFF8.2 program. The experimentally obtained different behaviors of the local structure were compared at various temperatures and applied electric fields. The polarization behavior of BT and PZT crystals was discussed in term of the changes in the local structure.

Prof.Dr.Rattikorn Yimnirun has been working in the area of ferroelectric and piezoelectric ceramics since his student days at a world-famous Materials Research Laboratory of the Pennsylvania State University, from where he obtained his Ph.D. in Materials Science and Engineering (Ceramic Science) under the supervision of Profs. Robert E. Newnham, L. Eric Cross, and Kenji Uchino. Currently, he is working at Vidyasirimedhi Institute of Science and Technology (VISTEC), serving as a Dean of School of Energy Science and Engineering.

Pitsanupong Kanjanapayont
Department of Geology, Faculty of Science, Chulalongkorn University, Bangkok 10330, THAILAND
e-mail: pitsanupong.k@chula.ac.th

GEOLOGY IN THE VICINITY OF CHINESE GREAT WALL STATION, KING GEORGE ISLAND, ANTARCTICA

Two Thai scientists, Dr. Pitsanupong Kanjanapayont and Dr. Thasinee Charoentitirat, participated the 33rd Chinese Antarctica Research Expedition (CHINERE33) in January to February 2017 under the polar research project by the Information Technology Foundation under the Initiative of Her Royal Highness Princess Maha Chakri Sirindhorn and National Science and Technology Development Agency (NSTDA). One of the objectives is to understand the general geology of the King George Island in the vicinity of the Chinese Great Wall Station, Antarctica. The geology comprises a succession of volcanic rocks in the Paleocene to Oligocene. There are 2 formations namely Geographer Cove Formation in the Paleocene to Lower Eocene and Fossil Hill Formation in the Eocene to Oligocene. The Geographer Cove Formation, which is Jasper Hill member and Agate Beach Member, is composed of amygdaloidal basaltic and basalt-andesitic lavas with volcanic breccia and agglomerate. The Fossil Hill Formation, which is Fossil Hill, Block Hill, and Long Hill members, consists of basaltic, basalt-andesitic, and andesitic subvolcanic rocks with breccia and agglomerate lava. Fossils of Eocene flora assemblage can be found in the Fossil Hill member.

Associate Professor Dr. Pitsanupong Kanjanapayont
Education:
B.Sc. (Geology), Chulalongkorn University, Bangkok, Thailand
M.Sc. (Geology), Chulalongkorn University, Bangkok, Thailand
Dr.rer.nat. (Geology), University of Vienna, Vienna, Austria
Present position: Head, Department of Geology, Chulalongkorn University
Research interest: Structural geology, Tectonics, Geochronology, Geology of Thailand, Geology of Southeast Asia
Major recognition/award/achievements: Scientist who joined the 33rd Chinese Antarctica Research Expedition (CHINERE33) in 2017, and the author of the book "บนเส้นทางสำรวจหินแผ่นดินแอนตาร์กติกา".

E_INV002

Kraichat Tantrakarnapa
Dept. of Social and Environmental Medicine, Faculty of Tropical Medicine, Mahidol University
e-mail: kraichat.tan@mahidol.ac.th

AIR POLLTUION AND HEALTH IMPACT ASSESSMENT IN THAILAND

Thailand is facing to air pollution from traffic, biomass burning and other sources that constitute a major threat to human health. However, the adverse health impacts and underlying mechanisms of different air pollutants are not clearly understood. Particulate matter has been observed in high concentration in many places, including Bangkok, the capital of Thailand. Our study used the secondary data of particulate matter from automatic monitoring stations located in Bangkok operated by the Pollution Control Department and health related data from Ministry of Public Health during the same period. The particulate matter data are available for PM2.5 and PM10, although PM2.5 monitoring only commenced in 2011. We found that average PM2.5 concentrations in Bangkok have decreased from 41.5 to 18.5 µg/m3 between 2011 and 2017. However, during a haze episode in Bangkok the daily concentration of PM2.5 and/or PM10 were over the ambient air quality standard; the average ratio of PM2.5/PM10 was 0.6. In addition, human exposure was measured among groups of people in Bangkok and Chiang Mai by using MicroPem monitors with associated the time activity data. The results indicated that PM2.5 exposure in residential and working spaces were less than outdoor exposure levels in both cities. The high concentration of PM2.5 in Chiang Mai was significantly higher than Bangkok. These data indicated that people who live in high concentration of PM2.5 were risky for their health particularly the respiratory track and other related diseases.

Education: B.S.(Statistics), M.Sc.(Technology of Environmental Management), Ph.D.(Environmental Engineering), Post graduate in Occupational Health and Safety in the Workplaces, ITC-ILO and University of Torino.
Present position: Associate Professor
Research interest: Environmental Health Management, Air Pollution and Health Impact, Climate Change and Health Impact
Awards: Outstanding Contribution Award to Environment and Health of Asia by Korean Society of Environmental Health

Supagorn Rugmai
Synchrotron Light Research Institute (Public Organization)
e-mail: supagorn@slri.or.th

DEVELOPMENT OF PYTHON-BASED SOFTWARE FOR RESEARCH AND EDUCATION

In recent years, Python has become one of the most utilized programing languages in the world, with its utilization covering wide range of application. Its unique advantages, such as comprehensibility, large user community and vast free online resources, make Python especially suited for scientific research and education. This talk describes development of python-based software as tools for scientific research and science education. Python software to perform data modeling for nano structural analyses is shown as an example of Python utilization in advanced Physical research. Examples of game-like Python software for science education are given to show how Python can be effectively utilized to teach scientific concepts. Finally, the unique ability of Python is demonstrated through an interactive calculation-simulation software for craft beer brewing, where practicality, science and fun are combined.

Dr. Supagorn Rugmai received a Ph.D. in Nuclear Physics from University of Surrey, UK and worked as a postdoctoral research fellow at University of Surrey, UK, Super Photon Ring 8 GeV (SPring-8), Japan, Pohang Accelerator Laboratory (PAL), Korea, and as an Assistant Professor at School of Physics, Suranaree University of Technology, Thailand. He is currently working as a beamline scientist at Synchrotron Light Research Institute (Public Organization) with research interest in nano structural characterization using Synchrotron X-ray Scattering.

Tossapon Boongoen
IQD-IT Research Group, School of Information Technology, Mae Fah Luang University
e-mail: tossapon.boo@mfu.ac.th

DEVELOPMENT OF CONSENSUS CLUSTERING AND APPLICATIONS IN THE LAST DECADE

Consensus clustering or cluster ensemble has been shown to be better than any standard clustering algorithm at improving accuracy and robustness across different data collections. This meta-learning formalism also helps users to overcome the dilemma of selecting an appropriate technique and the corresponding parameters, given a set of data to be investigated. Almost two decades after the first publication of a kind, the method has proven effective for many problem domains, especially microarray data analysis and its down-streaming applications. Recently, it has been greatly extended both in terms of theoretical modeling and deployment to problem solving. This session attempts to match the emerging attention with the provision of fundamental basis and theoretical details of state-of-the-art methods found in the present literature. It also includes different applications and extensions of cluster ensemble, with research issues and challenges being highlighted.

References:

1. T. Boongoen and N. Iam-On, "Cluster Ensembles: A Survey of Approaches with Recent Extensions and Applications", Computer Science Review, 28: 1-25, 2018
2. P. Panwong, T. Boongoen and N. Iam-On, "Improving Consensus Clustering with Noise-Induced Ensemble Generation: A Study of Uniform Random Noise", In Proceedings of International Conference on Machine Learning and Computing, pp. 390-395, 2018
3. N. Iam-On and T. Boongoen, "Improved Student Dropout Prediction in Thai University using Ensemble of Mixed-Type Data Clusterings", International Journal of Machine Learning and Cybernetics, 8(2): 497-510, 2017
4. N. Iam-On and T. Boongoen, "Diversity-Driven Generation of Link-Based Cluster Ensemble and Application to Data Classification", Expert Systems with Applications, 42(21): 8259-8273, 2015
5. N. Iam-On and T. Boongoen, "Comparative Study of Matrix Refinement Approaches for Ensemble Clustering", Machine Learning, 98(1-2): 269-300, 2015
6. N. Iam-On, T. Boongoen, S. Garrett and C. Price. "New Cluster Ensemble Approach to Integrative Biological Data Analysis", International Journal of Data Mining and Bioinformatics, 8(2): 150-168, 2013
7. N. Iam-on, T. Boongoen, S. Garrett and C. Price, "A link-based approach to cluster ensemble approach for categorical data clustering," IEEE Transactions on Knowledge and Data Engineering, 24(3): 413-425, 2012
8. N. Iam-on, T. Boongoen, S. Garrett and C. Price, "Link-based approach to the cluster ensemble problem," IEEE Transactions on Pattern Analysis and Machine Intelligence, 33(12): 2396-2409, 2011

Wg.Cdr.Dr.Tossapon Boongoen is an Associate Professor at School of IT, Mae Fah Luang University. He obtained B.Eng. in Communication & Information Engineering and Ph.D. in Computer Science from Cranfield University. His postdoctoral and fellowship were with Aberystwyth University. His research interests are artificial intelligence, machine learning and data science. He serves as associate editors for IEEE Access and AMB Express. He also received Toray Science Foundation 2014 & Newton Fund 2018 awards.

G_INV002

Ponrudee Netisopakul
Faculty of Information Technology,
King Mongkut's Institute of Technology Ladkrabang
ponrudee@it.kmitl.ac.th

THE INVASION OF RECOMMENDERS

A recommender system is an AI-based system with a power of suggestion. This suggestion includes not only products and services, similar to Amazon's book recommender or tourist recommendation system, but also areas with more seriousness. Some examples of these areas are medical sciences such as disease diagnosis and treatments, laws such as legal recommendation systems, finance such as personal and institutional financial policies. It also includes some very personal and private areas such as a choice of food to eat for each meal, a choice of vacation places to go to, a choice of dresses to wear for each occasion, a choice of songs to listen to, or even information content we consume daily, such as news feed, etc. In short, since the mid-1990s, many recommenders have been invading and influencing human's decisions in almost every area.

This talk reviews the evolution of recommender system development approaches from traditional rule-based recommenders to crowd-based followee-follower recommenders to sensorization of thing-based recommenders. The talk also discusses advantages, disadvantages, and impacts of modern recommenders toward individuals, societies, and communities.

References:

1. Yaisawas, P., Lerdsri, S., Thanasopon, B., & Netisopakul, P. (2018). Business Popularity Analysis From Twitter. Advances in Intelligent Systems and Computing, 566, 2018, 337-348.
2. PPasupa, K., Netisopakul, P., & Lertsuksakda, R. (2016). Sentiment Analysis Of Thai Children Stories. Artificial Life and Robotics, 21(3), 357-364.

Ponrudee Netisopakul is currently an associate professor at the Faculty of Information Technology (FIT), King Mongkut's Institute of Technology Ladkrabang (KMITL). She received a B.Sc. in Electronic Processing from Chulalongkorn University, an M.Sc. in Computer Science from the University of Southern California (USC), another M.Sc. in Computer Information Science from the University of Delaware, and a Ph.D. in Computing and Information Science from Case Western Reserve University, USA. She is the head of the Knowledge Management and Knowledge Engineering Laboratory at FIT, KMITL. Her research interests include Knowledge Discovery, Knowledge Representation and Reasoning, Knowledge Sharing, and Recommendation Systems. She is currently a member of the Editorial Board of Journal of the Information Technology, KMITL, and the MUT Journal of Business Administration. She is also an active member of the Artificial Intelligence Association of Thailand (AIAT), ECTI, IIAI, IEICE, and IEEE.

Thunyarat Amornpetchkul
Graduate School of Business Administration, National Institute of Development Administration (NIDA), Bangkok 10240
e-mail: hunyarat.a@nida.ac.th

DYNAMIC PRICING OR DYNAMIC LOGISTICS?

In this research, we consider a dynamic pricing problem of a retailer who sells a product through two channels (e.g., online and a physical store). The inventory is kept at two separate locations, dedicated for demand arriving at each channel. To balance inventory and demand at each channel, the retailer may employ a price differentiation policy and/or an inventory transshipment policy. A price differentiation policy helps manage demand by allowing the retailer to charge different prices in each period for the same product sold at different channels. On the other hand, an inventory transshipment policy acts on the inventory side by allowing the retailer to transfer inventory between the channels when needed. Assuming the customer's choice follows a multinomial logit model, we characterize the retailer's optimal pricing and transshipping policies, and compare the effectiveness of the two mechanisms in improving profits. We find that the optimal price differentiation policy in the current period always results in a larger expected sales volume, compared to the optimal uniform pricing policy. In contrast, the optimal transshipment decision may result in a larger or smaller expected sales volume. While price differentiation provides a larger profit improvement than transshipment does in many situations, transshipment is shown more effective when the retailer holds significantly less inventory at the high-margin channel. Furthermore, when implemented concurrently, the benefit from price differentiation and inventory transshipment mechanisms may either substitute or complement each other. The two mechanisms can substitute each other when the retailer's objective is to correct his inventory position. However, when the retailer prefers to maintain the same balance of inventory at the channels, the two mechanisms work together, complementarily.

Thunyarat is an assistant professor in Operations Management and the associate dean for administrative affairs in the Graduate School of Business Administration at the National Institute of Development Administration (NIDA). She received a Ph.D. in Business Administration (Operations and Management Science) from the Stephen M. Ross School of Business, University of Michigan, in 2014. Prior to that, she received two Bachelor's degrees with summa cum laude from a dual-degree program (Actuarial Science under the Wharton School and Computer Science under Penn Engineering) at the University of Pennsylvania in 2008.
Her research interests include Pricing and Revenue Management, Marketing and OM Interface, Supply Chain Management, and Financial Contracting. Apart from academic research and teaching, she is also actively involved in conducting applied research projects based on government's and companies' needs, and providing training and consulting for businesses.

Peerayuth Charnsethikul
Department of Industrial Engineering, Faculty of Engineering, Kasetsart University, Bangkok 10900
fengprc@ku.ac.th

A COMBINED BENDERS DECOMPOSITION AND COLUMN GENERATION TECHNIQUE FOR ONE DIMENSIONAL CUTTING STOCK PROBLEM AND PERSONNEL SCHEDULING PROBLEM WITH DISCRETE UNCERTAIN REQUIREMENTS.

In this talk, both classical operations research models, the one dimensional cutting stock problem and the personnel scheduling problem with both discrete and combinatorial number of uncertain demand patterns were reformulated as two stage stochastic linear programming resulting very large mixed integer linear programming (MILP). Both were solved using a combined effort of using Benders decomposition with a special purposed algorithm handling excessive number of model constraints while Column generations is used to handle too many decision variables in the models. At the end, strategies for rounding integer solution will be presented with some computational results comparatively. The key result is to illustrate that the proposed approach can overcome efficiency and effectiveness limitations of available state of the art MILP software as the problems sizes grow.

References:

1. https://pubsonline.informs.org/doi/abs/10.1287/mnsc.1.3-4.197
2. https://www.researchgate.net/publication/329788606_Benders_Decomposition_with_Special_Purpose_Method_for_the_Sub_Problem_in_Lot_Sizing_Problem_Under_Uncertain_Demand
3. https://www.researchgate.net/publication/326129447_A_Stochastic_Programming_Approach_for_Cyclic_Personnel_Scheduling_with_Double_Shift_Requirement
4. https://www.researchgate.net/publication/330632393_A_Column_Generation_Approach_for_Personnel_Scheduling_with_Discrete_Uncertain_Requirements
5. http://researchs.eng.cmu.ac.th/UserFiles/File/Journal/25_3/13.pdf

Peerayuth Charnsethikul is currently the dean of engineering faculty and also an associate professor in industrial engineering at Kasetsart university, Bangkok, Thailand. His areas of interest are large scale numerical computations and optimization For a more historical review of his work, please visit the following website: https://www.researchgate.net/profile/Peerayuth_Charnsethikul

SP1_INV001

Edward R.T. Tiekink

Research Centre for Crystalline Materials, School of Science and Technology, Sunway University, No. 5 Jalan Universiti, 47500 Bandar Sunway, Selangor Darul Ehsan, Malaysia

e-mail: edwardt@sunway.edu.my

SNAP FROZEN METASTABLE POLYMORPHS – A STORY OF A TETRAMORPHIC ONE-DIMENSIONAL COORDINATION POLYMER

It is now routine to grow a crystal and place it on a goniometer directly under a stream of cold nitrogen, usually set at 100 K. These experimental conditions often give good data, quickly. However, the crucial question remains: is the 100 K structure representative of the room temperature structure? After all, most chemistry will be conducted under ambient conditions rather than the 100 K of the X-ray experiment. In this presentation, the results of a recent study of a cadmium di-isopropyl-dithiophosphate coordination polymer constructed with a 1,2-bis(4-pyridylmethylene)hydrazine linker:

$$\{Cd[S_2P(O\text{-}iPr)_2]_2(4\text{-}NC_5H_4C(H)N{=}NC(H)C_5H_4N\text{-}4)\}_n \text{ (I)}$$

will be presented.

Two metastable polymorphs, γ and δ, were discovered when crystals of (I) were placed directly under the cryostream at 100 K. At room temperature, a different polymorph was found, the α form. Slowly cooling of α, gave the β form which did not convert to either of γ or δ with cooling. Warming γ and δ eventually gave α via β. Details of these transformations, reversible and irreversible, are revealed by single crystal X-ray diffraction, PXRD, DSC, DFT calculations and by an analysis Hirshfeld surfaces and delineated two-dimensional fingerprint plots, including those focused upon the cadmium atom environments only.

Edward Tiekink is currently a Distinguished Professor and Head of the Research Centre for Crystalline Materials at Sunway University in Malaysia. Edward is a graduate of The University of Melbourne (D.Sc., 2006) and his scientific passions revolve around chemical crystallography, especially supramolecular association between molecules, and the development of metal-based drugs targeting a variety of diseases.

SP1_INV002

Pongsak Khunrae
Department of Microbiology, Faculty of Science, King Mongkut's University of Technology Thonburi (KMUTT), Bangkok 10140, Thailand
e-mail: pongsak.khu@kmutt.ac.th

CRYSTAL STRUCTURE OF VP37 FROM WSSV REVEALS HEPARIN BINDING SITE IMPORTANT FOR WSSV INFECTION

Viral envelope proteins play an important role in facilitating the attachment of viruses to the surface of host cells. In previous studies, we have shown that C-terminal domain of VP37 from WSSV (cVP37) is responsible for binding to shrimp hepatocytes. Having seen the binding between VP37 and shrimp heamocytes inhibited by heparin prompts us to propose that the attachment of WSSV might be mediated by the interaction between VP37 and a heparin-like molecule presented on the shrimp cells. Here we present the crystal structure of cVP37 in which two sulphate molecules are found to bind to cVP37 at K214 and K256 site. Replacement of K256 with alanine drastically decreased the binding between cVP37 and heparin as indicated by surface plasmon analysis. With these results combined, we propose that the sulphate binding site corresponding to K256 may serve as heparin binding site in VP37.

Since the completion of his Ph.D. study at University of Cambridge in 2010, Dr. Pongsak Khunrae returned to Thailand to serve as a lecturer at the Department of Microbiology, King Mongkut's University of Technology Thonburi (KMUTT). At KMUTT, he has established a research group dedicated to investigating protein structure and function. The group has strong interest in studying interactions between proteins from the parasites and molecules from their hosts. Especially understanding the protein interactions that are important in infectious diseases in aquatic animals, which are economically important, are among the center of his research activities. Several structural techniques are being used to understand how proteins interact with specific ligands on host tissues and also attempt to develop agents that can be used to block these interactions. Today, Dr. Pongsak Khunrae is known as one of the experts in protein crystallography in Thailand, who enjoys inspiring young scientists to appreciate the beauty of protein.

Leela Ruckthong [1]
Jeanne A. Stuckey [2]
Vincent L. Pecoraro [3]
[1] Department of Chemistry
King Mongkut's University of Technology Thonburi, Bangkok, 10140, Thailand
[2] Life Sciences Institute, University of Michigan, Ann Arbor, 48109, USA
[3] Department of Chemistry, University of Michigan, Ann Arbor, 48109, USA
e-mail: leela.ruc@mail.kmutt.ac.th

CRYSTALLOGRAPHIC EXAMINATION OF CYSTEINE BEHAVIORS UPON METAL COMPLEXATIONS IN DE NOVO METALLOPROTEINS

Understanding levels of ligand organization upon metal complexation is essential for evaluating molecular recognition in biology. While native protein structures containing a Cys-rich binding site are usually unavailable in both non- and metallated forms, a series of three-stranded coiled coil peptides are engineered to chelate metals in geometries that were proposed in bacterial regulatory sites. Protein X-ray crystallographic examination has confirmed that the preferred coordination determines the degree of Cys reorientation towards metal binding. The apo-environment where the thiols direct toward the helical core is found to be preorganized for trigonal pyramidal species (PbS3 and AsS3) in an endo form in which the metal is oriented toward the C-termini of the structure. However, significant thiol rotation is required for trigonal planar (HgS3) and pseudo-tetrahedral (ZnS3O) complexations. This study helps ravel the unappreciated features on defining metal behaviors, metal selectivity and metal-protein interactions in biological system; i.e. lead interference in human LINE-1 retrotransposon protein, mercury and arsenic detoxification in bacterial metalloregulatory systems and zinc binding site in a metallochaperone. Moreover, the knowledge allows for broader applications in metalloprotein engineering. Here, examples of designing approaches will also be presented to demonstrate how one can enforce cadmium into a specific geometry within the trimeric scaffolds, simply by altering amino acids either in the first or second coordination sphere of the metal center.

Dr. Leela Ruckthong achieved a full undergraduate scholarship from the Development and Promotion of Science and Technology (DPST) and obtained her B.Sc. in Chemistry from Kasetsart University. She was subsequently awarded a full doctoral scholarship from the Ministry of Science and Technology to pursue her Ph.D. in Biophysics at the University of Michigan, Ann Arbor, USA. She completed her thesis under the supervision of Prof. Dr.Vincent Pecoraro. Right after graduation, she received a postdoctoral fellowship from Department of Chemistry and worked in collaboration with Assoc.Prof.Dr. Jeanne Stuckey in the Central of Structural Biology at the University of Michigan. She returned home in 2017 and has been appointed as a lecturer in Department of Chemistry, Faculty of Science, King Mongkut's University of Technology Thonburi (KMUTT). Her research background is in metalloprotein engineering with a specialty in using protein X-ray crystallography to explore metal-protein interactions, metal complexation and variation of active site geometries in protein environments. Moreover, she has experienced in designing metal coordination spheres with non-coded amino acids to enforce a specific geometry onto a metal center for structural and catalytic purposes in proteins.

SP1_INV004

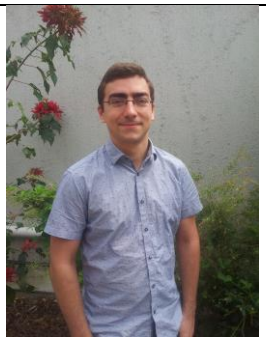
Kittikhun Wangkanont
Department of Biochemistry, Faculty of Science, Chulalongkorn University
e-mail: kittikhun.w@chula.ac.th

LATTICE TRANSLOCATION DISORDER COUPLED WITH PSEUDOTRANSLATION IN *Klebsiella pneumoniae* UDP-GALACTOPYRANOSE MUTASE CRYSTAL

In Thailand, more people are living longer than ever before. On the one hand, this means D-Galactofuranose (Gal*f*) is a carbohydrate residue found in crucial components of various microbes such as the cell wall of *Mycobacterium tuberculosis*. Because Gal*f* is not found in mammalian systems, inhibition of Gal*f* biosynthesis is a promising antimicrobial strategy. Gal*f* is incorporated into glycans by glycosyltransferases utilizing UDP-Gal*f* as the activated sugar donor. UDP-Gal*f* is synthesized from UDP-galactopyranose (UDP-Gal*p*) by UDP-galactopyranose mutase (UGM). Several investigators have identified potent inhibitors of several UGM homologs that can inhibit bacterial growth. However, structural information of how these inhibitors function is still limited. We crystallized UGM from *Klebsiella pneumoniae* (KpUGM) with a triazolothiadiazine inhibitor. The crystal diffracted to 2.5 Å resolution, but the diffraction pattern showed periodic streaking along the c* direction with intensity maxima at around l = 8n, suggesting a lattice translocation disorder along the c direction. The Patterson map also revealed small off-origin peaks corresponding to the lattice translocation disorder, as well as pseudotranslation peaks. The structure was successfully solved by molecular replacement, but demodulation was required to resolve potential ligand electron densities. The information obtained is the first few stepping stones toward understanding UGM inhibition and development of UGM-targeting antibiotics.

Dr. Kittikhun Wangkanont obtained his B.S. in Chemistry and Zoology from the University of Wisconsin-Madison, A.M. in Chemical Biology from Harvard University, and Ph.D. in Chemistry from the University of Wisconsin-Madison. He is currently a lecturer at Chulalongkorn University. His research group investigates the biochemistry and structural biology of carbohydrate-binding protein in the innate immune system as well as the catalytic mechanism of rare carbohydrate biosynthetic enzymes in pathogenic bacteria.

SP1_INV005



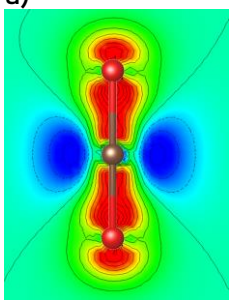
Arnaud Grosjean

School of Molecular Sciences, Faculty of Science,
University of Western Australia
e-mail: Arnaud.grosjean@uwa.edu.au

IN DEPTH INTO THE STRUCTURES OF MOLECULAR FUNCTIONAL MATERIALS

Molecular functional materials have had an increasing interest over the past years thanks to their wide range of specific properties such as porosity as well as mechanic, optic and electromagnetic properties.
The origin of most of these properties is in close relationship with the structural arrangements of these systems. It is therefore, increasingly important to perform structural investigations to get a better understanding of these structure-properties relationship. In this fashion, leading to better designs and synthesis for future functional materials.
In this presentation, some results on structure-properties relationship investigations conducted on molecular materials will be presented: experimental charge density analysis of CO_2 in an organic host-guest system (a); structure, microstructure and aging of a Spin Transition material (b); Structural mapping of a flexible molecular single crystal material (c).

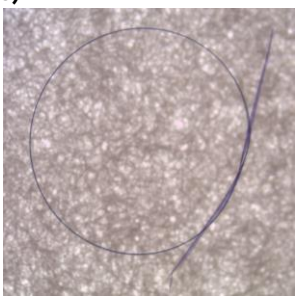
a)



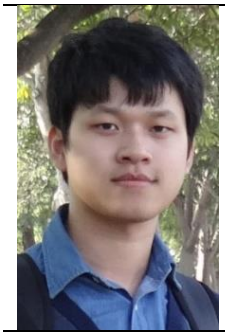
b)

T=300K T=400K

c)



Graduated from Bordeaux University (Ph.D. in Physical Chemistry of condensed matter), Currently research associate at the University of Western Australia. Research interests involve structural analysis of functional materials from intrinsic properties to dynamic processes. 2014 Ph.D. Award from The French crystallographer association.



Kitt Panyarat
Department of Chemistry, Faculty to Science,
Chiang Mai University
e-mail: kitt52pnrt@gmail.com

CRYSTAL ENGINEERING OF LANTHANIDE-AZO-4,4'-BENZENETETRACARBOXYLATE FRAMEWORKS

Crystal engineering of lanthanide coordination polymers (LnCPs) has always been a challenge attributing to the flexible chemistry of the lanthanide ions. This is particularly true when certain functions are desired. With the judicious choice of ligand, the design and the crystal structures of new one-dimensional $[Ln(AztB)(H_2O)_4]\cdot[K(H_2O)^+]$ (Ln = Eu(I), Gd(II), Tb(III), Dy(IV) and Ho(V); *AztB* = azo-4,4'-benzenetetracarboxylic acid) will be presented and discussed. The titled LnCPs contain hydrophilic void with approximately 8×8 Å^2 window. Housed in the void is the hydrated potassium cation which also acts as a charge compensating species.

Graduated from Chiang Mai University (D.Phil. in Chemistry), Currently being a researcher at Chiang Mai University, Research interests involving the crystal engineering of lanthanide coordination polymers.

Supaart Sirikantaramas
Molecular Crop Research Unit, Department of Biochemistry, Faculty of Science, Chulalongkorn University
e-mail: supaart.s@chula.ac.th

BIOTECHNOLOGICAL PRODUCTION OF CANNABINOIDS: WHERE ARE WE NOW AND WHERE ARE WE GOING?

Tetrahydrocannabinol (THC) and cannabidiol (CBD) are the most notable terpenophenolic phytocannabinoids found in *Cannabis sativa* L. For over 20 years, the biosynthesis of these compounds has been extensively studied. At present, all genes encoding the biosynthetic enzymes required for the production of both THC and CBD have been cloned and characterized, making it possible to biotechnologically produce these compounds. My talk will cover from the discovery of phytocannabinoid biosynthetic enzymes to the utilization and modification of the biosynthetic pathway for over-production and heterologous production of THC and CBD. As a plant scientist, we are moving toward a genetic manipulation and synthetic biology. Cannabis plants would not be the only organisms producing THC and CBD as we knew.

References:

1. Sirikantaramas S, Taura F,. In: Chandra S, Lata H, ElSohly M (eds) *Cannabis sativa* L.- Botany and Biotechnology. Springer, Cham. 2017;183–206.
2. Sirikantaramas S, Yamazaki Y, Saito K,. Phytochem Rev. 2008;7:467.
3. Taura F, Sirikantaramas S, Shoyama, Y, Yoshikai K, Shoyama Y, Morimoto S,. FEBS Lett. 2007;581:2929-2934.
4. Sirikantaramas S, Taura F, Tanaka Y, Ishikawa Y, Morimoto S, Shoyama Y,. Plant Cell Physiol. 2005;46:1578-1582.
5. Sirikantaramas S, Morimoto S, Shoyama Y, Ishikawa Y, Wada Y, Shoyama Y, Taura F,. J Biol Chem. 2004;279:39767-39774.

Supaart Sirikantaramas received his Ph.D. from Kyushu University, Japan, where he focused on molecular cloning and characterization of cannabinoid synthases from Cannabis sativa. He is currently an Associate Professor in Chulalongkorn University. In his lab, he uses omics-based technology and synthetic biology to dissect biosynthetic pathways and fruit ripening metabolisms, and to biosynthesize plant-based bioactive compounds. In 2019, he received Outstanding Mid-career Researcher Award from Faculty of Science, Chulalongkorn University.

SP2_INV002

Bungorn Sripanidkulchai

Center for Research and Development of Herbal Health Products, Faculty of Pharmaceutical Sciences, Khon Kaen University, Khon Kaen, Thailand40002

e-mail: bungorn@kku.ac.th

MEDICAL APPLICATIONS AND MECHANISM OF ACTION OF CANNABINOIDS

Cannabis or marijuana has been long known as traditional medicine for the treatment of many diseases. Among several identified chemical compounds, cannabinoids are the main active components, in which the first identified compound with psychoactive property is delta-9-tetrahydrocannabinol (THC). Then the non-psychoactive compound, cannabidiol (CBD) that antagonizes THC action and other cannabinoids, terpenes and flavonoids were later isolated from cannabis. Since THC was discovered to specifically bind to cannabinoid receptors of the endocannabinoid system (ECS) and exerts several physiological functions as the endogenous lipid ligands, such as anandamide (N arachidonoylethanolamine) and 2-AG (arachdonolyglycerol) did, the research on phytocannabinoids, endogenous and synthetic cannabinoids are intensively going on. At the moment, cannabinoid related products are marketed in many forms, such as THC:CBD (1:1) ratio, THC- enriched and CBD-enriched formulations. The medical uses of cannabis products are suggested for the neuropathic pain, chemotherapy- induced nausea/vomiting of cancer patients, spasticity of multiple sclerosis and epilepsy. However, the uses of cannabinoids for many other diseases and disorders, such as anxiety, depression, Alzheimer's disease, schizophrenia and cancer are under investigated. The mechanism of action of cannabinoids involves not only ECS, but also via many others including serotonin receptor (5-HT1alpha), G-coupled protein receptor (GPR55), transient potential vanilloid receptor(TPVR1, TPVR2), and adenosine receptorA2A). Moreover, the effects of cannabinoids on the modulation of neurotransmitter release and function are also reported. With the differential effects of THC and CBD on cannabinoid receptor and other pathways, the selectivity of these cannabinoids for specific diseases are proposed. Currently, CBD not only uses for epilepsy treatment, but also was aimed to be used for the cancer treatment. To be more understand on both benefit and side effect/toxicity of cannabinoids, the pharmacokinetic, drug metabolism and possible drug-drug interaction will be also discussed.

Education: Faculty of Pharmaceutical Sciences, Mahidol University, 1967-1972, BSc. (Pharmacy), Graduate School, Mahidol University, 1972-1974, MSc. (Biochemistry), University of Alabama at Birmingham, USA, 1981-1986, PhD (Cell Biology) Present position: Professor Research interest: Pharmaceutics chemistry, Carcinogenesis, Heavy metal toxicants, Thai herbal medicinal plants

SP2_INV003

Kornkanok Ingkaninan

Bioscreening Unit, Faculty of Pharmaceutical Sciences, Naresuan University

e-mail: k_ingkaninan@yahoo.com

INNOVATION IN CANNABIS TO REACH INTERNATIONAL STANDARD

In February 2019, Thailand legalized the use of cannabis for medical purpose. Since then, there has been an urge to do research and development of cannabis products. However, for benefits of Thai people and for the access to global markets, the development of cannabis products in Thailand should be concerned in term of quality, efficacy and safety. To meet the international standard, the raw materials should be prepared with Good Agriculturing and Collection Practice (GACP). The cannabis extract should be standardized with the certain amount of cannabinoids i.e. tetrahydrocannabinol (THC), cannabidiol (CBD) and other bioactive constituents. The efficacy and safety of standardized cannabis extracts should be conducted. The clinical studies to prove efficacy and safety of cannabis products developed should be conducted under Good Clinical Practice (GLP). The international guidelines such as ISO/IEC17025 for the analytical methods, ISO13485 for medical devices, OECD guidelines for lab testing as well as COLIPPA guideline and USP for topical products and drugs should be used.

Dr. Kornkanok Ingkaninan is an Associate Professor at Bioscreening Unit, Faculty of Pharmaceutical Sciences, Naresuan University. She received her B.Pharm and M.Pharm from Chulalongkorn University and Ph.D. from Leiden University, Netherlands. Her area of interest is research and development on natural products. She got >100 papers and > 10 patents and received so many awards such as Outstanding Research Award from National Research Council in 2014, The Best Innovation in Biotechnology from Japan Intellectual Property Association in 2014. Her group is one of the pioneers on Cannabis research in Thailand.

POSTER SESSION

INFORMATION FOR POSTER PRESENTATION

Time for poster attachment & location:
The location for poster attachment will be specified according to Abstract ID (e.g. A1_099_PA, C2_070_PF) at the congress venue (General Sampao Choosri Building, Room E4A-515/516/517/518). The Abstract ID can be found in the Program Book. Time for poster attachment is as follows:

Session	Date	Time
POSTER ATTACHMENT (E4 BUILDING, ROOM 515/516/517/518)	Sunday 6th October 2019 Monday 7th October 2019	13.30-16.30 14:00-15:30
POSTER REMOVAL (E4 BUILDING, ROOM 515/516/517/518)	Wednesday 9th October 2019	11:45-12:15
REQUEST FOR ATTENDANT CERTIFICATE (REGISTRATION DESK)	Monday 7th October 2019 Tuesday 8th October 2019	15:00-16:00 09:00-16:00
DISTRIBUTION OF ATTENDANT CERTIFICATE (REGISTRATION DESK)	Wednesday 9th October 2019	11:30-12:30

Poster sessions:
Participants are expected to be at their posters according to the date and time assigned.

Session	Date	Time
POSTER SESSION A/B/C/G	Monday 7th October 2019 Tuesday 8th October 2019	15:30-17:00 12:30-13:30 16:00-17:30
POSTER SESSION D/E/F/H	Tuesday 8th October 2019 Wednesday 9th October 2019	12:30-13:30 16:00-17:30 10:30-12:00

SESSION A: AGRICULTURAL SCIENCE / BIOTECHNOLOGY

ID	Title	Presenter
A_003_PA	DEVELOPMENT OF REVERSE TRANSCRIPTION-LOOP-MEDIATED ISOTHERMAL AMPLIFICATION FOR DETECTION OF TILAPIA LAKE VIRUS	Rapheephat Suvannakad
A_004_PA	DEVELOPMENT OF A ONE-STEP LAMP COLORIMETRIC METHOD FOR DETECTION OF PHYTOPLASMA, CAUSE OF SUGARCANE WHITE LEAF DISEASE	Sukanya Pengpanich
A_006_PA	INVESTIGATION OF MICRONUTRIENTS IN SELECTED THAI RICES USING SYNCHROTRON BASED TECHNIQUES	Nuttawan Pramanpol
A_008_PA	DEVELOPMENT OF STRIP TEST FOR DETECTION OF SERUM PROGESTERONE IN SWINE	Umaporn Pimpitak
A_009_PF	EVALUATION OF FORMIC ACID IN CONTROLLING *Tropilaelaps* MITES IN LABORATORY	Puncharat Promsuvong
A_010_PF	EFFICACY OF NATIVE PLANT EXTRACTS (GINGER AND MARIGOLD) IN CONTROLLING RICE WEEVIL: *Sitophilus oryzae* L.	Kanchana Kiriyadee
A_011_PA	CONSTRUCTION OF BIOCIDE-INDUCIBLE PROMOTER DRIVEN FLUORESCENCE GENE EXPRESSION FOR DETECTING PARAQUAT CONTAMINATION	Adisak Romsang
A_012_PA	PRODUCTION OF A MONOCLONAL ANTIBODY AGAINST CASEIN FOR PREPARATION OF THE ELISA TEST KITS	Songchan Puthong
A_014_PA	EFFECT OF WATER COLORS ON DIGESTIBILITY OF ASIAN SEABASS (*Lates calcarifer* Bloch) JUVENILE IN AQUAPONIC REARING SYSTEM	Prachaub Chaibu
A_015_PA	A NOVEL COMPOSITE FROM PAPER WASTE AND SOYBEAN WASTE: PREPARATION AND PROPERTIES	Sa-ad Riyajan
A_020_PF	ANTIFUNGAL ACTIVITY OF CRUDE EXTRACTS FROM LICHEN *Parmotrema tinctorum* (Despr. ex Nyl.) Hale AGAINST *Pythium* spp. CAUSAL AGENTS OF DAMPING-OFF DISEASE OF MARIGOLD (*Tagetes erecta* L.)	Muthita Molsil
A_021_PA	IMPROVEMENT OF FERMENTED FISH (NAM-PLA) BY USING COLORING AGENT FROM *Monascus* sp. NP1	Kangsadan Boonprab
A_023_PF	DETECTION OF *atzB* GENE IN TROPICAL *Trichoderma harzianum* ISOLATED FROM ATRAZINE CONTAMINATED SOIL IN CENTRAL REGION OF THAILAND	Gun Anantasomboon
A_024_PA	THE ALLELOPATHIC EFFECT OF EXTRACT FROM AGRICULTURAL RESIDUES ON SEED GERMINATION AND SEEDLING GROWTH OF WEED IN PADDY FIELD	Itthipol Sungwienwong
A_025_PA	SCREENING AND ISOLATION OF LIPASE PRODUCING MICROORGANISMS FROM LIPID-RICH FOOD WASTE	Panaya Kotchaplai
A_027_PF	ANTIMICROBIAL ACTIVITY OF A NISIN-CONTAINING BACTERIAL CELLULOSE FILM FROM RICE WASHING DRAINAGE (RWD)	Phimchanok Jaturapiree
A_029_PF	WHICH IS THE SUITABLE TRANSPLANTED FRAME FOR CULTIVATING THE LICHEN *Parmotrema tinctorum* FOR SUSTAINABLE UTILIZATION?	Mongkol Phaengphech
A_032_PA	EFFECT OF HAIRY BASIL STRAW SUBSTRATE ON GROWTH AND YIELD OF GREY OYSTER MUSHROOM	Thanaporn Wichai

ID	Title	Presenter
A_033_PA	THE *Indica-japonica* CLASSIFICATION OF UPLAND RICE VARIETIES	Phijittra Umalee
A_034_PA	CHARACTERIZATION OF GASTRIC SURVIVAL TEST OF *Lactobacillus kunkeei* FROM EUROPEAN FARM BEE IN THAILAND	Theerakarn Srisangsung
A_035_PA	EFFECTS OF RIBOSOMAL PROTEIN S3a (RPS3a) ON WSSV INFECTED WHITE SHRIMP (*Litopenaeus vannamei*)	Panchalika Deachamag
A_036_PA	CHARACTERIZATION OF SOME PROBIOTIC PROPERTIES OF *Lactobacillus kunkeei* FROM EUROPEAN FARM BEE IN THAILAND	Tasanee Kham-oun
A_039_PA	*In vitro* EFFICACY OF TPI SYNBIOTICS AGAINST LIVESTOCK AND AQUATIC ANIMALS BACTERIAL PATHOGENS	Channarong Rodkhum

SESSION B: BIOLOGICAL SCIENCE

ID	Title	Presenter
B1_002_PA	ANTIOXIDANT EFFECT OF *Caesalpinia sappan* HEARTWOOD EXTRACT ON HYDROGEN PEROXIDE-INDUCED OXIDATIVE STRESS IN HUMAN LUNG FIBROBLASTS (MRC-5 CELLS)	Aylada Kaenu
B1_005_PA	ANTIMICROBIAL ACTVITIES OF CARCININ *Pm* FROM BLACK TIGER SHRIMP	Suchao Donpudsa
B1_006_PA	STUDY OF COPPER BINDING TO LYTIC POLYSACCHARIDE MONOOXYGENASE FROM *Vibro harveyi*	Yong Zhou
B1_007_PF	*Aquilaria crassna* LEAVE CRUDE EXTRACT ENHANCES GLUCOSE CONSUMPTION AND DECREASES GLUCONEOGENESIS IN HEPG2 CELLS	Phanupol Mongkolsiri
B2_002_PA	CHARACTERISATION OF BACTERIOPHAGE TN3 ISOLATED FROM THUA NAO, A THAI FERMENTED SOYBEAN	Ekachai Chukeatirote
B2_003_PF	ISOLATION AND PHYSIOLOGICAL CHARACTERIZATION OF BENEFICIAL ANAEROBIC MICROBIOTA IN COMMERCIAL CHICKEN GUTS	Benya Nontaleerak
B2_011_PF	ANTIBACTERIAL AND ANTIBIOFILM ACTIVITIES OF RAMBUTAN (*Nephelium lappaceum* L.) PEEL EXTRACT ON *Vibrio parahaemolyticus* AND *Escherichia coli* ISOLATED FROM FOODS	Tittita Aksonkird
B2_012_PA	ANTI-ENTEROVIRUS 71 SUBGENOTYPE B5 ACTIVITIES OF DIFFERENT PARTS OF *Oroxylum Indicum In vitro*	Thongkoon Priengprom
B2_013_PA	ANTIBACTERIAL ACTIVITY OF CRUDE EXTRACTS FROM *Xylaria psidii* (SDBR- CMU308) AND PURIFICATION OF ITS EXTRACTED METABOLITES	Pichamon Srisawad
B2_014_PA	SELECTION OF PHAGE DISPLAY HUMAN SCFV SPECIFIC TO *Pseudomonas aeruginosa*	Sanruethai Pongsakunpassorn
B2_015_PA	BINDING OF SPECIFIC PHAGE DISPLAY HUMAN scFv TO *Escherichia coli*	Worawit Mawongwan
B3_001_PF	DRAF INTESTINE MICROBIOTA OF SEA CUMBER (*Stichopus horrens*) FOR AQUACULTURE SYSTEMS	Wachira jaengkhao
B3_002_PA	IMMUNE RESPONSE OF MICE VACCINATED WITH COMBINE VACCINE CONTAINING RECOMBINANT *Fasciola gigantica saposin*-LIKE PROTEIN 2 AND LEUCINE AMINOPEPTIDASE	Werachon Cheukamud

ID	Title	Presenter
B3_003_PF	PHYSIOLOGICAL FUNCTION ANALYSIS OF NOVEL GENE CASSETTE CONFERRING PARAQUAT SUSCEPTIBILITY IN *Pseudomonas aeruginosa*	Chanapimon Keerathiwattanarat
B3_004_PA	CLONING OF ASPARAGINYL ENDOPEPTIDASE OR LEGUMAINS 3 FROM *Fasciola gigantica*	Phawiya Suksomboon
B3_007_PA	MOLECULAR CLONING OF SERINE PROTEASE END CODING GENE FROM *Fasciola gigantica*	Komsil Rattanasroi
B3_009_PF	ANTIMICROBIAL ACTIVITY AND A NEW COMPOUND FROM *Fusarium oxysporum*	Supawan Meena
B3_011_PF	EXPRESSION ANALYSIS OF *Drosophila melanogaster* INNATE IMMUNITY GENES DURING *Pseudomonas aeruginosa* INFECTION	Chutimon Tangaiad
B3_012_PF	TRANSCRIPTIONAL RESPONSES OF *Pseudomonas aeruginosa* TO REACTIVE CHLORINE STRESS	Nannipa Phuphuripan
B3_013_PF	FUNCTIONAL CHARACTERIZATION OF A GENE ENCODING A PUTATIVE GLUTATHIONE S-TRANSFERASE ON METAL AND ANTIMICROBIAL RESISTANCE IN *Pseudomonas aeruginosa*	Thanaphat Auwattanamongkol
B4_002_PA	CHIMERIC ANTIGEN RECEPTOR (CAR) T CELL AGAINST CHRONIC HEPATITIS C VIRUS INFECTION	Monrat Chulanetra
B4_003_PA	DEVELOPMENT OF REAL-TIME LAMP FOR QUANTIFICATION OF URINE IP-10 MRNA BIOMARKER OF LUPUS NEPHRITIS USING A PORTABLE TURBIDIMETER	Jantana Kampeera
B4_004_PA	COMBINED LOOP-MEDIATED ISOTHERMAL AMPLIFICATION AND LATERAL FLOW DIPSTICK FOR SENSITIVE DETECTION OF *Mycobacterium tuberculosis*	Pakapreud Khumwan
B4_005_PF	OPTIMISATION OF HIGH RESOLUTION MELTING CURVE ANALYSIS (HRMA) TO DETECT MUTANT CALRETICULIN IN *JAK2* NEGATIVE MYELOPROLIFERATIVE NEOPLASM PATIENTS	Htoo Pyei Hlaing
B4_006_PA	ANTICANCER ACTIVITY OF STILBENE DERIVATIVES FROM PEANUT HAIRY ROOT CULTURE ON CHOLANGIOCARCINOMA	Donruetai Thalapphet
B4_008_PF	THE STUDY OF UT2B17 POLYMORPHISM IN REPRESENTATIVE THAI MUSLIM POPULATION IN SONGKHLA PROVINCE	Sirikanya Anantasena
B4_009_PF	BIOLOGICAL ACTIVITIES OF PAPER MULBERRY EXTRACT (*Broussonetia papyrifera* (L.) Vent.)	Orawan Wanachewin
B4_010_PA	SELECTION OF SPECIFIC ANTIBODIES AGAINST ADVANCED GLYCATION END PRODUCTS (AGEs)	Rungthiwa Tosaard
B4_011_PA	THE INHIBITION OF ADVANCED GLYCATION END PRODUCTS FORMATION BY SOME VEGETABLES	Areerat Ruankham
B5_001_PA	GENETIC DIVERSITY OF THE ORIENTAL GARDEN LIZARD *Calotes versicolor* (Daudin, 1802) IN NORTHERN THAILAND	Watee Kongbuntad
B5_003_PA	PRELIMINARY ANATOMICAL CHARACTERS IN GENUS *Kadsura* (SCHISANDRACEAE) IN THAILAND	Kwanchanok Virasiri
B5_005_PA	PLANT DIVERSITY OF DOI NGAM, MAE FAH LUANG UNIVERSITY	Jantrararuk Tovaranonte

ID	Title	Presenter
B5_007_PA	PRELIMINARY RESULTS OF THE PLANT DIVERSITY SURVEY, PHA HUNG LIMESTONE MOUNTAIN, MAE SAI DISTRICT, CHIANG RAI PROVINCE	Suchaphat Kongthong
B5_009_PA	ABUNDANCE AND COMPOSITION OF JUVENILE CORALS IN MU KO CHANG AND MU KO SAMET, THE EASTERN GULF OF THAILAND	Wanlaya Klinthong
B5_010_PA	LICHEN FAMILY GRAPHIDACEAE IN MANGROVE FOREST OF PRACHUAP KHIRI KHAN AND PHETCHABURI PROVINCES	Vasun Poengsungnoen
B5_011_PA	THE RECOVERY POTENTIAL OF CORALS IN MU KO ANGTHONG, SURAT THANI PROVINCE, THE GULF OF THAILAND	Charernmee Chamchoy
B5_012_PA	ASSESSING FORAMINIFERA ABUNDANCE ON CORAL COMMUNITIES IN CHUMPHON PROVINCE, THE WESTERN GULF OF THAILAND	Sirirat Jaiharn
B5_013_PA	POPULATION DENSITY OF THE GIANT CLAMS *Tridacna* spp. ON SHALLOW REEF FLATS IN THE WESTERN GULF OF THAILAND	Siriluck Rongprakhon
B5_014_PA	DISTRIBUTION AND POPULATION DENSITY OF THE SEA URCHIN *Diadema setosum* ON SHALLOW REEF FLATS IN THE WESTERN GULF OF THAILAND	Ploypailin Rangseethampanya
B5_015_PA	SPECIES DIVERSITY AND COMMUNITY STRUCTURE OF CORALS ON SHALLOW REEF FLATS IN CHUMPHON PROVINCE, THE WESTERN GULF OF THAILAND	Wiphawan Aunkhongthong
B5_016_PA	COMPARING ABUNDANCE AND COMPOSITION OF INFAUNA ON SANDY BEACH AND CORAL REEF COMMUNITIES AT KO MATTRA, THE WESTERN GULF OF THAILAND	Laongdow Jungrak
B5_017_PA	SEASONAL VARIATION OF PHYTOPLANKTON AT HAT PAK MENG, THE ANDAMAN SEA	Orathep Mue-suea
B5_018_PA	PROTECTION OF COASTAL EROSION BY CORAL REEFS IN THE EASTERN GULF OF THAILAND	Arirush Wongnutpranont
B5_019_PA	DIVERSITY OF LICHENS GENUS *Artonia* IN MANGROVE FOREST OF EASTERN THAILAND	Mattika Sodamuk
B5_020_PF	DIVERSITY OF FOLIICOLOUS LICHENS ON *Acrostichum aureum* L. IN MANGROVE FOREST FROM CHUMPHON PROVINCE	Udomrak Meethong
B5_021_PA	THE CRUSTOSE LICHEN FAMILY PYRENULACEAE FROM KOH KOOD, TRAT PROVINCE	Supattara Phokaeo
B5_022_PA	DIVERSITY OF BASIDIOLICHENS ON KOH KOOD, TRAT PROVINCE	Phimpha Nirongbut
B5_023_PA	ASSESSING IMPACTS OF MARINE DEBRIS ON CORAL COMMUNITY AT AN UNDERWATER PINNACLE IN CHUMPHON PROVINCE	Sittiporn Pengsakun
B5_024_PA	A PRELIMINARY STUDY ON LICHEN LITTERFALL IN A TROPICAL SECONDARY FOREST IN THAILAND	Pitakchai Fuangkeaw
B5_025_PF	BIODIVERSITY OF DISCOLICHEN IN MANGROVE FOREST AT CHUMPHON PROVINCE, THAILAND	Phimpisa Phraphuchamnong

ID	Title	Presenter
B5_026_PA	EFFICACY OF ENDOPHYTIC FUNGI ON INHIBITING GROWTH OF GRAY LEAF SPOT DISEASE (*Stemphylium solani*) IN TOMATO	Thanyarat Onlamun
B5_027_PA	THE EFFECT OF FUNGAL ENDOPHYTES, *Xylaria feejeensis*, SRNE2BP ON SEED GERMINATION AND SEEDLING VIGOR OF SPINACH AND TOMATO	Pichayaporn Junmaha
B5_028_PF	SYSTEMATIC REVIEWS OF RHINOBATIFORMES IN THAI WATERS BASED ON 80 MORPHOMETRIC CHARACTERS	Apinya Huskul

SESSION C: CHEMISTRY

ID	Title	Presenter
C1_002_PF	A CHEMICAL SENSOR FOR FORMALDEHYDE DETECTION USING NITROGEN-DOPED GRAPHENE QUANTUM DOTS	Teerapong Jantarat
C1_003_PF	IN-HOUSE METHOD VALIDATION FOR TOTAL ACID NUMBER IN BIODIESEL BY POTENTIOMETRIC TITRATION	Songsuda Promthong
C1_004_PA	DETERMINATION OF IODINE VALUE IN COOKING OIL	Pimpimol Phukpattaranont
C1_005_PA	DETERMINATION OF COENZYME Q10 IN FISH BLOOD WASTE BY MEANS OF HIGH PERFORMANCE LIQUID CHROMATOGRAPHY	Wilairat Cheewasedtham
C1_007_PF	ENANTIOMERIC SEPARATION OF 1-PHENYLALKANOLS BY GC USING METHYLATED BETA-CYCLODEXTRIN CHIRAL STATIONARY PHASE	Suchada Muangsri
C1_008_PA	COMPARATIVE STUDY OF CHEMICAL CONTENS IN DIFFERENT COFFEE LEAVES VARIETIES	Saowaluk Madkoksung
C1_009_PA	HIGH BIOACTIVE COMPOUNDS IN COFFEE CHERRY HUSK TEA	Kanchana Watla-iad
C1_010_PF	ALTERNATIVE COLORIMETRIC DETERMINATION OF 2-NAPHTHOL FOR SCREENING OF ALPHA-GLUCOSIDASE ASSAY	Lalida Chanchaem
C1_011_PA	PRECONCENTRATION AND TRACE DETERMINATION OF COPPER (II) IN THAI FOOD RECIPES USING Fe_3O_4@Chi-GQDS NANOCOMPOSITES AS A NEW MAGNETIC ADSORBENT	Nunticha Limchoowong
C1_012_PF	APPLICATION OF SILVER AMALGAM ELECTRODE FOR ANODIC STRIPPING VOLTAMMETRIC DETERMINATION OF CADMIUM IN CONTAMINATED SOIL AND PLANT	Mangheny Godfrey
C1_013_PF	PAPER-BASED LINER FOR HEADSPACE COLORIMETRIC DETERMINATION OF VOLATILE COMPOUNDS	Kamonwan Meesuwan
C1_014_PA	ELECTROCHEMICAL ACTIVATION OF CARBON SURFACES	Treerawat Sangsrijan
C2_001_PF	SYNTHESIS AND CHARACTERIZATION OF A FLUORESCENT CHEMOSENSOR BASED ON ANTHRAQUINONE DERIVATIVE FOR METAL IONS DETECTION	Chawanakorn Kongsak
C2_003_PA	SLOW-RELEASE OF CAPSAICIN FROM A ZIF-8 FRAMEWORK AS TOPICAL APPLICATION	Christoph Sontag
C2_005_PF	SYNTHESIS OF TiO_2-SiO_2 COMPOSITE AND ITS APPLICATION AS A PHOTOCATALYST FOR OXIDATIVE DESULFURIZATION	Tu Thi Phuong Nguyen

ID	Title	Presenter
C2_006_PF	CYTOTOXICITY OF GOLD(III) PORPHYRIN COMPLEXES AND THEIR DERIVATIVE ON MCF7 CELL LINES	Tossapon Phromsatit
C2_007_PA	BIODIESEL PRODUCTION USING NANOMAGNETIC CaO-BASED CATALYSTS WITH METHANOL TRANSESTERIFICATION OF USED PALM OIL	Chalisa Visvajit
C2_008_PF	COUMARIN-BASED SEMICARBAZIDE AS "TURN-OFF" FLUORESCENT SENSOR FOR Cu^{2+} DETECTION	Pichayanan Srisuwan
C2_009_PA	GREEN SYNTHESIS OF SILVER AND GOLD NANOPARTICLES USING PEONY (*Paeonia Lactiflora*) PETAL EXTRACT AND THEIR ANTIOXIDANT AND ANTIMICROBIAL PROPERTIES	Sasikarn Teepakornwornkul
C2_010_PA	SYNTHESIS, CHARACTERIZATION AND PHOTOPHYSICAL PROPERTY OF HETEROARYL CHALCONE DERIVATIVES	Parichart Sornwai
C2_011_PA	SYNTHESIS, CHARACTERIZATION AND PHOTOPHYSICAL PROPERTY OF PYRAZOLINE DERIVATIVES	Thitipone Suwanwong
C2_012_PA	SYNTHESIS OF PYRAZOLINE DERIVATIVE AS FLUORESCENT SENSOR FOR Hg^{2+} and Pb^{2+} IONS	Narumon Phonrung
C3_001_PA	CHEMICAL CONSTITUENTS FROM THE AERIAL PARTS OF *Euphorbia antiquorum* L.	Jirapast Sichaem
C3_002_PF	QUANTITATIVE DETERMINATION OF PHENOLIC AND TANNIN CONTENTS AND ANTIOXIDANT ACTIVITY OF PAPER MULBERRY	Banthot Chomsawan
C3_003_PF	SYNTHESIS AND CYTOTOXICITY OF TETRAHYDROCURCUMIN PYRAZOLE INDOLE DERIVATIVES	Vachiraporn Ajavakom
C3_004_PF	FORMALDEHYDE FLUORESCENT SENSORS FROM 1,8-NAPHTHALIMIDE DERIVATIVES	Apicha maharat
C3_006_PF	DESIGN AND SYNTHESIS OF OFF/ON FLUORESCENT pH SENSOR BASED ON RHODAMINE 6G	Siriphong Somprasong
C3_007_PF	XANTHONES FROM THE ROOTS OF *Cratoxylum cochinchinense*	Peeravat Natrsanga
C3_008_PF	DEVELOPMENT OF AN ASYMMETRIC DIELS–ALDER REACTION OF *O*-NAPHTHOQUINONE	Watcharapon Prasitwatcharakorn
C3_009_PA	TOTAL SYNTHESIS OF CAERULOMYCIN A	Rungnapha Saeeng
C3_012_PA	SYNTHESIS OF LITHOCHOLIC ACID HYDRAZONE DERIVATIVES AND THEIR *In vitro* CYTOTOXIC ACTIVITY	Patchanee Charoenying
C3_014_PF	CHEMICAL CONSTITUENTS OF *Garcinia cowa* LEAVES	Piyaporn Phukhatmuen
C3_015_PA	A LABEL-FREE APPROACH FOR APTAMER-BASED FLUORESCENCE DETECTION OF MERCURY(II)	Duangkamol Tiarpattaradilok
C3_016_PF	CHEMICAL SYNTHESIS OF GLYCOSYL DITHIOCARBAMATE USING LACTOSE ISOLATED FROM WHEY AS PRECURSOR	Pranpariya Ponpakdee
C3_017_PA	FLAVONES FROM THE TWIG EXTRACTS OF *Pongamia pinnata*	Jirativat Nanthachan
C3_018_PF	POTENT VASORELAXANT CAGED POLYPRENYLATED XANTHONES FROM THE RESIN OF *Garcinia hanburyi*	Rungnapa Noina
C3_020_PA	(+)-ELEUTHERINE: A POTENTIAL ANTI-CARIES AGENT FROM THE RHIZOMES OF *Eleutherine bulbosa* (Mill.) Urb	Ritbey Ruga
C3_021_PA	POLYOXYGENATED CYCLOHEXANE DERIVATIVES FROM THE STEMS OF *Uvaria curtisii*	Abdulwahab Salae

ID	Title	Presenter
C4_002_PA	THERMAL RESPONSE OF LIPOPROTEIN NANODISCS BY COARSE-GRAINED MOLECULAR DYNAMICS SIMULATIONS	Warin Rangubpit
C4_004_PF	MOLECULAR DOCKING STUDIES OF DONEPEZIL-COUMARIN HYBRID AS NOVEL MULTI TARGET hAChE AND hMAO-B INHIBITORS	Charinee Thonthong
C4_005_PF	LASER-INDUCED BREAKDOWN SPECTROSCOPY STUDY OF RED-COLORED ANCIENT GLASS BEADS FROM KHLONG THOM ARCHAEOLOGICAL SITE	Pisutti Dararutana
C4_006_PA	THE USE OF A SOLVENT MIXTURE TO STUDY THE INFLUENCE OF DIELECTRIC PROPERTIES ON PHOTOINDUCED ELECTRON TRANSFER REACTIONS	Patcharanan Choto

SESSION D: POLYMER & MATERIALS SCIENCE / NANOTECHNOLOGY

ID	Title	Presenter
D_001_PF	ZINC OXIDE DOPED WITH OXIDE OF COPPER SUPPORTED ON CELLULOSE FLAKES FOR DEGRADATION OF METHYLENE BLUE	Saowapa Chotisuwan
D_003_PA	GEMOLOGICAL CHARACTERISTICS OF OYSTER COPPER TURQUOISE CLAIMED TO BE FROM UNITED STATES OF AMERICA	Apichet Boonsoong
D_004_PA	APPLICATION OF EXTENDING SHELF LIFE OF FRESH EGG USING CARBOXYMETHYL CELLULOSE /$CACO_3$ MODIFIED BY PALMITIC ACID AND STEARIC ACID AS AN ACTIVE PACKAGING	Witthawat Piampowdee
D_005_PA	A FLOWER SHAPE-GREEN SYNTHESIS AND CHARACTERIZATION OF SILVER NANOPARTICLES (AgNPs) WITH DIFFERENT STARCH AS A REDUCING AGENT FOR BIODIAGNOSIS APPLICATION	Khanittha Ponsanti
D_006_PA	PRODUCTION AND CHARACTERIZATION OF PRINTED SCREEN ELECTRODES MODIFIED WITH GRAPHENE/ZNO NANOCOMPOSITE FOR GOUT	Nion Taikerd
D_007_PF	EFFECTS OF LOW DOSE OF GOLD NANOPARTICLES ON PERICYTES BIOLOGY	Sasikarn Looprasertkul
D_008_PA	PROCEEDING ON EXTRACTION OF CELLULOSE-PAPER FROM BREWERS' SPENT GRAIN BY CHEMICAL TREATMENT	Jakrada Attarataya
D_009_PA	ANTI-BACTERIAL AND FUNGI ACTIVITY OF NATURAL RUBBER BASED TITANIUM AND ZINC OXIDE NANOCOMPOSITES	Siriwat Radabutra
D_010_PA	THE EFFECT OF ANODIZATION DURATION ON MORPHOLOGY AND ELECTRICAL PROPERTIES OF TiO_2 NANOTUBE ARRAYS	Somwan Chumphongphan
D_011_PA	EFFECT OF ANNEALING TEMPERATURE OF TITANIUM DIOXIDE FILMS PREPARED BY ELECTRO SPARK DEPOSITION TECHNIQUE	Gitchanaphon Sriwichai
D_013_PA	A FACILE SYNTHESIS OF SELF-CATALYTIC PVP/PVA/CA HYDROGEL USING HYDROGENCARBONATE AS A GELLING AGENT	Kriangsak Songsrirote

ID	Title	Presenter
D_015_PF	SYNTHESIS OF HIGH MOLECULAR WEIGHT POLY(ε-CAPROLACTONE) USING TITANIUM(IV) *n*-BUTOXIDE AS EFFECTIVE INITIATOR	Wanich Limwanich
D_016_PF	SYNTHESIS OF GOLD NANOPARTICLES USING NATURAL TANNIN AND THEIR CATALYTIC ACTIVITY IN CONGO RED REDUCTION	Penwisa Pisitsak
D_017_PA	PREPARATION AND PHYSICAL PROPERTIES OF (1-x) $Bi_{0.5}(Na_{0.80}K_{0.20})_{0.5}TiO_3$-$xCa_3Co_4O_9$ CERAMICS	Pimpilai Wannasut
D_018_PA	MORPHOLOGY CHARACTERIZATION OF CROSSLINKED-CHITOSAN/ POLY(ETHLYENE OXIDE) ELECTROSPUN NANOFIBERS CONTAINING Cu-BTC	Thitirat Inprasit
D_019_PF	PORTABLE ELECTROCHEMICAL SENSOR FOR FENITROTHION ANALYSIS	Kanyanat Dee-ying
D_020_PA	EFFECT OF TiO_2 AND ZnO IN IN-SITU UV-CROSSLINKING OF ELECTROSPUN PVA NANOFIBER	Pisutsaran Chitichotpanya
D_021_PA	AN APPROACH FOR USING ELECTROCHEMICAL IMPEDANCE SPECTROSCOPY FOR TESTING THE COATING ABILITY OF NON-INTENDED BPA LACQUER ON CAN SURFACE	Natapol Suetrong
D_022_PA	FLEXURAL STENGTH OF *Bambusa nutans* BAMBOO	Darunee Vattanasiriweach
D_023_PA	MECHANICAL PROPERTY MODIFICATION OF BAMBOO STRIPS	Suthee Vattanasiriweach
D_025_PA	EFFECT OF pH ON THE PREPARATION OF INDIGO CARMINE DYE/CA-AL LAYERED DOUBLE HYDROXIDE COMPOSITES	Soontorn Suvokhiaw
D_026_PA	3D-PRINTED GRAPHENE/POLY (LACTIC ACID) NANOCOMPOSITES	Aphiwat Pongwisuthiruchte
D_027_PA	PREPARATION OF NITROGEN-DOPED GRAPHENE BY SIMPLIFIED REFLUX METHOD FOR SUPERCAPACITOR MATERIALS	Wesarach Samoechip
D_029_PA	NANOCOMPOSITE FIBER FROM POLY (BUTYLENE SUCCINATE) REINFORCED WITH GRAPHENE NANOPARTICLE	Nutthapong Poompiew
D_030_PA	RAPID VIBRO-MILLING APPROACH TO NOVEL MICROWAVE DIELECTRIC NICKEL DINIOBATE NANOMATERIALS	Supon Ananta
D_031_PA	EFFECT OF AGEING HEAT TREATMENT ON CORROSION RESISTANCE OF SINTERED 17-4PH STAINLESS STEEL IN ARTIFICIAL SALIVA	Manutchaya Wongkaewmoon
D_033_PF	NOVEL AND FACILE FABRICATION OF MAGNETICALLY MESOPOROUS CARBON MONOLITHS FOR REMOVAL OF TERACYCLINE	Parichart Onsri
D_035_PA	EFFECTS OF TIO_2 CONTENT AND HEAT TREATMENT TEMPERATURE ON CRYSTALLIZATION KINETICS AND MECHANICAL PROPERTIES OF NA_2O-CAO-P_2O_5 BIOACTIVE GLASS-CERAMICS	Pratthana Intawin
D_036_PA	INVESTIGATION OF MICROSTRUCTURE AND MECHANICAL PROPERTIES IN THE INJECTION MOLDING OF LITHIUM DISILICATE GLASS-CERAMIC USING PEG-BASED BINDER FOR DENTAL MATERIAL APPLICATION	Arnon Kraipok

ID	Title	Presenter
D_038_PA	STUDY CRYSTALLIZATION BEHAVIOR AND KINETICS OF CALCIUM MAGNESIUM SILICATE GLASS-CERAMIC DOPED WITH Dy_2O_3	Wipada Senanon
D_039_PA	MICROSTRUCTURE AND MECHANICAL PROPERTIES OF YTTRIA-STABILIZED ZIRCONIA CERAMICS WITH A PEG-BASED BINDER FOR LOW-PRESSURE INJECTION MOLDING	Manlika Kamnoy
D_040_PA	LOW-PRESSURE INJECTION MOLDING OF ALUMINA CERAMICS USING A PEG-BASED BINDER FOR MEDICAL MATERIALS APPLICATION	Lalita Srimoon
D_041_PA	THE OPTICAL PROPERTIES OF Bi_2GeO_5 GLASS AND GLASS DOPE WITH ERBIUM ION	Surapong Panyata
D_042_PA	SOLID STATE SYNTHESIS OF CORDIERITE-MULLITE SYSTEM	Ramita Khamprasit
D_043_PA	MOISTURE ADSORPTION CAPACITY OF BAMBOO CHARCOAL	Pawarit Chumpon
D_044_PF	PREPARATION AND CHARACTERIZATION OF KAFFIR LIME OIL MACROCAPSULES	Aungsana Prajaksangsiri
D_045_PA	EFFECT OF HYDROQUINONE AND METHYL METHACRYLATE MONOMER ON ACRYLIC DENTURE BASE RESIN	Natthawika Sankham
D_046_PA	FABRICATION OF SUPERHYDROPHOBIC IN 17-4PH STAINLESS STEEL BY ANODIZATION PROCESS	Suttita Rattanawong
D_047_PF	PREPARATION OF QUARTZ AND CRISTOBALITE FROM RICE HUSK ASH DERIVED FROM BIOMASS POWER PLANT	Weerachon Phoohinkong
D_049_PF	INFLUENCE OF Sb DOPANT ON PHYSICAL, OPTICAL AND ELECTRICAL PROPERTIES OF CO-PRECIPITATED ZnO POWDERS	Somtop Santibenchakul
D_050_PA	EFFECT OF ANIMAL OIL ON PHYSICAL AND MECHANICAL PROPERTIES OF POROUS ALUMINO-SILICEOUS MATERIALS	Narumon Lertcumfu
D_051_PA	ELECTRICAL PROPERTIES OF BISMUTH FERRITE DOPED ON STRONTIUM IRON NIOBATE LEAD-FREE CERAMICS	Ratabongkot Sanjoom
D_052_PA	MECHANICAL, ELECTRICAL, AND MAGNETIC PROPERTIES OF BISMUTH SODIUM POTASSIUM TITANATE-BASED CERAMICS MODIFIED BY BARIUM IRON TANTALATE	Pharatree Jaita
D_053_PA	EFFECT OF SINTERING TEMPERATURE ON MECHANICAL AND ELECTRICAL PROPERTIES OF LEAD ZIRCONATE TITANATE MODIFIED BY BLNT CERAMICS	Parkpoom Jarupoom
D_055_PA	MOLDED SHEETS FROM COFFEE HUSK AND REUSED PAPER: EFFECT OF COFFEE HUSK PARTICLE SIZE	Anudthida Maphon
D_060_PF	INVESTIGATION OF THE PHASE FORMATION AND MECHANICAL PROPERTIES OF LI-SILICA GLASS-CERAMICS SYSTEM	Wilaiwan Leenakul
D_061_PA	PREPARATION AND PROPERTIES OF GLASS-CERAMICS FOR DENTAL RESTORATION	Krit Sutjarittangtham
D_062_PA	EFFECT OF $BaTiO_3$ NANO-PARTICLES ON DIELECTRIC AND FERROELECTRIC PROPERTIES OF $Ba_{0.85}Sr_{0.15}Ti_{0.90}Zr_{0.10}O_3$	Juthamas Thongduang

SESSION E: ENERGY / ENVIRONMENTAL& EARTH SCIENCE

ID	Title	Presenter
E_001_PA	ADSORPTION OF SOME PLANT NUTRIENTS BY CHITOSAN-PECTIN FILM	Anawat Pinisakul
E_002_PF	ARCHITECTURE ELEMENTS AND STRATIGRAPHY OF ANCIENT MUN RIVER, NAKHON RATCHASIMA, NORTHEASTERN THAILAND	Thunchanok Kawinate
E_004_PF	ACTIVITY OF $PtIrO_2$/C FOR REGENERATIVE PEM FUEL CELL	Ladawan Thupchai
E_005_PF	$NiCo_2S_4$/N-rGO AS A BIFUNCTIONAL OXYGEN REACTION ELECTROCATALYST FOR RECHARGEABLE ZINC-AIR BATTERIES	Phonphiphat suwannarak
E_007_PA	CONVERSION OF PALM OLEIN TO BIOJET FUEL OVER NICKEL SUPPORTED ON BETA AND HY ZEOLITES	Thanawat Sukanan
E_008_PF	PREPARATION OF NiCoS CATALYSTS FOR RECHARGEABLE ZINC-AIR BATTERIES	Nuttasith Tangaemsakul
E_010_PF	HYDROGEN PRODUCTION AND COD REMOVAL FROM BIODIESEL WASTEWATER USING COUPLED SEMICONDUCTOR PHOTOCATALYST	Napat Chuenangkul
E_017_PA	ENHANCEMENT OF CaO AS ECONOMICAL AND GREEN HETEROGENEOUS CATALYST DERIVED FROM ACID TREATED GOLDEN APPLE SNAIL SHELL FOR BIODIESEL PRODUCTION	Sunti Phewphong
E_018_PA	PHYSICOCHEMICAL PROPERTIES OF BLENDING LARD OIL AND RUBBER SEED OIL AS A FEEDSTOCK FOR BIODIESEL PRODUCTION	Wuttichai Roschat
E_019_PA	EFFICIENCY OF BLENDING BIODIESEL OIL AGAINST YANG-NA OIL AND PETROLEUM DIESEL OIL FOR AGRICULTURAL DIESEL ENGINES	Kaewta Donpamee
E_020_PF	SOME PETROCHEMICAL FEATURES OF GRANITIC ROCKS ALONG HIGHWAY 1D, XIENGKHOUANG TO XAISOMBOUN PROVINCES, LAO PDR	Patcharin Kosuwan Jundee
E_023_PA	STUDY AND DEVELOPMENT OF GREEN BIO-SURFACTANT SOLUTION FOR CLEANING	I-Lin Laosri
E_026_PA	WASTE PALM DERIVED SOLID FUEL VIA HYDROTHERMAL CARBONIZATION USING A PRESSURIZED REACTOR	Yoothana Thanmongkhon
E_029_PF	LOW ASH BIOMASS PELLET FROM CORN STALK: EFFECT OF CALCIUM CARBONATE BASE ADDITIVE ON FUELS AND ASH QUANTITIES	Thanakit kumwung

SESSION F: PHYSICS / APPLIED PHYSICS

ID	Title	Presenter
F_001_PF	STRUCTURAL AND PHYSICAL PROPERTIES OF $SnS_{1-x}Se_x$ SOLID SOLUTION THIN FILMS PREPARED BYCLOSE SPACED SUBLIMATION METHOD	Parichat Cummom
F_002_PF	EFFECTS ON TRIBOLOGICAL BEHEVIORS OF SYNTHETIC HYDROCARBON BASED LUBRICANT FOR MICROELECTRONIC APPLICATIONS	Chanikan Polpattanakul

ID	Title	Presenter
F_003_PF	FABRICATION AND CHARACTERIZATION OF $(CdS)_{1-x}(ZnTe)_x$ AND $CuSbS_2$ THIN FILMS FOR PHOTODIODE APPLICATION	Dusit Thueman
F_006_PF	HEAT TREATMENT OF MOGOK ZIRCON, MYANMAR	Kanyarat Kwansirikul
F_008_PF	EFFECT OF SINTERING TEMPERATURES ON DENSITY AND VICKERS MICRO-HARDNESS OF BZT CERAMICS PREPARED BY MOLTEN SALT METHOD	Chompoonuch Warangkanagool
F_010_PA	EFFICIENCY OF UV FLEXOGRAPHIC INK COLOR MATCH PREDICTION ON POLYPROPYLENE LABEL USING ARTIFICIAL NEURAL NETWORK AND COLOR MATCH PREDICTION SOFTWERE	Nutthawit soha

SESSION G: MATHEMATICS / STATISTICS / COMPUTER SCIENCE

ID	Title	Presenter
G_001_PF	EDGE-ODD GRACEFUL LABELING IN THE CONTEXT OF DUPLICATION OF GRAPH ELEMENTS	Siwaporn Saewan

SESSION H: FOOD SCIENCE & TECHNOLOGY

ID	Title	Presenter
H_001_PA	EFFECTS OF MALTODEXTRIN AND INLET AIR TEMPERATURE ON THE PROPERTIES OF SPRAY-DRIED MANGOSTEEN POWDER	Mintra Nugthum
H_002_PA	MONITORING MOISTURE CONTENT IN STIR-FRIED GREEN CURRY PASTE USING NEAR-INFRARED SPECTROSCOPY	Patcharanun Suksangpanomrung
H_003_PA	RAPID ANALYSIS OF FRESH SUGAR CANE JUICE BY NEAR-INFRARED SPECTROSCOPY	Arisara Hiriotappa
H_004_PA	EFFECT OF MANGO PUREE ON THE RHEOLOGY OF BATTER AND QUALITIES OF CRISPY WAFFLE	Prassara Kanokbodeevanit
H_005_PA	EFFECTS OF PEELING AND STEAMING TIME ON THE PASTING AND GEL TEXTURAL PROPERTIES OF GREEN BANANA FLOUR	Supamas Hanpermchai
H_006_PA	ANTIBACTERIAL ACTIVITY OF ESTERIFIED SATURATED FATTY ACIDS WITH MALTODEXTRIN AGAINST *Escherichia coli* AND *Staphylococcus aureus*	Thidarat Pantoa
H_007_PA	LIPID DIGESTIBILITY OF SOYBEAN POLYSACCHARIDE-STABILIZED OIL-IN-WATER EMULSIONS PASSING THROUGH *In vitro* GASTROINTESTINAL DIGESTION	Sunsanee Udomrati
H_008_PA	DEVELOPMENT OF LAMP COMBINED WITH A PORTABLE ELECTROCHEMICAL SENSOR FOR RAPID DETECTION OF E. *coli* O157:H7 IN FOOD SAMPLES	Sarawut Sirithammajak
H_009_PF	COMPARISON OF EXTRACTION TECHNIQUES USING DHS-TENAX TA, SBSE AND SPME FOR ANALYSIS OF DRIED CHILI VOLATILES	Ersa Aurora Ria Diani
H_010_PF	EFFECTS OF JIAOGULAN ON HEXANAL CONTENT IN *SAI-UA* (NORTHERN STYLE HERBAL-PORK SAUSAGE)	Siriporn Riebroy Kim
H_011_PA	NUTRITIONAL COMPOSITIONS AND ANTIOXIDANT ACTIVITY OF TORCH GINGER (*Etlingera elatior*) FLOWER	Ladda Sangduean Wattanasiritham

ID	Title	Presenter
H_012_PA	OPTIMIZATION OF SPRAY DRYING CONDITION FOR 'HOM THONG' BANANA FLOWER EXTRACTS USING RESPONSE SURFACE METHODOLOGY	Karuna Wongkrajang
H_013_PF	INFLUENCE OF STEVIA CONCENTRATION AND GUAR GUM ON RHEOLOGY AND PHYSICO CHEMICAL PROPERTIES OF GUAVA JUICE	Napassorn Peasura
H_014_PA	EXTRACTION OF CAFFEINE AND BIOACTIVE COMPOUNDS FROM COFFEE CHERRY PEEL	Somruedee Thaiphanit

SESSION SP1: CRYSTALLOGRAPHY

ID	Title	Presenter
SP1_004_PF	THERMAL ANALYSIS OF PHASE TRANSITION AND CRYSTALLIZATION OF $EuBa_2Cu_3O_{7-\delta}$ POWDER PREPARED BY SOLID-STATE REACTION	Paitoon Boonsong
SP1_005_PF	A NEW ZINC(II) COORDINATION POLYMER BASED ON 5-NITROISOPHTHALATE; SYNTHESIS, CRYSTAL STRUCTURE AND HIGHLY SENSITIVE FLUORESCENCE SENSING PROPERTIES OF SMALL MOLECULES AND METAL IONS	Pornsan Lueangseephet
SP1_006_PA	SYNTHESIS, CHARACTERIZATION AND X-RAY STRUCTURAL STUDIES OF A NEW 1D LADDER-LIKE CHAIN ZINC(II) COORDINATION POLYMER CONTAINING 1,4-BIS(IMIDAZOL-1-METHY) BENZENE	Chanoknan Sangphuek
SP1_007_PA	SYNTHESIS, CRYSTAL STRUCTURES AND HIRSHFELD SURFACE ANALYSIS OF THREE NEW MONONUCLEAR 3-CHLOROBENZOATE COPPER (II) COMPLEXES WITH 2,2'-BIPYRIDINE AND 1,10-PHENANTHROLINE CHELATING LIGANDS	Wanussanun Chaisuriya
SP1_008_PA	CRYSTAL STRUCTURE AND HIRSHFELD SURFACE ANALYSIS OF A NEW MONONUCLEAR TETRAHEDRAL ZINC(II) COMPLEX	Nanthawat Wannarit
SP1_009_PA	SYNTHESIS AND PROPERTIES OF A NEW ADENINE-BASED Zn (ii) COORDINATION POLYMERS FOR SENSITIVE SENSING OF NITROAROMATICS	Phakinee Srilaoong
SP1_010_PA	AN UNEXPECTED ZINC(II) COORDINATION POLYMER BASED ON N-VINYLIMIDAZOLE AND 2-ANIMOTEREPHTHALIC ACID MIXED LIGANDS	Patsara Kwanmuang
SP1_011_PA	STRUCTURAL TRANSFORMATION OF $[Cu_2(tp)(bipy)_2(H_2O)_4][Cu_2(tp)_3(bipy)_2(H_2O)_2]$ COMPLEX IN ETHANOL UNDER HYDROTHERMAL CONDITION AND THEIR Cu^{2+} ADSORPTION PROPERTIES AFTER ACID TREATMENT	Winya Dungkaew
SP1_013_PA	CRYSTALLOGRAPHIC INVESTIGATION OF LANTHANIDE COORDINATION POLYMERS OF (HYDRAZIDECARBONYL) BENZOATE	Chatphorn Theppitak
SP1_017_PA	SUPRAMOLECULAR STRUCTURE OF $[(VO_4)_2][Na_6(H_2O)_{18}]\cdot 2H_2O$	Chana Panyanon
SP1_018_PA	EXPERIMENTAL AND THEORETICAL INVESTIGATION OF 2D HALOGEN-BONDED ORGANIC FRAMEWOKS BASED ON TETRABROMOTEREPHTHALIC ACID BUILDING BLOCK	Nucharee Chongboriboon
SP1_020_PA	SYNTHESIS OF A COORDINATION POLYMER $[Cu_2(NICOTINATO)_4]$ BY THREE DIFFERENT METHODS	Orrasa In-noi

ID	Title	Presenter
SP1_021_PA	CRYSTALLIZATION AND STRUCTURAL STUDIES OF ORGANIC-INORGANIC HYBRID BASED ON DECAVANADATE CLUSTER: $[(V_{10}O_{28})_2][ImH]_{12} \cdot 3H_2O$	Purita Aroonchat
SP1_022_PA	CRYSTAL STRUCTURE OF SILVER (I) BROMIDE COMPLEX CONTAINING 1-(4-NITROPHENYL) THIOUREA AND TRIPHENYLPHOSPHINE LIGANDS	Yupa Wattanakanjana

SESSION A:
AGRICULTURAL SCIENCE
& BIOTECHNOLOGY

A_001_OF: COMPARISON OF ANTIOXIDANT ACTIVITY AND STILBENE COMPOUNDS PRODUCED BY TAINAN9 AND KALASIN2 PEANUT HAIRY ROOT CULTURE ELICITED WITH A COMBINATION OF METHYL JASMONATE, CYCLODEXTRIN, AND PARAQUAT

Pakwuan Wongshaya[1], Anupan Kongbangkerd[2], Apinun Limmongkon[1,*]
[1]Department of Biochemistry, Faculty of Medical Science, Naresuan University, Phitsanulok 65000, Thailand
[2]Department of Biology, Faculty of Science, Naresuan University, Phitsanulok 65000, Thailand
[*]e-mail: apinunl007@yahoo.com

Abstract: Peanuts (*Arachis hypogaea*) can produce valuable secondary metabolites, such as stilbenes compounds to defend against oxidative stress. *In vitro* hairy root culture is a convenient method to produce large quantities of plant secondary metabolites. In this study, peanut hairy roots derived from 2 different peanut cultivars; Tainan9 (T9-K599) and Kalasin-2 (K2-K599) were used for elicitation assay and antioxidant stilbene compound determination. They were cultured and elicited with a combination of 3 elicitors, paraquat (PQ), methyl jasmonate (MeJA) and cyclodextrin (CD). The antioxidant activity, total phenolic compounds and stilbene compounds namely *trans*-resveratrol, *trans*-arachidin1 and *trans*-arachidin3 were compared between peanut hairy root cultivars. The results showed a higher production of stilbene compounds with antioxidant activity in K2-K599 compared to T9-K599 hairy root culture. This indicated that hairy root derived from different peanut cultivar might process distinct levels of an antioxidant defense mechanism to protect it against oxidative stress.

A_002_OA: COLORIMETRIC LOOP-MEDIATED ISOTHERMAL AMPLIFICATION ASSAY FOR VISUAL DETECTION OF SCALE DROP DISEASE VIRUS IN ASIAN SEABASS

Sirintip Dangtip, Rapheephat Suvannakad,Wansika Kiatpathomchai*
Bioengineering and Sensing Technology Research Team, BIOTEC, National Science and Technology Development Agency (NSTDA), PathumThani
*email: Wansika@biotec.or.th

Abstract: Loop-mediated isothermal amplification (LAMP) is an innovative powerful gene amplification technique for nucleic acid detection under an isothermal condition. In contrast to the commonly used PCR technique, LAMP exhibits great intrinsic sensitivity and specificity through the use of six specially-designed primers covering eight distinct regions on the target gene. In this research, we developed the colorimetric LAMP assay based on the conventional pH-sensitive xylenol orange reporter (LAMP-XO) for a rapid detection of Scale drop disease virus (SDDV) in Asian seabass. This novel method allows for a convenient observation of the test results, which can be easily assessed by a color shift from purple to yellow in the presence of the SDDV target. Our colorimetric LAMP-XO test reported herein could achieve the naked-eye sensitivity only after 60 min of incubation at 65°C with 10 times more sensitivity than the semi-nested PCR assays without cross-amplification with other aquatic pathogens. This result demonstrates that LAMP-XO is appropriate for the actual field application outside a well-equipped laboratory environment.

Key word: Loop-mediated isothermal amplification (LAMP), Scale Drop Disease Virus (SDDV), Xylenol orange, Point-of-care diagnostics, Asian Seabass.

A_003_PA: DEVELOPMENT OF REVERSE TRANSCRIPTION-LOOP-MEDIATED ISOTHERMAL AMPLIFICATION FOR DETECTION OF TILAPIA LAKE VIRUS

Rapheephat Suvannakad[1], Jantana Kampeera[1], Sirintip Dangtip[1], Narong Arunrut[1], Saengchan Senapin[1,2], Wansika Kiatpathomchai[1,*]

[1]Bioengineering and Sensing Technology Research Team, National Center for Genetic Engineering and Biotechnology, National Science and Technology Development Agency (NSTDA), Pathum Thani 12120, Thailand

[2]Fish Health Platform, Center of Excellence for Shrimp Molecular Biology and Biotechnology (Centex Shrimp), Faculty of Science, Mahidol University, Bangkok, Thailand

*e-mail: wansika@biotec.or.th

Abstract: Tilapia lake virus (TiLV) disease outbreaks cause high mortality rate in farmed Nile and red tilapias (*Oreochromis* spp.), and lead to the loss of fish productions in many countries. Thus, early diagnosis, before TiLV spreads, is urgently needed. As a gold standard method, semi-nested RT-PCR is efficient for TiLV detection but it requires sophisticated instruments and times. To expand a choice for easy and rapid diagnostic platforms, we primarily developed a TiLV-specific assay based on reverse transcription loop-mediated isothermal amplification with agarose gel electrophoresis (RT-LAMP-AGE). This assay efficiently amplified the target sequence within 45 min at 63 °C using only a simple heating block. Its sensitivity was comparable to semi-nested RT-PCR at 100 pg of total RNA. The results also showed no-cross activity among other 20 microorganisms found in fish farms, indicated that RT-LAMP was highly specific to TiLV. For further work, the technique will be integrated with other visual biosensors such as gold-nanoparticle probe or pH-sensitive dye for rapid detection of TiLV infection in the field.

A_004_PA: DEVELOPMENT OF A ONE-STEP LAMP COLORIMETRIC METHOD FOR DETECTION OF PHYTOPLASMA, CAUSE OF SUGARCANE WHITE LEAF DISEASE

Sukanya Pengpanich[1], Sirintip Dangtip[1], Rapheephat Suvannakad[1], Sarawut Sirithammajak[1], Prapat Punpee[2], Wansika Kiatpathomchai[1]*

[1]Bioengineering and Sensing Technology Research Team, National Center for Genetic Engineering and Biotechnology, National Science and Technology Development Agency (NSTDA), Pathum Thani 12120, Thailand

[2]Mitr Phol Sugarcane Research Center Co., Ltd., Chaiyaphum, Thailand

*e-mail: wansika@biotec.or.th

Abstract: Sugarcane white leaf disease (SCWL) is a major problem for sugarcane cultivation in Thailand caused by Phytoplasma. SCWL phytoplasma has an effect to sugarcane not only in term of the low quality of sugarcane production, but also increasing the cost of maintenance and disposal. Thus, the selecting a strong sugarcane and specific pathogen free state to grow that will be better. Here, we developed the detection method of SCWL Phytoplasma by using a one-step loop-mediated isothermal amplification (LAMP) colorimetric using pH sensitive dye for increasing efficiency of the detection SCWL prior to planting. The Phytoplasma LAMP primer set was designed from the 626 nucleotides sequence of the NCBI, accession number MK351909.1. The primer conditions were optimized at 63 °C for 1 h. The one-step color demonstrated high specificity and sensitivity detection at picogram levels of the DNA extracted from phytoplasma infected sugarcane leaf samples. Consequently, the using LAMP-color technique would help to screen and control SCWL disease and also providing a sensitive, rapid and low cost method. Importantly, it would be suitable for practical use in a fieldwork as well.

A_006_PA: INVESTIGATION OF MICRONUTRIENTS IN SELECTED THAI RICES USING SYNCHROTRON BASED TECHNIQUES

Nuttawan Pramanpol*, Wantana Klysubun, Nichada Jeeranaikoon, Catleya Rojviriya, Anuchit Ruangvittayanon, Sirawich Limkul
Synchrotron Light Research Institute (Public Organization), Nakhon Ratchasima, Thailand
*e-mail: nuttawan@slri.or.th

Abstract:
Rice is an important staple food for about half of global population. Although it is a major source of carbohydrate but it has relatively lower nutritional trace elements than other cereal grains. Synchrotron based techniques have been used to assess the nutrient- accumulation, localization and diffusion in rice, benefit for breeding and value-added product development in developed countries. Here we would like to demonstrate the capability of Thailand synchrotron facilities for rice research. Synchrotron based techniques including X-ray tomography and X-ray fluorescence spectroscopy and imaging were employed in order to investigate the trace elemental distribution in selected Thai rice grains. Chemical mapping and semi-quantitative analysis of micronutrients in rice samples will be presented. In comparison to conventional methods to determine trace elements, the synchrotron based X-ray fluorescence spectroscopy requires simpler sample preparation without chemical treatment. Synchrotron based techniques available at Thailand synchrotron could be alternative for screening high nutritional Thai rice varieties.

A_007_OF: PROTEIN HYDROLYSATE PRODUCTION FROM DEFATTED RICE BRAN BY INNER ENZYME OF RICE MALT PLUS BROMELAIN

Yupakanit Puangwerakul*, Suvimol Soithongsuk
Food Technology Faculty, Rangsit University, PathumThani, Thailand
*e-mail: lombiotec@yahoo.com

Abstract: Soluble protein hydrolysate produced from defatted rice bran plus rice malt were hydrolyzed by inner enzyme extraction and by inner enzyme plus bromelain extraction. The hydrolysate from the two methods had different protein content of 6.33 and 9.06%, respectively. Moreover, the extracted protein from the second method had higher degree of solubility, emulsion activity and DPPH scavenging activity. However, protein hydrolysate powder produced by inner enzyme extraction had higher foaming ability and contained vitamin B1, B3 and B6 more than the second method. For the amino acid composition, it was found that protein hydrolysate powder produced from different method had mostly essential amino acids met the standard for child and adult intake recommendation of FAO/WHO/UNU. Protein hydrolysate powder had excellent solubility at 92-98%. The ACE-inhibitory activity from protein hydrolysate powder produced from defatted rice bran by inner enzyme extraction and by inner enzyme plus bromelain extraction were 27.50 and 26.43%, respectively.

Keywords: Rice protein, Rice malt, Defatted rice bran, ACE-inhibitory activity

A_008_PA: DEVELOPMENT OF A STRIP TEST FOR DETECTION OF SERUM PROGESTERONE IN SWINE

Umaporn Pimpitak[1,*], Padet Tummaruk[2], Songchan Puthong[1], Anumart Buakeaw[1], Junpen Suwimonteerabutr[2], Kittinan Komolpis[1]

[1]Institute of Biotechnology and Genetic Engineering, Chulalongkorn University, Bangkok, Thailand

[2]Department of Obstetrics, Gynaecology and Reproduction, Faculty of Veterinary Science, Chulalongkorn University, Bangkok, Thailand

*e-mail: Umaporn.P@chula.ac.th

Abstract: In swine industry, the major causes of culling replacement gilts from the swine breeding herds is reproductive failure. The most common reproductive failure in the female pigs is the failure or delay to express first standing estrus so call "puberty attainment". Identifying the puberty onset in the female pigs is one the key factors that can help farmers to reduce the production costs of swine farming. Therefore, the development of an accurate and friendly use of progesterone hormone measurement methods to determine the puberty onset in gilt is a way to distinguish the problematic animals from the herds before implementing a proper treatment. To increase the production efficiency in swine industry, a proper gilts management should be implemented to reduce the culling rate and increase the consistency of the production. The present research work was developed using lateral flow immunoassay or strip test based on competitive format to detect serum progesterone in pig. The test strips were prepared with the condition that the cut-off value of the detection was set at 15 ng/ml for to identifying ovulated (high progesterone) and non-ovulated (low progesterone) gilts. The truely positive value and the truely negative value of the assay were specified at ≥ 20 ng/ml and ≤ 10 ng/ml (about cut-off value ±47%), respectively, while the unreliable region was defined for progesterone concentration between 10 ng/ml and 20 ng/ml. In case of truely positive test, purple color of the gold-antibody conjugate was observed only at the control line (C) of the strip after 10 min of sample loading. On the contrary, purple color was clearly observed at both C line and the test line (T) of the strip for truely negative test. If purple color at the T could be observed but at low intensity, the progesterone concentration was between 10 ng/ml and 20 ng/ml. Pig serum samples (n=17) were tested for progesterone using the prepared test strip and compared with those using ELISA. The result showed that both detection methods yielded the same readout result. This indicated that the test strip could be used to detect progesterone in pig serum and could be applied to distinguish of the female pigs in the field.

A_009_PF: EVALUATION OF FORMIC ACID IN CONTROLLING *Tropilaelaps* MITES IN LABORATORY

Puncharat Promsuvong, Kitiphong Khongphinitbunjong, Khanobporn Tangtrakulwanich*
Bioscience, School of Science, Mae Fah Luang University, Chiang Rai, 57100, Thailand
*e-mail: khanobporn.tan@mfu.ac.th

Abstract: The evaluation of formic acid at different concentrations to control bee mites (*Tropilaelaps mercedesae*) was compared by bioassay experiment using formic acid at concentrations 98%, 90%, 80%, 70%, and 60% and 0% as control treatment respectively. The result showed that there were significant differences ($P < 0.0001$) in increasing mortality rate of the mites among these concentrations. The 98% and 90% of formic acid could cause the mite to die within 1 hr after the mites were exposed to these concentrations. While the 60%, 70% and 80% concentrations of formic acid could cause the mortality to the mites after being exposed at least for 2 hrs. All pupae showed normal characteristics for 7 days after being exposed to every concentration of formic acid treatment. On the 8th day, all pupae in every concentration showed deflated abdomen, brown color of the bodies, none responsive nor movement which indicated mortality except for the control treatment. The pupae in the control treatment died on the 11th day after the experiment was started. Result of study showed benefit of using formic acid as miticide. However, further study is needed to verify the optimal concentration of formic acid to be applied in the field apiary.

Keywords: formic acid, pupae bee, *Tropilaelaps* mites

A_010_PF: EFFICACY OF NATIVE PLANT EXTRACTS (GINGER AND MARIGOLD) IN CONTROLLING RICE WEEVIL: *Sitophilus oryzae* L.

Kanchana Kiriyadee, Wimonsiri Kaewsamer, Wisanu Maneerat, Khanobporn Tangtrakulwanich*
Bioscience, School of Science, Mae Fah Luang University, Chiang Rai, 57100, Thailand, School of Science.
*email: khanobporn.tan@mfu.ac.th

Abstract: The bio-assay was conducted under laboratory condition in order to investigate the efficacy of 2 plant extracts, marigold (*Tagetes erecta* L.)and ginger (*Zingiber officinale* Roscoe) in order to investigate the efficacy of each extracts in controlling rice weevil (*Sitophilus oryzae*). The experiments were set as the repellency test, fumigant test, and contact toxicity test. The solvents used in the crude extraction were hexane, ethyl acetate, and dichlolomethane, respectively. Repellency test revealed that there was no significant in efficacy of both crude extracts in repelling rice weevil. The fumigant test showed that ginger crude extract had more efficacy in knocking down the weevils than marigold did when ethyl acetate and dichlolomethane were used as solvents for extraction. For the contact toxicity test, ginger crude extract showed higher potential in increasing mortality than the marigold extracts when hexane was used as solvent in extraction. Overall results, ginger crude extract showed more promising efficacy in controlling rice weevil than the marigold crude extract. The GC/MS analyses revealed that ginger crude extract had the main compounds as Hexamethylcyclotrisiloxan (27.159%) Octamethylcyclotetrasiloxane (12.928 %) and 1,3,3-Trimethyl-2-Oxabicyclo[2.2.2]octan-6-ol (11.005 %) respectively. Further study is needed to verify the bio active compound affecting the rice weevils.

Keywords: Ginger, Marigold and Controlling Rice Weevil

A_011_PA: CONSTRUCTION OF BIOCIDE-INDUCIBLE PROMOTER DRIVEN FLUORESCENCE GENE EXPRESSION FOR DETECTING PARAQUAT CONTAMINATION

Teetouch Kajornchaitut[1,2], Nannipa Phuphuripan[1], Kazuhito Fujiyama[2], Adisak Romsang[1,3,*]
[1]Department of Biotechnology, Faculty of Science, Mahidol University, Bangkok 10400, Thailand
[2]International Center for Biotechnology, Osaka University, 2-1 Yamadaoka, Suita, Osaka 565-0871, Japan
[3]Center for Emerging Bacterial Infections, Faculty of Science, Mahidol University, Bangkok 10400, Thailand
*e-mail: adisak.rom@mahidol.ac.th

Abstract: Biocides are widely used in both agricultural and medicinal purposes. Its applications usually required an excess amount and consequentially leaved as an environmental contamination. Some biocides including paraquat were banded in many countries due to its harmful effects to human health and may alter a cross-resistance to other biocides such as antibiotics and disinfectants using in the hospitals. Detection of these biocides can be done by chemical reaction but it was hard to apply in sustainably general purposes. Biological method could be more effective and further develop into a sustainable application. In this study, we constructed biocide-inducible promoter driven fluorescence gene expression for detecting paraquat contamination. First, the amplification of the DNA fragment containing full-length *fprB* promoter in *Pseudomonas aeruginosa* was done using Phusion polymerase chain reaction. The isolated promoter was ligated into a promoterless-driven fluorescence gene expression vector, pGemT-Easy-DsRed and transformed into *Escherichia coli* laboratory strain. The inserted DNA sequence in the recombinant plasmid of the *E. coli* transformants was clarified by PCR and DNA sequencing methods. Testing the capability of paraquat detection in these recombinant *E. coli* strain was done by a measurement of fluorescence intensity from the culture after exposing with serial fold dilution of paraquat. The key results showed that the recombinant *E. coli* strain expressed the fluorescence depending on the paraquat exposure in the time-dependent manner. Its sensitivity was depth into a level of 10 ppm paraquat and a significantly difference was observed within an hour after exposure by using fluorescence spectroscopy ($\lambda_{Exitation}$ at 558 nm and $\lambda_{Emission}$ at 583 nm). Moreover, the fluorescence color could be observed by naked eyes after exposing with 500 ppm paraquat for more than 8 hours. Indeed, biocide-inducible promoter driven fluorescence gene expression was successfully constructed and used in the preliminary assay for detecting paraquat contamination. Further development will be done to increase its sensitivity and sustainable applications.

A_012_PA: PRODUCTION OF A MONOCLONAL ANTIBODY AGAINST CASEIN FOR PREPARATION OF THE ELISA TEST KITS

Songchan Puthong[1]*, Anumart Buakeaw[1], Nanthika Kongchareonporn[1,2], Kittinan Komolpis[1,2], Umaporn Pimpitak[1]

[1]Institute of Biotechnology and Genetic Engineering, Chulalongkorn University, Bangkok, Thailand

[2]Food Rish Hub, Research Unit of Chulalongkorn University, Bangkok, Thailand

*e-mail: songchan.p@chula.ac.th

Abstract: Casein is a major milk protein (about 80% of the total proteins) found as colloidal particles called casein micelles. Milk casein is composed of alpha S1-casein (αS1-CN), alpha S2-casein (αS2-CN), beta-casein (β-CN) and kappa-casein (κ-CN). Because cow milk is an important source of proteins, it has been used for daily consumption as well asa raw material several cooking recipies. Unfortunately, some consumers are allergic to casein. The symptoms are individually varied from mild to severe such as rash, running nose, swelling of tongue and lips, eye irritation, difficult to breath and death. These consumers must avoid casein-containing foods which sometimes cannot be noticed from the food appearance or ingredient labels. Therefore, rapid and simple detection method of casein is necessary. Test strip is considered to be the most widely used screening detection method due to its easy to use and low cost. This method requires an antibody specific to casein. Consequently, in this research, monoclonal antibodies (mAbs) raised against cow casein were produced. Mice immunization, hybridoma cell preparation and screening were performed to obtain eight monoclones (CN1F4, CN3F4, CN5F4, CN10F4, CN11F4, CN12F4, CN16F4 and CN20F4). MAbs from these clones were produced, purified and tested for their ability to bind to cow casein by an indirect competitive enzyme-linked immunosorbent assay (ELISA). The results showed that mAb CN1F4 was the most sensitive mAb obtained with the inhibition concentration (IC50) value of 17.01±4.29 µg/ml and limit of detection (LOD) value of 2.46±0.01 µg/ml indicating that mAb CN1F4 was a good candidate for further development of an indirect competitive ELISA and lateral flow immunoassay.

A_013_OF: EVALUATION OF THE CYTOTOXICITY AND GENOTOXICITY OF THE EXTRACTS FROM *Halymenia durvillei*

Athit Chaiwichien[1], Supawadee Osotprasit[1], Tepprit Samrit[1], Pornanan Kuekai[1], Krai Meemon[2], Nakorn Niamnont[3], Montakan Tamtin[4], Prasert Sobhon[2], Narin Changklungmoa[1,*]

[1]Faculty of Allied Health Sciences, Burapha University, Long-Hard Bangsaen Road, Saen Sook Sub-district, Mueang District, Chonburi 20131, Thailand

[2]Department of Anatomy, Faculty of Science, Mahidol University, Rama VI Rd., Bangkok 10400, Thailand

[3]Department of Chemistry, Faculty of Science, King Mongkut's University of Technology Thonburi, Bang Mod, Bangkok 10140, Thailand

[4]Phetchaburi Coastal Aquaculture Research and Development Center, Coastal Aquatic Feed Research Institute, Phetchaburi 76100, Thailand

*e-mail: narin_bio@hotmail.com

Abstract: *Halymenia durvillei* (HD), a species of Madagascar marine coasts red algae, is believed to have potential for pharmacological, nutritional and cosmetic applications. However, such potentials only make sense when devoid of any adverse on health consequences. Thus, the aim of this work was to investigate cytotoxicity and genotoxicity of ethanolic (HD-ET) and aqueous (HD-AQ) extracts. The cytotoxicity was evaluated by MTT assays in L929 and HaCaT cell lines. The genotoxicity was studied by comet assay and micronucleus test in TK6 cell line. The cytotoxicity studies indicated low toxicity to non-toxicity of HD-ET and HD-AQ. In addition, HD-ET and HD-AQ did not show genotoxicity *in vitro* against TK6 cells, at 10–1000 µg/ml. In conclusion, *H. durvillei* at popular concentrations used (or popularly used concentrations), in nutraceuticals or infusion, may be consumed safely because it did not show any cytotoxic or genotoxic effects in in vitro. This is encouraging and justifies further investigation on studies in *in vivo* to confirm the safety of *H. durvillei* extracts.

A_014_PA: EFFECT OF WATER COLORS ON DIGESTIBILITY OF ASIAN SEABASS (*Lates calcarifer* Bloch) JUVENILE IN AQUAPONIC REARING SYSTEM

Prachaub Chaibu[1]*, Winyu Boonprasert[2], Nampet Prakobsin[1], Anuparp Wunkanapol[1]
[1]Faculty of Fisheries Technology and Aquatic Resources, Maejo University, Chiangmai, 50290
[2]Faculty of Agricultural Technology and Agro-Industry, Rajamangala University of Technology Suvanabhumi, Huntra, Ayutthaya, 13000
*e-mail: Prachaub@mju.ac.th

Abstract: This research aimed to study the influence of four different artificial water colors on growth and survival of Asian seabass juvenile cultured in cement ponds by aquaponics rearing system. The initial average weight and length of Asian seabass juveniles were 10.09±1.09 gram and 8.06±1.03 centimeter respectively. They were cultured in different artificial water colors: treatment 1 natural water (control), treatment 2 brown, treatment 3 blue and treatment 4 blue-green at a density of 153 individuals/cubic meter. Commercial feed with diet containing 42 percent protein had been applied for 10 weeks. At the end of the experiment, Asian seabass juveniles in treatment 4 were significantly better than the control fish ($p<0.05$) with an increased weight of 58.08±2.72 gram and the survival rate being 83.11±6.48 percent. When evaluating the effect of artificial water colors on the digestibility of trypsin and chymotrypsin, it was found that the fish in treatment 4 showed a maximum tendency of activity and the ratio of trypsin and chymotrypsin (T / C ratio) was significantly better than that of other treatments ($p<0.05$).

A_015_PA: A NOVEL COMPOSITE FROM PAPER WASTE AND SOYBEAN WASTE: PREPARATION AND PROPERTIES

Sa-ad Riyajan*
Department of Chemistry, Faculty of Science and Technology, Thammasat University
99 Moo 18 Paholyothin Road, Klong-Luang, Pathumthani 12120, Thailand
*e-mail: saadriyajan@hotmail.com

Abstract: In order to effectively apply soybean meal for the preparation of water-resistant soybean-based adhesives for plywood, the effects of soybean meal and lactic acid on the properties of the wood composite were investigated. Firstly, the soybean-meal-based adhesives modified with lactic acid were referred to as SL adhesive, based on the type of soybean meal used. The chemical structure of the SL adhesives was investigated by FTIR. Then, the SL adhesive was mixed with the paper waste at room temperature for 6 h. Then, the mixture was compressed at 120°C for 15 min by compression machine to form a novel composite. The physical properties including density, swelling ratio, moisture content, and moisture absorption and water resistance of the samples were analyzed. Moreover, the biodegradation of the sample was also investigated. The density of the wood composite increased as a function of soybean meal and lactic acid and its value ranges between 0.11 and 0.125 g/cm^3. Moreover, the swelling ratio and moisture content of this composite decreased as a function of soybean meal due to its good adhesion between the adhesive and fiber matrix. The water resistance of this sample was improved after the addition of natural rubber. After the addition of soybean meal in the composite, the moisture absorption of sample increased due to its reduction in hydroxyl group. Finally, after use, this composite easily degraded in the nature.

A_016_OA: ROBUST BIOPROCESS FOR THE SUSTAINABLE PRODUCTION OF THE FUNGAL ANTI-CANCER LEAD COMPOUND ILLUDIN M

Lillibeth Chaverra-Muñoz, Theresa Briem, Tian Cheng, Clara Chepkirui, Stephan Hüttel*, Marc Stadler*
Helmholtz Centre for Infection Research, Braunschweig Germany
*e-mail: stephan.huettel@helmholtz-hzi.de; marcstadler@helmholtz-hzi.de

Abstract: Fungi and especially Ascomycota and Basidiomycota are excellent examples of organisms with an incredible versatile secondary metabolism. This feature has been used to establish biotechnological processes to obtain interesting natural products with unique biological activities that are potential starting points in drug discovery programs like the illudins produced by the basidiomycetes *Lampteromyces* and *Omphalotus*. These sesquiterpenoids serve as base molecules for the development of new antitumor agents. Because the strong and unspecific cytotoxicity of the natural compounds have prevented their direct use in cancer therapy, semisynthetic conjugates based on illudin M have being designed with a strongly improved therapeutic index. Current research on that molecule class is ongoing to improve further their selectivity towards malignant cells and this purpose requires a reliable supply of larger amounts of illudin M. The aim of this project is to develop a stable up-stream and downstream process for the biotechnological production of illudin M in multi-gram scale using *Omphalotus nidiformis* as a model organism for its production.

Several parameters such as morphology, pH, agitation, oxygen transfer, influence of seed culture density and media components were studied using shake flasks and subsequent stirred-tank experiments with regard to improve culture conditions enhancing a scalable production of the compound. Strategies for product recovery and purification were also developed.

Preliminary results suggest that through optimization of culture conditions and following an improved strategy for downstream processing it is possible to achieve 500 mg/L of pure illudin M.

A_017_OF: DATA REDUNDANCY IN PAIRED-END DNA SEQUENCE ALIGNMENTS

Eliot Cline, Anant Eungwanichayapant*
School of Science, Mae Fah Luang University, Thailand
*e-mail: anant@mfu.ac.th

Abstract: Illumina sequencers generate paired-end reads by sequencing both ends of a DNA fragment. Sequencing libraries contain variable-length fragments. Fragment length determines the distance between the 3' ends of the reads in a pair. They overlap when this distance is less than twice the read length. The overlapping portion is redundant, as the same part of the fragment was sequenced twice. Variant detection software overestimates read-depth in these areas of overlap. This paper studied how data redundancy affects variant detection.

A simulated tomato genome containing known variants was created, from which paired-end reads were generated at multiple mean fragment lengths and standard deviations (relative to mean fragment length). Reads were aligned to the published tomato reference genome. Software was developed to merge the overlapping pairs into a single read. Variants were called on the merged and unmerged data and the results compared.

Reads generated at small standard deviations showed very few overlapping pairs after alignment. For large standard deviations, up to 26% of read-pairs overlapped and contained 12% redundant data. However, removing the redundant data did not have a major effect on variant detection performance.

A_018_OF: SAFETY ASSESSMENT OF THE ETHANOLIC EXTRACT OF *Caulerpa lentillifera* IN VITRO SYSTEM

Supawadee Osotprasit[1], Athit Chaiwichien[1], Tepparit Samrit[1], Pornanan Kueakhai[1], Prasert Sobhon[2], Krai Meemon[2], Nakorn Niamnont[3], Montakan Tamtin[4], Narin Changklungmoa[1,*]

[1]Faculty of Allied Health Sciences Burapha University, Chonburi, Thailand

[2]Faculty of Science, Department of Anatomy, Mahidol University, Bangkok, Thailand.

[3]Faculty of Science, Department of Chemistry, King Mongkut's University of Technology Thonburi, Bangkok, Thailand.

[4]Coastal Aquatic Feed Research Institute, Coastal Fisheries Research and Development Bureau, Department of Fisheries, Phetchaburi, Thailand.

*e-mail: narin_bio@hotmail.com

Abstract: *Caulerpa lentillifera* (sea grape) that have been widely used for the pharmaceutical industry, herbal medicines and medical supplies. In this study, we attempted to evaluate the cytotoxicity and genotoxicity of sea grape extract in ethanol fraction. The extract was evaluated cytotoxicity assays by MTT and LDH assay on hepatocyte cell (FL83B). In addition, to test genotoxicity by the comet assay in vitro performed using lymphoblast cell (TK6) for detecting DNA damage. Our results demonstrated the cytotoxicity of sea grape extract, that showed high cell viability and low LDH activity. For genotoxicity to use three different parameters were performed: tail length, %tail DNA and tail moment were not different from the control group. In conclusion, sea grape extract showed no cytotoxic and genotoxic effects on both cell types under the conditions studied in vitro. Therefore, our results indicated that ethanol fraction of *C. lentillifera* safe for consumption and supplementary food.

A_019_OF: EFFICIENCY OF *Caulerpa lentillifera* AND *Halymenia durvillei* EXTRACTED SUBSTANCES IN ANTI-OXIDATION

Tepprit Samrit[1], Athit Chaiwichien[1], Supawadee Osotprasit[1], Narin Changklungmoa[1], Krai Meemon[2], Montakan Tamtin[3], Nakorn Niamnont[4], Prasert Sobhon[2], Pornanan Kueakhai[1,*]

[1]Faculty of Allied Health Sciences, Burapha University, Long-Hard Bangsaen Road, Saen Sook Sub-district, Mueang District, Chonburi 20131, Thailand

[2]Faculty of Science, Department of Anatomy, Mahidol University, Bangkok, Thailand,

[3]Department of Fisheries, Coastal Aquatic Feed Research Institute, Coastal Fisheries Research and Development Bureau, Petchaburi, Thailand,

[4]Faculty of Science, Department of Chemistry, King Mongkut's University of Technology Thonburi, Bangkok, Thailand.

e-mail: earn_patho@hotmail.com, pornanan@buu.ac.th (P. Kueakhai)

Abstract: Free radicals are an atom or molecule that have one or more unpaired electrons and can react quickly with a micromolecule and macromolecule that cause of many diseases. Antioxidants were mostly found in plants such as herb and seaweeds. *Caulerpa lentillifera* (CL) and *Halymenia durvillei* (HD) are seaweeds that classified in Chlorophyta and Rhodophyta phylum. They were cultivated in tropical and subtropical region for food and water waste treatment. The aim of the present study was to evaluate the antioxidant and anti-inflammation effect of CL and HD extracts. In this study, seaweeds were extracted by ethanol (ET), hexane (HE) and ethyl acetate (EA) solutions. The antioxidation effect demonstrated by DPPH scavenging assay and ABTS scavenging assay. The result of DPPH and ABTS scavenging assay found CL and HD extract contained antioxidation compound in EA, HE, and ET fraction. The EA fraction was highest antioxidant effect.

A_020_PF: ANTIFUNGAL ACTIVITY OF CRUDE EXTRACTS FROM LICHEN *Parmotrema tinctorum* (Despr. ex Nyl.) Hale AGAINST *Pythium* spp. CAUSAL AGENTS OF DAMPING-OFF DISEASE OF MARIGOLD (*Tagetes erecta* L.)

Muthita Molsil*, Patchara Mongkolsuk, Vasun Poengsungnoen, Mongkol Phaengphech, Onuma Piasai, Kawinnat Buaruang
Lichen Research Unit. Department of Biology. Faculty of Science. Ramkhamhaeng University. Huamark, Bangkapi, Bangkok 10240, Thailand
*e-mail: mumi-401@hotmail.com

Abstract: Damping-off in marigolds caused by *Pythium* spp. can damage young marigolds leading to collapse of seeding, and cause severe economic losses. The objective of this study was to investigate the antifungal activity of lichen crude extracts, *Parmotrema tinctorum* (Despr. ex Nyl.) Hale, against *Pythium* spp. causal agents of damping-off disease of marigold (*Tagetes erecta* L.). Two hundred grams of the investigated lichen thalli were cut and macerated in 500 mL of acetone for 48 hrs. The extracts were concentrated with rotary evaporator at 40 °C. The lichen crude extract was dissolved in dimethyl sulphoxide (DMSO) and tested against two isolated strains of *Pythium* spp. (Py-R7, Py-RM4) by poisoned food method with five different concentrations; 3,000, 1,000, 500, 100 and 50 µg/mL. Fungicide metalaxyl and DMSO were used as positive and negative controls. .EC_{50} was calculated using Probit analysis. The crude extract at 3,000 µg/mL inhibited 87% and 78% mycelial growth of Py-R7 and Py-RM4, respectively. In contrast, the crude extracts at concentrations of 500, 100 and 50 µg/mL were less active to reduce the growth of both fungal strains (less than 50% mycelial growth inhibition). The EC_{50} values of crude extracts on Py-R7 and Py-RM4 were 436.5 and 630.9 µg/mL, respectively.

A_021_PA: IMPROVEMENT OF FERMENTED FISH (NAM-PLA) BY USING COLORING AGENT FROM *Monascus* sp. NP1

Kangsadan Boonprab*, Pattarachat Ingrugruenglue, Painuparp Jindaratanawong
Fishery products Department, Fisheries Faculty, Kasetsart University Bangkok, Thailand 10900
*e-mail: ffisksb@ku.ac.th, bffisksb@yahoo.com

Abstract: This work was focused on improvement of fermented fish (Nam-Pla) from minced catfish meat (MCM) by using coloring agent from *Monascus* sp NP1 through Chinese red rice or Ang-kak (AK) product. Three topics were carried out. The first was, principal study on fungal pigment compounds (PCs) extract characters. PCs composed of two λmax (510 and 390 nm). Theirs amount varied to pH (3-12), NaCl and NH_4SO_4 (0,1,3,5 and 10%) and time at 80 °C (0,15,30 and 45 min). The amount of PCs at two λmax provided inverse to the variation of all treatments significantly ($p<0.05$). The second was, the development study on Nam-Pla process by the variation weight of fine AK [(≤850 μm), 0.5, 1 and 1.5 % by weight in based recipes (1200g MCM, 40g salt, 100g stream rice, 200g minced garlic). The results showed that 0.5% of AK was the best since it obtained the highest sensory evaluation scores (Hedonic scales 9-point) at day 2 which was an ending time process. The unique characters of the product were investigated. They were: pH at 4.5; acid concentration at 0.75%; PCs in product at 0.180±0.003 (OD_{390}) and 0.214±0.011 (OD_{510}); L*, a* and b* at 46.553±0.193, 13.2000±.326 and 11.3300.±020, respectively. The proportion of nutrition in product (%) as protein, fat, moisture and ash were 11.35±0.49, 5.39±0.03, 70.45±0.54 and 3.43±0.03, respectively. Energy was 142.75 kcal per 100 g serving. Total viable count (TVC) was $4.83x10^8$ cfu/g while a lactic acid bacteria (LAB) was $7.65x10^8$ cfu/g with no detection of food pathogen. From total isolation (50 strains) natural flora bacteria of product, all of them showed Gram-positive bacteria, rod- or cocci-shaped and negative catalase which indicated they may be LAB. The cost of product showed 4.22 Baht per 100g. The last study was the fermentation profile of product during 7 days. The amount of all parameters [TVC, LAB, PCs at two λmax, pH and acid concentration (%)] was varied to time significantly ($p<0.05$) in day 0-2 while they were constant in day 3-7. From the whole results, it was proposed that the possibility to use safe color from natural agent (AK) with its several usefulness for health was shown with the best favorite of the consumer as well as the rising value of Nam-pla (good source protein from fish for healthy food) because the high attractive color agent of product like Nam-Moo (fermented meat of pig) or Nam-Meat(fermented meat of cow).

A_022_OF: TOTAL PHENOLIC CONTENT, TOTAL FLAVONOID CONTENT AND ANTIOXIDANT ACTIVITY OF THE CULTURE FILTRATE EXTRACT FROM *Ganoderma lucidum*

Puttachard Hensanghong[1], Rungnapa Tangchitcharoenkhul[2], Janpen Tangjitjaroenkun[3,*]
[1]Program in Natural Product Science and Technology, Faculty of Science at Si Racha, Kasetsart University, Si Racha Campus, Thailand
[2]Graduate school, Suan Dusit University, Bangkok, 10300, Thailand
[3]Department of Resources and Environment, Faculty of Science at Si Racha, Kasetsart University, Si Racha Campus, Thailand
*e-mail: xjanpen@gmail.com, sfscijpt@src.ku.ac.th

Abstract: *Ganoderma lucidum* has been recognized as a medicinal mushroom for over 2000 years. The extract from fruiting body of *G. lucidum* has been attributed to numerous bioactivities including anti-microbial, anti-inflammatory and antioxidant. In the present study, the mycelial submerged culture of the *G. lucidum* were performed using potato dextrose broth at 25°C for 21 days under static condition. The culture filtrate was extracted with two equal volume of ethyl acetate. The ethyl acetate extract of *G. lucidum* get yields 0.58 g. The total phenolic content was 55.56 ± 5.06 mg GAE/g DW. The total flavonoid content was 71.63 ± 1.05 mg QE/g DW. The screening of antioxidant activity by thin layer chromatography autographic assay found the bleaching color from purple to yellow between 5 and 10 minutes. The quantitative determination of antioxidants used 3 assays, DPPH radical scavenging activity found IC_{50} values of 870.07 ± 26.07 µg/mL, 2,2'-azino-bis[3-ethylbenzthiazoline-6-sulfonic acid] (ABTS) free radical scavenging activity IC_{50} values of 235.81 ± 9.28 µg/mL and ferric reducing antioxidant power assay (FRAP) found 216.031 ± 3.738 mmol Fe_2SO_4 equivalent/g DW, respectively. The culture filtrate extract of *G. lucidum* exhibited a good free radical scavenging activity and also it contained high contents of total phenolic and total flavonoid compounds. This study demonstrates that this extract could be a potential source of natural antioxidants.

A_023_PF: DETECTION OF *atzB* GENE IN TROPICAL *Trichoderma harzianum* ISOLATED FROM ATRAZINE CONTAMINATED SOIL IN CENTRAL REGION OF THAILAND

Gun Anantasomboon[1,*], Intira Tampayak[2]
[1]Anatomy Unit,
[2]Microbiology Unit, Department of Medical Science, Rangsit University, Patumthani, Thailand
*e-mail: ananta_rsu@yahoo.com

Abstract: *Trichoderma* spp. is tropical fungus currently used as biological control agent due to their ability to antagonize other plant pathogenic fungi, as well as to degrade some agrochemicals. Among herbicides, atrazine, is intensively used in sugarcane, corn and sorghum fields. Due to the toxicity and persistence of atrazine in the environment, bioremediation using microorganisms have been studied to remove atrazine from contaminated soil and water. This study aimed to investigate the tropical *Trichoderma* spp. that may has unique capability in atrazine degradation or toleration. Fifty isolates of fungal strain from atrazine contaminated corn and sugar cane fields from Kampahaengphet, Nakornpathom and Ratchaburi provinces were cultured in modified medium agar containing 50 mg/L of atrazine for 15 days, then the *atzB* gene investigations of eight survival isolates were determined by using PCR analysis. All of eight survival isolates were finally identified for specific fungal stain by PCR and DNA sequencing analyses, respectively. The results showed that six fungus isolates were positive *atzB*-PCR analysis and classified as *Trichoderma harzianum*. Therefore, the selected strain of tropical *T. harzianum* from central region of Thailand may benefit for the agriculture and the global environment to reduce or to degrade atrazine in contaminated soil.

A_024_PA: THE ALLELOPATHIC EFFECT OF EXTRACT FROM AGRICULTURAL RESIDUES ON SEED GERMINATION AND SEEDLING GROWTH OF WEED IN PADDY FIELD

Itthipol Sungwienwong*, Sasitorn Wilapana, Rachanikon Dandi, Janya Jaiprasert, Suchao Donpudsa
Department of Chemistry, Faculty of Science, Srinakharinwirot University, Bangkok 10110, Thailand
*e-mail: itthipol@g.swu.ac.th

Abstract: The aim of this study was to investigate the allelopathic effect of extract from agricultural residues on seed germination and seedling growth of the five weeds five weeds in paddy field including *Echinochloa crus – galli* (L.) T. Beauv, *Echinochloa colonum* (L.) Link, *Digitaria ciliaris* (Retz.) Koel, *Dactyloctenium aegyptium* (L.) P. Beauv and *Chloris barbata* Sw. The agricultural residues containing leaves of *Solena amplexicaulis* (Lam.) Gandhi, *Carissa carandas* Linn and *Vernonia amygdalina*, coffee ground of *Coffea arabica* L. and peel of *Nephelium lappaceum* L. were extracted using distilled water or 70 % (w/w) ethanol. The extracts were added on cultivated container. The seed germination and seedling growth of the five weeds and rice were observed. The results showed that the extract from leaves of *Carissa carandas* Linn using distilled water presented the highest inhibition rate against the seed germination and the seedling growth of the five weeds. However, this extract did not affect seed germination and the seedling growth of rice. From the previous result, the optimum conditions for extracting leaves of *Carissa carandas* Linn using distilled water such as the ratio of content between the residues and the solvent, temperature and the incubation time were determined. It was found that the optimum conditions for this extraction were 1:10 ratio of the leaves to the water and the extract was required an incubation at 5 °C.

A_025_PA: SCREENING AND ISOLATION OF LIPASE PRODUCING MICROORGANISMS FROM LIPID-RICH FOOD WASTE

Panaya Kotchaplai*
Institute of Biotechnology and Genetic Engineering, Chulalongkorn University, Phayathai road, Bangkok 10330 Thailand
*e-mail: panaya.k@chula.ac.th

Abstract: Food waste has been reported as an excellent alternative nutrient source for microbial cultivation, thus making it a promising feedstock for various biological processes e.g. biogas or biodiesel production. However, its low bioavailability, and high lipid content presented in the food waste are the critical challenges for biovalorization of food waste. Application of lipase, an enzyme hydrolyzing lipids into fatty acid and glycerol has been reported for improving the efficiency of lipid-rich feedstock bioconversion. In this study, the potential lipase-producing microorganisms were isolated from various sources including processed food waste and grease waste from Chulalongkorn university canteen. The screening for esterase- and lipase-producing microorganisms were performed using tributyrin agar plate and Rhodamine B plate, respectively. Among fifteen strains capable of producing clear zone on tributyrin agar plate and the orange fluorescence on Rhodamine B plate, six isolates were further tested for extracellular lipase production using *p*-nitrophenyl palmitate as a substrate. Lipase activity of the six isolates cultivated in unoptimized GYP broth ranged from 0.01 - 0.05 U/ml.

A_026_OA: PROTEIN ENGINEERING IN THE MAKING OF SUPER XYLANASE FOR ANIMAL FEED APPLICATIONS

Harit Boonyaputthikul[1], Apichet Ngenyoung[1], Triwit Rattanarojpong[1], Pongsak Khunrae[1,*], Thana Sutthibutpong[2,3,*]

[1]Department of Microbiology, Science Laboratory Building, Faculty of Science, King Mongkut's University of Technology Thonburi.

[2]Theoretical and Computational Physics Group, Department of Physics, KMUTT, Thailand. Faculty of Science, King Mongkut's University of Technology Thonburi.

[3]Theoretical and Computational Science Center (TaCS), Science Laboratory Building, Faculty of Science, King Mongkut's University of Technology Thonburi (KMUTT), 126 Pracha-Uthit Road, Bang Mod, Thrung Khru, Bangkok 10140, Thailand.

*e-mail: pongsak.khu@kmutt.ac.th; thana.sut@kmutt.ac.th

Abstract: The need to alleviate pollution at farm level agricultural waste/biomass management as well as high efficiency conversion of biomass into xylose sugar has necessitated the need to use enzyme biotechnology particularly xylanase. However, the processes applied require high temperatures and chemical treatments which denature enzymes. We produced a mutant xylanase enzyme using protein engineering aimed at addressing these problems. Our enzyme has activity of 4000 U/mg higher than 3200U/mg activity of native enzyme, tolerant temperatures up to 105 °C for 6 minutes whereas the native enzyme tolerate up to 90°C and has a commercial value of 10 Baht/kg. Also, our enzyme can digest corn husk, cob and stover (20-30% biomass reduction/day) without chemical pre-treatment, the highest efficiency ever reported. This shows that our enzyme is thermostable, has higher efficiency, is cheap and can help eliminate biomass burning and increase biomass conversion. According to our results, this innovation can impact on helping reduce undegradable feed component fiber to become an absorbable sugar and promote animal growth rate.

A_027_PF: ANTIMICROBIAL ACTIVITY OF A NISIN-CONTAINING BACTERIAL CELLULOSE FILM FROM RICE WASHING DRAINAGE (RWD)

Pipat Sudying, Phimchanok Jaturapiree*
Department of Biotechnology, Faculty of Engineering and Industrial Technology, Silpakorn University, Muang, Nakhon Pathom 73000 Thailand
*e-mail: phimchanok@hotmail.com

Abstract: Among available packaging materials, cellulose products have attracted increasing interest due to their edibility, biodegradability and potential as a good carrier of a wide range of antimicrobial agents. A bacterially produced cellulose film containing nisin was developed and used in a proof-of-concept study to control *Bacillus cereus*, *Escherichia coli* and *Staphylococcus aureus*. Bacterial cellulose pellicles were produced by *Komagataeibacter nataicola* Li1 from rice washing drainage (RWD) as the renewable carbon source. Using inexpensive waste materials as substrates in fermentation media could significantly reduce the bacterial cellulose production cost. Moreover, it also has an environmentally friendly effect by the removal of this waste from the environment. Bacterial cellulose films from rice washing drainage containing nisin showed effectiveness in controlling *B. cereus* and *S. aureus*, indicating that the use of active bacterial cellulose films would be a promising method to enhance the safety and extend the shelf life. Substantial work is still required, however, to make the production of active bacterial cellulose films economically feasible.

A_028_OA: EVALUATION OF SEGMENT 5 AND 6 PROTEINS FORM TiLV AS A POTENTIAL VACCINE CANDIDATE

Apisit Lueangyangyuen[1], Saengchan Senapin[2,3], Ha Thanh Dong[4], Sasimanas Unajak[5], Triwit Rattanarojpong[1], Pongsak Khunrae[1,*]

[1]Department of Microbiology, Faculty of Science, King Mongkut's University of Technology 7 8 Thonburi (KMUTT), Bangkok 10140, Thailand

[2]Fish Health Platform, Center of Excellence for Shrimp Molecular Biology and Biotechnology (Centex Shrimp), Faculty of Science, Mahidol University, Bangkok, Thailand

[3]National Center for Genetic Engineering and Biotechnology (BIOTEC), National Science and Technology Development Agency (NSTDA), Pathum Thani, Thailand

[4]Faculty of Science and Technology, Suan Sunandha Rajabhat University, Bangkok, Thailand

[5]Department of Biochemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand

*e-mail: pongsak.khu@kmutt.ac.th

Abstract: Tilapia syncytial hepatitis disease can result in cumulative mortality rate up to 100% within 14 day. This disease is caused by Tilapi

a Lake virus (TiLV), an enveloped single-stranded RNA virus consisting of ten genomic segments. Among the 10 segments, segment 5 and 6 were predicted to contain signal peptide, suggesting the encoded protein from these two segments might be existed as part of an envelope of the virus. In this study, the segment 5 and segment 6 gene were constructed and expressed in E. coli and evaluated potential use as a vaccine in tilapia. Our results showed that a partial form of segment 5 and 6 could be expressed insolubly in E. coli. The results from immunization experiments showed that the serum antibody levels in Nile tilapia induced by partial segment 5 and 6 were significantly increased 7 days post immunization. Interestingly, Tilapia immunized by both partial form of segment 5 and 6 showed to have the highest survival rate of about 60% at day 14 after being challenged with TiLV. These results suggest that segment 5 and segment 6 are a promising candidate for development of a vaccine against TilV infection in Nile tilapia.

A_029_PF: WHICH IS THE SUITABLE TRANSPLANTED FRAME FOR CULTIVATING THE LICHEN *Parmotrema tinctorum* FOR SUSTAINABLE UTILIZATION?

Mongkol Phaengphech[1]*, Wetchasart Polyiam[1], Chaiwat Boonpeng[1], Kansri Boonpargob[1]
Lichen Research unit, Department of Biology, Faculty of Science, Ramkhamhaeng University, Bangkok, Thailand
*e-mail: mongkolpp@gmail.com

Abstract: Carbon assimilation in lichens depends largely on available atmospheric humidity. Maintaining optimal thallus water content can prolong carbon fixation and increase lichen production. The objective of this study was to develop transplanted frames that prolong optimal thallus water content. Three small and three large frames were made, standing 45° above the ground facing the East. Enclosing beneath each frame with either shading net, shading net lining with plastic sheet, or open (control). Six thalli of the lichen *Parmotrema tinctorum* were fixed over the surface of each frame. Thallus relative water content (RWC), chlorophyll fluorescence (Φ_{PSII}) and microclimate were measured from 5 a.m. to 1 p.m. for 4 days during 25 to 28 January 2019. The result showed that the frame that surrounded by the shading net lining with plastic sheet could maintain higher and longer humidity inside the frame. Consequently, the transplanted lichens on this frame showed evidently higher thallus water content than the others. Temperatures were not different among all frames. This result suggested that walling the lower surface of the frames with the combination of shading net and plastic sheet was suitable for lichen transplantation. This information is essential for cultivation of lichens for sustainable utilization. More importantly, further study under varying environment needs to be carefully assessed.

A_030_OA: DEVELOPMENT OF MUTATED ENHANCE GREEN FLUORESCENCE PROTEIN (mtEGFP) BASED ON SENSOR FOR DETECTION OF HEAVY METAL IONS IN THE ENVIRONMENT

Wasusit Somsoros[1], Pirachat Namsri[1], Penpak Siripitak[1], Kheamrutai Thamaphat[2], Triwit Rattanarojpong[1], Pongsak Khunrae[1,*]

[1]Department of Microbiology, Faculty of Science, King Mongkut's University of Technology Thonburi, Bangkok 10140, Thailand

[2]Green Synthesis and Application Laboratory, Department of Physics, Faculty of Science, King Mongkut's University of Technology Thonburi, Bangkok 10140, Thailand

*e-mail: pongsak.khu@kmutt.ac.th.

Abstract: Enhanced Green Fluorescent Protein (EGFP) is one of the most widely protein used as a marker for the genetic engineering, which demonstrates that a target gene can be expressed throughout a given organism. In this study, we are interested in developing an EGFP to use as biosensors for detection of heavy metal ions in food, drug and sewage. It has been modified three amino acid residues near the chromophore, which absorbs the UV or visible radiation and initiates the fluorescence emission, by replacing with cysteine. We observed that our mutated EGFP (mtEGFP) has ability to detect various heavy metal residues and also found that mtEGFP has more specific to mercury than other heavy metals. According to the observation of the color change with the naked eye, the mtEGFP is clearly observed in the naked eye by convert from green to orange when the mtEGFP mixed with mercury (ii) ion at the lowest concentration of 2 ppm, which is a critical point that must be controlled according to the Minamata Convention on Mercury. Therefore, we propose that the mtEGFP may have potential for further development into biosensors for detect mercury residue, as well as heavy metals in the environment.

Keywords: Biosensor, Heavy metal ions, Mercury residues, mtEGFP

A_031_OF: STUDIES ON MICROBIAL BIOMASS CARBON AND NITROGEN TURNOVER DERIVED FROM SUGARCANE RESIDUES INCORPORATED INTO A SANDY LOAM SOIL

Walaiphan Chuwongpanich[1], Natthapol Chittamart[1,*], Saowanuch Tawornpruek[1], Surachet Aramrak[1], Kazumichi Fujii[2]

[1]Department of Soil Science, Faculty of Agriculture, Kasetsart University, Bangkok, 10900, Thailand

[2]Forestry and Forest Products Research Institute, Tsukuba 305-8687, Japan

*email: fagrnpc@ku.ac.th

Abstract: Organic amendments have been widely used to increase organic matter in sandy soil, consequently improving its fertility and productivity. However, identifying the most effective organic amendment needs to be studied. Here, three organic amendments including sugarcane leaf residues sugar and K-humate were incubated in Korat soil series and followed by evaluating changes in microbial biomass carbon and nitrogen and the nitrogen mineralization turnover into the soil after applying those organic amendments.

The results revealed that at the end of incubation, the contents of microbial biomass carbon (MBC) were observed in the significantly respective order of leaf residue amended soil (52.52 mg kg^{-1} soil), K-humate amended soil (39.98 mg kg^{-1} soil) and sugar amended soil (29.48 mg kg^{-1} soil). Meanwhile, the contents of microbial biomass nitrogen (MBN) increased in all treatments over the control during incubation. The soil amended with K-humate had the lowest C:N ratio and released the highest mineral N content of 35 mg kg^{-1} soil at the end of incubation periods. Our findings imply that sugarcane leaf and completely decomposed organic materials such as K-humate can provide carbon and nitrogen source turnover into the coarse and medium-textured soils.

Keywords: Microbial biomass Carbon, Microbial biomass Nitrogen, Nitrogen Mineralization, Korat soil series

A_032_PA: EFFECT OF HAIRY BASIL STRAW SUBSTRATE ON GROWTH AND YIELD OF GREY OYSTER MUSHROOM

Thanaporn Wichai[1], Sarintip Sooksai[1], Ruengwit Sawangkeaw[1], Sajee Noitang[1], Weradaj Sukaead[1], Jittra Piapukiew[2], Aphichart Karnchanatat[1,*]

[1]The Institute of Biotechnology and Genetic Engineering, Chulalongkorn University, Bangkok, THAILAND

[2]Department of Botany, Faculty of Science, Chulalongkorn University, Bangkok, THAILAND

*e-mail: aphichart.k@chula.ac.th

Abstract: Hairy basil *(Ocimum citriodorum* Vis.) is an important industrial crop in Sukhothai, Thailand. Over 5,800 rai or 90% of hairy basil seed is located in Sukhuthai province. After yearly harvesting seeds, the plenty of remaining of dried stem and inflorescence, called straw are disposed as agricultural waste approximately 200-300 kg/rai. This research aims to add values and beneficially manage of hairy basil straw by alternating the rubber wood sawdust in grey oyster mushroom (*Pleurotus sajor-caju (Fr.)* Sing.) cultivation. The ratio of rubber wood sawdust to hairy basil straw was varied as follow 100:0, 80:20, 50:50, 20:80 and 0:100. The maximum mycelium growth rate, as 1.38 mm/day with total length of 22.17 mm in 16 days, in the100:0 culture (100% of sawdust). However, the 80:20 and 50:50 cultures exhibited similar mycelium growth rates of 1.29 and 1.30 mm/day, respectively. In the first round of mushroom harvesting, the weight of mushroom from the culture with the ratio of rubber saw dust per hairy basil straw as 100:0, 80:20, 50:50, 20:80 and 0:100 was measured as 69.0, 59.1, 56.9, 37.7 and 39.1 g, respectively. It could be concluded that the hairy basil straw could replace rubber wood sawdust up to 50 % in grey oyster mushroom cultivation with slightly decreasing mycelium growth rates and productivity in the first harvesting round. Furthermore, the endosmosis of bioactive compounds such as caryophyllene oxide, geranial and linoleic acid in basil straw to the cultivated mushroom could be expected.

Keywords: *Pleurotus sajor-caju (Fr.)* Sing., grey oyster mushroom, Ocimum Straw Trunk

A_033_PA: THE *Indica-japonica* CLASSIFICATION OF UPLAND RICE VARIETIES

Kanjanakorn Muangsong, Rattanasiri Deeklom, Phijitra Umalee, Somrudee Nilthong
School of Science, Mah Fah Luang University, Thasud, Chiang Rai 57100, Thailand
*e-mail: somrudee@mfu.ac.th

Abstract: Upland rice, or *Oryza sativa* L., is the major food sources for Asian people, and this rice has been widely grown for a long time in Thailand. Twenty-nine upland rice varieties obtained from farmers in Chiang Rai province were classified by using phenol reaction test and genotypic screening by *Pgi1*, *Cat1* and ORF100 markers. The results indicated that most of the upland rice varieties (89.66%) were *japonica* cultivars, and the other two varieties were *indica* cultivars. One of the upland rice varieties (Khao Lai) was the only one showing heterozygous genotype. These results indicated that the use of phenol reaction test and marker analysis for morphological and genotypic screening, respectively, are effective for *indica-japonica* classification of upland rice varieties in Chiang Rai province.

Keywords: Upland rice, *Pgi1*, *Cat1*, ORF100, *Indica-japonica* classification

A_034_PA: CHARACTERIZATION OF GASTRIC SURVIVAL TEST OF *Lactobacillus kunkeei* FROM EUROPEAN FARM BEE IN THAILAND

Theerakarn Srisangsung[1,*], Autchima Buatavee[1,*], Thitikan Jitpromkam[1,*], Assatorn Sukrachart[1], Nattakarn Kumchonmaynukoul[1], Nantinee Moontan[1], Kitiphong Khongphinitbunjong[1,2],
Eleni Gentekaki[1,2], Siam popluechai[1,2,**]

[1]School of Science, Mae Fah Luang University, Chiang Rai 57100, Thailand
[2]Gut microbiome research group, Mae Fah Luang University, Chiang Rai 57100, Thailand
*Authors contribute equally
**e-mail: siam@mfu.ac.th

Abstract: European honey bee (A. mellifera) is an insect pollinator of huge economic importance. It can help to improve the quantity and quality of crop production by pollination. At present, the death of European bees was increases caused by chemical, environmental or biological such as stress caused by imbalance microbe in bee's gut. Probiotic are beneficial to bee health, and potential their use to modulate the gut microbiota balance. Aims of this study were isolated probiotic bacteria form European farm bee in Thailand and test gastric survival by determination of resistance pH (pH 1 – pH 3), pepsin resistance (pH 1 – pH 3) and pancreatin resistance (pH 8) of those probiotics. DNA sequencing and BLAST search against the NCBI database were used to confirm four isolated bacteria (CSI-5, CSI-6, CSI-7, and CSI-8). They are *Lactobacillus kunkeei*. The results of pH resistance found all isolates can resistance at low pH. CSI-6, CSI-7, and CSI-8 were present high tolerance at pH 1. Of these, CSI-7 was present highly significant resistance ability at every pH. Pepsin resistance results shown all isolates have the ability to resistant to pepsin which the strongest tolerance at pH 1. For pancreatin resistant indicated that all isolates had resistant ability to pancreatin. Furthermore, CSI-5 exhibited the tolerance highest resistant than other isolates significantly. The present study concludes that the four isolates can survival under gastric condition, especially CSI-7. Future studies should be performed on the Bile salt-resistance and glycolic acid resistance test for using these four isolates as probiotic supplements.

A_035_PA: EFFECTS OF RIBOSOMAL PROTEIN S3a (RPS3a) ON WSSV INFECTED WHITE SHRIMP (*Litopenaeus vannamei*)

Panchalika Deachamag[1,*], Artorn Iatsui[1], Wilaiwan Chotigeat[1]
Department of Molecular Biotechnology and Bioinformatics, Faculty of Science,
Prince of Songkla University
*e-mail: deachamag@hotmail.com

Abstract: Ribosome protein S3a (RPS3a) gene expression was reported in white shrimp. In this study, we produced and purified a recombinant protein His-RPS3a from shrimp. The obtained recombinant protein S3a was 33 kDa. The purified His-RPS3a was injected in quantities of 1, 10 and 20 µg/shrimp and the expression of prophenoloxidase(proPO) and phagocytosis activating protein (PAP) gene was investigated by using real-time PCR. The result showed that the PAP gene expression increased 4.1 folds when the His-RPS3a protein was injected at 1 µg/shrimp while the proPO gene expression increased 5.3 folds when the His-RPS3a at 20 µg/shrimp was injected into shrimp. Also, protection of S3a in WSSV infection in shrimp was evaluated. Therefore, the shrimp were injected by 10, 20, and 40 µg/shrimp of the His-RPS3a and then challenged with WSSV. And the survival rate of the infected shrimp was observed for 15 days. The relative percentage survival (RPS) of the WSSV challenged shrimp after injected with the His-RPS3a for 3 days, were 23%, 27%, and 35%, respectively. In addition, the RPS3a-phMGFP was prepared in the form of chitosan-DNA nanoparticles. The shrimp was fed RPS3a-phMGFP DNA at 25, 50 and 75 mg / shrimp / day for 7 days. The PAP gene expression in the fed group at 75 mg/shrimp/ day was higher than the control group. So the shrimp after fed with the RPS3a-phMGFP DNA at 75 mg/shrimp/ day of RPS3a-phMGFP for 7 days, were challenged with WSSV and cultured for 15 days. The result showed that the relative percentage survival (RPS) of the WSSV challenged shrimp after feeding by RPS3a-phMGFP for 7 days, were 35% while the control group died 100% within 15 days. These results showed that the RPS3a could delay the death of the WSSV infected shrimp. Therefore, the possible function of the RPS3a could enhance the immune system and slow down the mortality of WSSV infected shrimp.

A_036_PA: CHARACTERIZATION OF SOME PROBIOTIC PROPERTIES OF *Lactobacillus kunkeei* FROM EUROPEAN BEE FARM IN THAILAND

Patcharida Buaklee[1,*], Nutchaya Unkaew[1,*], Tasanee Kham-oun[1,*], Nantinee Moontun[1], Nattaya Manpadung[1], Eleni Gentekaki[1,2], Kitiphong Khongphinitbunjong[1], Siam Popluechai[1,2,*]

[1]School of Science, Mae Fah Luang University, Chiang Rai 57100, Thailand

[2]Gut microbiomes research group, Mae Fah Luang University, Chiang Rai 57100, Thailand

*Authors contribute equally

**e-mail: siam@mfu.ac.th

Abstract: The European honeybees (*Apis mellifera*) play an important role when it comes to maintaining the economic and ecologic system. Through their pollination the honeybees utilize their pollen to bring about crop production and growth. Recently, there has been a large number of honeybee deaths. The imbalance of intestinal bacteria was maintained as one of the causes. However, probiotic was found beneficial for the health of the honeybees and can prevent pathogenic microbes. Before producing a probiotic supplement, there has important to verify bacterial isolates are not antibiotic-resistant bacterial pathogens. This study aims to isolate and characterized some probiotic properties of *Lactobacillus kunkeei* from European farm bees in Thailand. Four isolates of *L. kunkeei* (CSI5, CSI6, CSI7, and CSI8) in this study was confirmed by DNA sequencing and BLAST against the NCBI database. The effect of six Antibiotic susceptibilities (Amoxicillin, Ampicillin, Vancomycin, Streptomycin, Chloramphenicol and, Kanamycin), antimicrobial agents (*Bacillus subtilis, Staphylococcus aureus, Pseudomonas aeruginosa*, and *Micrococcus luteus*), and hemolytic testings were examined in this study. Antibiotics susceptibility was shown the inhibitory diameter of CSI5, CSI6, and CSI7 resistant to vancomycin, while CSI8 resistant to streptomycin. The results of antimicrobial testing with four pathogenic bacteria were indicated that the four *L. kunkeei* were not against the pathogens. Furthermore, the hemolytic test presented four isolated *L. kunkeei* that exhibited γ-hemolytic activities. Our results have shown four isolates of the *L. kunkeei* that have the ability for producing probiotic supplements. However, requires further research for these four isolates such as antibiotic susceptibility (in group of Inhibitors of protein synthesis and inhibitors of nucleic acid synthesis) and antibacterial activity of honeybee pathogen for confirmability of probiotic production.

A_037_OA: THE UTILIZATION OF PHOSPHATE CONTAINING WASTEWATER FROM SHRIMP PROCESSING FACTORY FOR REARING MARINE MICROALGAES, *Tetraselmis*, AND *Chaetoceros* sp.

Hafeezee Chema[1], Chonlatee Cheewasedtham[2,*]

[1]Division of Fishery Technology, Department of Technology and Industry, Faculty of Science and Technology, Prince of Songkla University, Pattani, Thailand 94000

[2]Ecological Aquaculture Research Unit, Division of Fishery Technology, Department of Technology and Industry, Faculty of Science and Technology, Prince of Songkla University, Pattani, Thailand 94000

*e-mail: chonlatee.c@psu.ac.th

Abstract: The utilization of phosphate containing wastewater (PCW) from shrimp processing as a rearing medium of microalgae was investigated in order to study the possibility in plankton aquaculture application. Two species of microalgae, *Tetraselmis* and *Chaetoceros,* were chosen in the experiment which reared in triplicated of 10-L glass container with 5 different concentrations of phosphate solution ranging from 26.0 ± 0.39, 20.1 ± 0.16, 14.2 ± 0.20, 8.3 ± 0.39 and 2.3 ± 0.18 mg/L, respectively. Growth performance and cell density (cell/ mL) of microalgae were compared to those that grown from standard algal Conway's medium. Each batch of experiment was conducted for seven days and results showed that both *Tetraselmis* and *Chaetoceros* can be grown in all concentrations of diluted PCW solutions. The highest cell density of *Tetraselmis* was found at stationary phase within 3 days, while that of *Chaetoceros* was found at only 2 days. The highest growth of *Tetraselmis* was found in phosphate solution at 2.3±0.18 × 10^5 mg/L and the highest cell density of 20.34±2.02×10^5 cell/mL was obtained. In the rearing of *Chaetoceros*, the highest cell density of 27.33±1.43×10^5 cell/mL was found in 14.2 ± 0.20 mg/L of phosphate solution. The cell density of *Tetraselmis* and *Chaetoceros* obtained from that of Conway's medium, 11.21±1.74 × 10^5 and 25.00±1.31 × 10^5 cell/mL, showed significantly lower cell density than those which reared in PCW from shrimp processing ($p<0.05$). In addition, the ratio of nitrogen to phosphorus content in these microalgae rearing was investigated. The results from this study can be the preliminary evidence to prove that phosphate containing wastewater from cooked shrimp processing factory can be used as an alternative micro-algal growing media for further utilization in aquaculture.

A_039_PA; *IN VITRO* EFFICACY OF TPI SYNBIOTICS AGAINST LIVESTOCK AND AQUATIC ANIMALS BACTERIAL PATHOGENS

Channarong Rodkhum[1,*], Wannisa Kudeesuk[2], Prateep Leopairut[2], Prachai Leophairatana[2]
[1]Department of Veterinary Microbiology, Faculty of Veterinary Science, Chulalongkorn University, Bangkok, Thailand
[2]TPI Bio Pharmaceutical company Limited, TPI tower, Sathorn, Bangkok, Thailand
*e-mail: Channarong.r@chula.ac.th

Abstract: TPI synbiotic is an organic product containing beneficial microorganisms and prebiotics. It made from selected vegetables and fruit through a fermentation process by adopting special technology. TPI synbiotic contains numerous specific bacteria such as *Bacillus spp.*, *Paenibacillus spp.*, and *Lactobacillus spp.* which were suspended in a liquid medium. The objective of this study is to evaluate *in vitro* efficacy of TPI synbiotics inhibit 10 pathogenic bacteria of livestock and aquatic animals including *Streptococcus agalactiae*, *Aeromonas hydrophila*, *Escherichia coli*, *Salmonella* Enteritidis, *Shigella sonei*, *Bordetella bronchiceptica*, *Pasturella multocida*, *Enterococcus faecium*, *AHPND-Vibrio parahaemolyticus*, and *Vibrio cholerae*. The efficacy test was performed by agar well diffusion method. The results showed that TPI synbiotic product can inhibit all ten bacterial pathogens with different in inhibition clear zone ranging from 10-55 mm. (Table 1). TPI synbiotic showed inhibitory effect to *Aeromonas hydrophila*, *Salmonella* Enteritidis, *Bordetella bronchiceptica, Enterococcus faecium*, AHPND-*Vibrio parahaemolyticus,* and *Vibrio cholerae*, while Ampicillin antibiotic showed less inhibitory zone against some bacteria (Table 1). The results indicated that TPI synbiotic is a promising choice for using in combating the above livestock and aquatic animals bacterial pathogens.

Table 1. Inhibitory effect of TPI synbiotics and Ampicillin against 10 pathogenic bacterial pathogens.

No.	Bacterial species	Inhibition zone (mm.)	
		TPI synbiotics	Ampicillin
1.	*Streptococcus agalactiae*	10	37 (S)
2.	*Aeromonas hydrophilla*	11	0 (R)
3.	*Escherichia coli*	12	20 (S)
4.	*Salmonella* Enteritidis	14	0 (R)
5.	*Shigella sonei*	12	18 (S)
6.	*Bordetella bronchiceptica*	18	0 (R)
7.	*Pasturella multocida*	11	26 (S)
8.	*Enterococcus faecium*	16	0 (R)
9.	AHPND-*Vibrio parahaemolyticus*	12	0 (R)
10	*Vibrio cholerae*	55	0 (R)

Abbreviation: S ; Sensitive, R ; Resistant

SESSION B1:
BIOCHEMISTRY

B1_001_OA: USES OF PLASMID DNA AND OLIGONUCLEOTIDES AS BIOPOLYMERS TO ASSIST THE FORMATION OF DIFFERENT SHAPED SILVER NANOPARTICLES

Sineenat Siri*
School of Biology, Institute of Science, Suranaree University of Technology, Nakhon Ratchasima 30000, Thailand
*e-mail: ssinee@sut.ac.th

Abstract: Various synthetic and natural polymers are used to facilitate a formation of silver nanoparticles (AgNPs), but very few are reported on the use of DNA, especially to control their shape formation. Thus, this work aimed to study the simple eco-friendly syntheses of different shaped AgNPs via the use of DNA (plasmid DNA and oligonucleotides) and light emitting diodes (LEDs) irradiation. The formation of yellow, orange and green colloidal AgNPs was obtained via the adjustment of a ratio of plasmid DNA and $AgNO_3$, and light wavelength, which the transmission electron microscope (TEM) images revealed their shapes of spherical, hexagonal, and corner-truncated triangle AgNPs, respectively. Under the 460-nm irradiation, the 1:1000 mole ratio of DNA and $AgNO_3$ yielded only spherical AgNPs. When the mole ratio was changed to 2:1000 and 4:1000, the formation of hexagonal and corner-truncated triangle AgNPs was detected. Similar to the use of 8-kb plasmid DNA, the use of oligonucleotides (30 mers) could assist the formation of different shaped AgNPs, but in the much lesser amount. The crystalline nature of the synthesized particles was identified as the face-centered cubic silver as determined by the analyses of X-ray diffraction, selected area electron diffraction, and high-resolution TEM. The synthesized AgNPs exhibited the antioxidant activity as well as the antibacterial activity against both Gram-negative *Escherichia coli* and Gram-positive *Staphylococcus aureus*. Although the antioxidant activities of all three forms of AgNPs were similar, the spherical AgNPs exhibited the greatest antibacterial activity. The results of this work indicated that DNA could be used as a capping agent, coupled with the photo-activation, to control the synthesis of different shaped AgNPs.

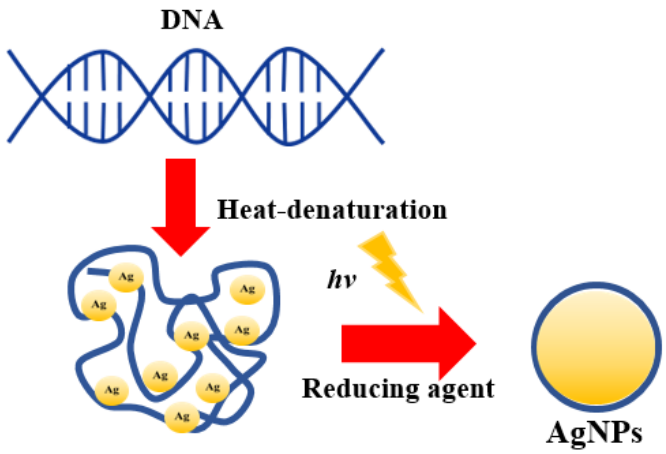


Figure 1. Schematic diagram of DNA as biopolymer to assist the formation of AgNPs.

B1_002_PA: ANTIOXIDANT EFFECT OF *Caesalpinia sappan* HEARTWOOD EXTRACT ON HYDROGEN PEROXIDE-INDUCED OXIDATIVE STRESS IN HUMAN LUNG FIBROBLASTS (MRC-5 CELLS)

Aylada Kaenu[1,*], Supranee Kongkham[2]
[1]Biochemistry and Molecular Biology Program, Faculty of Medicine, Thammasat University, Pathumthani, Thailand
[2]Division of Biochemistry, Department of Preclinical Sciences, Faculty of Medicine, Thammasat University, Pathumthani, Thailand
*e-mail: aylada79@gmail.com

Abstract: *Caesalpinia sappan* (CS) *L.* heartwood has been widely used in Southeast Asia as a traditional ingredient of food and beverages. It has been reported that brazilin is the major active compound in the herb, which is responsible of medical properties, including anti-inflammatory, and antioxidant activities. This study was conducted to investigate antioxidant activity of 75% CS extract using chemical and cell-based assays. Total phenolic content and free radical scavenging activities on DPPH and $ABTS^{+}$ were determined. In cell-based assay using MRC-5 human lung fibroblast cells treated with H_2O_2 for oxidative stress induction, intracellular reactive oxygen species (ROS) level was also investigate using 2', 7'-dichlorodihydrofluorescein-diacetate (DCFH-DA). The result showed that the total phenolic content of the extract was 741.84±3.25 mg GAE/g and the extract had a significant antioxidant potential an IC50 value of 2.24±0.25 µg/mL and 2.38±0.32 µg/mL for DPPH and $ABTS^{\cdot+}$ radical scavenging assay, respectively, which were comparable to the activity of BHT (13.88±2.34 µg/mL and 2.92±0.44µg/mL). Using MTT assay, cytoxicity of CS extract was performed on MRC-5 cells with values of 39.97±1.58 µg/mL. The CS extract inhibitied ROS generation in MRC-5 cells at concentrations of 1.25, 2.5, and 5 µg/mL with the percent inhibition of 38.2, 37.6, and 42.7, respectively. These results suggest that 75% ethanol *C. sappan* extracted has potential antioxidant activity in both chemical and in vitro cell-based assays. Further works are required to identify the phytochemical composition and the possible mechanism of action.

Keywords: Antioxidant activity, *Caesalpinia sappan L.*, human lung fibroblast, Hydrogen peroxide

B1_003_OA: c-MYC DIRECTLY TARGETS AN OVEREXPRESSION OF PYRUVATE CARBOXYLASE IN HIGHLY INVASIVE BREAST CANCER

Udom Lao-On[1], Pinnara Rojvirat[2], Pakkanan Chansonkrow[1], Varodom Chaoroensawan[1,3], Sarawut Jitrapakdee[1,*]

[1]Department of Biochemistry, Faculty of Science, Mahidol University, Bangkok, Thailand

[2]Division of Interdisciplinary, Mahidol University, Kanjanaburi, Thailand

[3]Integrative Computational BioScience (ICBS) Center, Mahidol University, Thailand

*e-mail: sarawut.jit@mahidol.ac.th

Abstract: Here we showed that the c-Myc oncogene is responsible for overexpression of pyruvate carboxylase (PC) in highly invasive MDA-MB-231 cells. Pharmacological inhibition of c-Myc activity with 10074-G5 compound, resulted in a marked reduction of PC mRNA and protein, concomitant with reduced cell growth in a dose-dependent manner. This growth inhibition can be partly restored by overexpression of PC, indicating that PC is a c-Myc-regulated pro-proliferating enzyme. Analysis of chromatin immunoprecipitation sequencing of c-Myc bound promoters revealed that c-Myc binds to two canonical c-Myc binding sites, located at nucleotides -417 to -407 and -301 to -291 in the distal promoter (P2) of the human PC gene. Mutation of either c-Myc binding site in the P2 promoter-luciferase construct resulted in 50-60% decrease in luciferase activity while double mutation of c-Myc binding sites further decreased the luciferase activity in MDA-MB-231 cells. Overexpression of c-Myc in HEK293T cells which have no endogenous c-Myc resulted in 250-fold increase in luciferase activity. Mutation of either E-boxes lowered luciferase activity by 50% and 25% respectively while double mutation of both sites abolished the c-Myc transactivation response. An electrophoretic mobility shift assay using nuclear protein from MDA-MB-231 confirmed binding of c-Myc to both c-Myc binding sites in the P2 promoter. Co-expression analysis of publicly available transcriptomes from the cancer genome atlas dataset revealed a strong association between expression of c-Myc and PC in primary breast, lung and colon cancer tissues, suggesting that overexpression of PC is at least in part regulated by deregulation of c-Myc in these cancers.

B1_004_OF: B1_004_OF: ANTIOXIDANT AND CYTOPROTECTIVE EFFECT OF *Arthrospira platensis* PROTEIN HYDROLYSATE

Nattaya Wongyai, Damratsamon Surangkul, Sarawut Sattayakawee, Chayaphon Sripannam, Krit Tantanarat, Amnat Phetrungnapha*
Department of Biochemistry, Faculty of Medical Science, Naresuan University, Phitsanulok 65000, Thailand.
*e-mail: amnatp@nu.ac.th

Abstract: Muscle aging is a complex process that is usually associated with a decrease in muscle mass, strength, and velocity of contraction. One of the most striking effects of muscle aging is known as sarcopenia, a condition characterized by loss of skeletal muscle mass and function. Accumulation of the reactive oxygen species (ROS) is one of the important factors leading to decrease of muscle mass. Therefore, reduction and prevention of ROS is crucial for protection of muscle mass loss. This research aims to study the antioxidant effect of protein hydrolysate produced from blue-green algae, *Arthrospira platensis*. Total protein of *A. platensis* was extracted and hydrolyzed with alcalase. The antioxidant activity of *A. platensis* protein hydrolysate (APH) was determined by using ABTS radical scavenging assay. The result showed that APH exhibited 90.10 ± 0.53% scavenging activity at the concentration of 100 µg/ml. Further study in L6 rat skeletal muscle cells indicated that APH could protect and recover the cells from H_2O_2-induced oxidative damage. However, gene expression analysis demonstrated that APH could not stimulate the expression of antioxidant genes such as SOD1, Gpx1, and CAT. The results obtained from this study will be useful for developing APH as a dietary supplement.

Keyword: Sarcopenia, antioxidant, protein hydrolysate, *A. platensis*

B1_005_PA: ANTIMICROBIAL ACTVITIES OF CARCININ*Pm* FROM BLACK TIGER SHRIMP

Suchao Donpudsa[1,*], Orawan Piaprad[1]

[1]Department of Chemistry, Faculty of Science, Srinakharinwirot University, Bangkok 10110, Thailand

*e-mail: suchao@g.swu.ac.th

Abstract: Crustins are antimicrobial peptides that are found in shrimp immune system. Their function is to defense the shrimp against the microbial infection. Little is known regarding the functions of type-I crustin (carcinin*Pm*) from the black tiger shrimp (*Penaeus monodon*); therefore, it was focused herein. The recombinant protein, carcinin*Pm* (rcarcinin*Pm*), were produced in *Escherichia coli* system in order to determine antimicrobial activities using agar diffusion assay. From the nucleotide and amino acid sequences, the carcininPm gene contains an open reading frame of 336 bps encoding 111 amino acid residues. The rcarcinin*Pm* exhibited antimicrobial activities against *Vibrio harveyi* 639 and *Vibrio parahaemolyticus* (AHPND). The carcinin*Pm* may involve in shrimp immune system against the bacteria. In future work, we plan to study the application of carcinin*Pm* against the pathogenic bacteria in shrimp.

B1_006_PA: STUDY OF COPPER BINDING TO LYTIC POLYSACCHARIDE MONOOXYGENASE FROM *Vibro harveyi*

Yong Zhou[1], Methinee Prongjit[2], Jeerus Sucharitakul[2], Wipa Suginta[1,*]
[1]School of Biomolecular Science and Engineering (BSE), Vidyasirimedhi Institute of Science and Technology (VISTEC), 21210 Rayong, Thailand
[2]Department of Biochemistry, Faculty of Dentistry, Chulalongkorn University, 10330 Bangkok, Thailand.
*e-mail: wipa.s@vistec.ac.th

Abstract: The enzymatic degradation of polysaccharides is a major goal of the biotechnology industry, most notably for both first (starch) and second (cellulose/chitin) generation biofuels. Lytic polysaccharide monooxygenases (LPMOs) are copper-dependent enzymes that contribute to enzymatic conversion of recalcitrant polysaccharides such as cellulose and chitin and they may also play a role in bacterial infections. In this research, we studied the binding property with various concentrations of copper to the LPMO from the marine bacterium *Vibrio harveyi* which was named *Vh*LPMO by using Isothermal Titration Calorimetry (ITC). The experiments were carried out at pH 7.0 (20 mM Tris-HCl Buffer) with *Vh*LPMO at the concentration of 40 µM and the concentration of $CuCl_2$ or $CuSO_4$ from 400 µM to 2 mM. The results indicated that the stoichiometry or molar ratio of copper ion to protein due to the experimental ITC data contained n values which never equated to 1 (expected value if one copper atom binds to one protein molecule). The more sigmoidal curve at the lowest Cu^{2+} concentration calculated the lowest binding constant of 400 µM with a stoichiometry, n, of 0.70. In addition, the use of the smaller sample size may have been partially successful in limiting the amount of copper from the machine that the protein came into contact with.

B1_007_PF: *Aquilaria crassna* LEAVE CRUDE EXTRACT ENHANCES GLUCOSE CONSUMPTION AND DECREASES GLUCONEOGENESIS IN HEPG2 CELLS

The anti-diabetic effects of *Aquilaria crassna* leaves crude extract on HepG2 Cells

Phanupol Mongkolsiri[1], Sarawut Jitrapakdee[1], Netiya Karaket[2], Pinnara Rojvirat[2,*]

[1]Department of Biochemistry, Faculty of Science, Mahidol University, Thailand

[2]Division of Interdisciplinary, Mahidol University (Kanchanaburi campus), Thailand

*e-mail: pinnara.roj@mahidol.ac.th

Abstract: Type 2 diabetes mellitus (T2DM) is a chronic metabolic disease characterized by elevated plasma glucose which can further cause cardiovascular complications. *Aquilaria crassna* L. is the medicinal plant that has been reported to show several medicinal properties including an anti-diabetic effect in an animal model. The current study aims to determine the mechanism by which *A. crassna* leaves extract (ALE) lowers glucose level. To verify the objective, HepG2 cell line was used as a model to examine the effects of the ALE on glucose metabolism. Our study demonstrates that the ethanolic extract of *A. crassna* leaves at the concentration up to 25 µg/mL did not produce the cytotoxic effect in HepG2 cells. Treatment of HepG2 cells at concentrations of 6.25, 12.5 and 25 µg/mL increased glucose consumption by approximately, 14%, 44%, and 82%, respectively. Furthermore, treatment of HepG2 cells with ALE at a concentration of 25 µg/mL suppressed the expression of a key gluconeogenic gene, glucose-6-phosphatase gene by 56%, indicating its action to reduce endogenous glucose production. The finding suggests that ALE possesses an anti-diabetic activity *in vitro* at least in part by increasing glucose consumption and reducing gluconeogenesis.

SESSION B2:
MICROBIOLOGY

B2_001_OA: DEVELOPMENT OF SHOE DEODORIZER SPRAYS: ADDING VALUE TO TAPIOCA STARCH VIA ECO-FRIENDLY SYNTHESIS OF SILVER NANOPARTICLES

Chotikan Tungklan, Sineenat Siri*
School of Biology, Institute of Science, Suranaree University of Technology, Nakhon Ratchasima 30000, Thailand
*e-mail: ssinee@sut.ac.th

Abstract: The eco-friendly production of silver nanoparticles (AgNPs) has gained much interest and their demand in industries is continuously high according to low production cost and less toxic to the environment. In Thailand, the tapioca starch extracted from cassava roots has been largely produced but has a relatively low price. Therefore, this research aims to study the rapid green production of AgNPs using tapioca starch coupled with microwave irradiation and investigate their antibacterial property as a shoe deodorizer spray. The optimal condition to produce AgNPs was 1% w/v tapioca starch, 250 mM $AgNO_3$, pH 11, 60 Watt microwave, and 60 s reaction time. The formation of AgNPs was determined by the characteristic surface plasmon resonance peak at 472 nm. The synthesized AgNPs were spherical with an average size of approximately 31 nm as determined by a transmission electron microscope. Their identity was also confirmed by selected area electron diffraction and X-ray diffraction analyses. The synthesized AgNPs exhibited the antibacterial activity against both Gram-negative *Escherichia coli* and Gram-positive *Staphylococcus aureus* as determined by the minimum inhibitory concentration (MIC), minimum bactericidal concentration (MBC), and bacterial inhibition zone. The MICs against both bacteria were equal at 15.625 µg/ml, while the MBCs against *E. coli* and *S. aureus* were 31.25 and 62.5 µg/ml, respectively. The synthesized AgNPs were applied as a shoe deodorizer spray, which its antibacterial activity was evaluated against the bacteria isolated from shoes. The produced spray exhibited the antibacterial activity against the isolated bacteria as determined by the bacterial inhibition zone (11.1 $\pm$ 0.2 mm). The results of this work suggested that the tapioca starch could be used for the rapid green synthesis of antibacterial AgNPs that have the great potential for an application as a shoe deodorizer spray.

B2_002_PA: CHARACTERISATION OF BACTERIOPHAGE TN3 ISOLATED FROM THUA NAO, A THAI FERMENTED SOYBEAN

Ratarat Kaewnak, Ekachai Chukeatirote*
School of Science, Mae Fah Luang University, Chiang Rai 57100, Thailand
*e-mail: ekachai@mfu.ac.th

Abstract: Currently, phage science has captured an interest of the scientist again. This is because i) bacteriophages are widely distributed in nature, and thus their diversity is largely unexplored; and ii) their potential use is diverse ranging from basic study to various applications. Here, we report the bacteriophage TN3, isolated from Thua Nao, a Thai fermented soybean. In this study, the phage TN3 was isolated, purified, and characterised. For host specificity test, 18 bacterial strains (13 *Bacillus* species and 5 non-*Bacillus* species) were used. It was found that the host range of this phage was limited to only the two strains of *B. subtilis* (strains ASA and TN3). The phage stability was then determined by pH, temperature, UV, and chloroform. Our data showed that the phage TN3 was stable between 30 and 40 °C, and in a pH range of 6 – 8. However, the UV exposure for 1 and 3 h caused a reduction of the phage titer (ca. 6 and 10%, respectively). In addition, the phage TN3 was sensitive to chloroform treatment.

B2_003_PF: ISOLATION AND PHYSIOLOGICAL CHARACTERIZATION OF BENEFICIAL ANAEROBIC MICROBIOTA IN COMMERCIAL CHICKEN GUTS

Benya Nontaleerak[1], Janista Thumrongtharadol[1,2], Khwannarin Khemsom[2], Saifon Nopnipa[2], Watanalai Panbangred[1,3], Adisak Romsang[1,2,*]

[1]Department of Biotechnology, Faculty of Science, Mahidol University, Bangkok 10400, Thailand

[2]Center for Emerging Bacterial Infections, Faculty of Science, Mahidol University, Bangkok 10400, Thailand

[3]Mahidol University and Osaka University: Collaborative Research Center for Bioscience and Biotechnology, Faculty of Science, Mahidol University, Bangkok 10400, Thailand

*e-mail: adisak.rom@mahidol.ac.th

Abstract: Globally, sustainable poultry production drives secure and quality of nutritional protein sources in human. Chicken's gastrointestinal tract contains a complex microbiota that functions in an increase in nutrients' digestion and absorption, enhancement on immune system and prohibition against pathogens. In this study, particular group of microorganisms was isolated from commercial chicken guts using selective media. Twelve morphologically different colonies were successfully grown on de Man, Rogosa & Sharpe Agar (MRS) at 41°C under an anaerobic condition. Supplementation of calcium carbonate exhibited a clear zone surround these strains inferring their acid producer property. The results from well diffusion assay showed that a 72-hour culture secretion from these isolated strains could inhibit the growth of both *Bacillus subtilis* and *Escherichia coli*. Treating the tested culture secretions with sodium hydroxide (NaOH) for adjusting the pH to 6.0 resulted in a decreased inhibitory effect against the tested bacteria. However, the NaOH-treated secretion from the isolated strains EBI-01 and EBI-03 conferred the growth inhibition against *B. subtilis*. Finally, the *16S rRNA* sequencing was done in these two strains and they were belonged in the *Lactobacillus* genus, which could be further analyzed in term of their phylogenic tract and probiotics properties. A better understanding of commercial chicken guts' microbiota will provide us novel chances for sustainably improving poultry health and production.

B2_004_OA: PHYLOGENY OF *Bacillus* STRAINS OBTAINED FROM ASIAN FERMENTED SOYBEAN FOOD PRODUCTS

Kanjana Soodpakdee, Rachapirom Tueyassa, Sakonsupa Duangrasee, Ekachai Chukeatirote*
School of Science, Mae Fah Luang University, Chiang Rai 57100, Thailand
*e-mail: ekachai@mfu.ac.th

Abstract: Various kinds of fermented soybean food products are manufactured and consumed in many Asian countries. These include Japanese Natto, Indian Kinema, Korean Chungkookjang, and Thai Thua Nao. To date, it has been suggested that the *Bacillus* bacteria are predominant, and thus are responsible for the fermentation process of these products. This study was therefore conducted to determine the bacterial diversity and phylogeny of *Bacillus* species isolated from these products. Initially, we obtained the bacterial data from the GenBank database using the following terms: *Bacillus*, fermented soybean, Natto, Kinema, Chungkookjang, and Thua Nao. Detailed information regarding the bacterial identity, strain code, and accession numbers of the 16S rRNA genes was then retrieved, and used in this study. In total, 140 *Bacillus* strains were obtained from the database search. To elucidate their phylogeny, their 16S rRNA genes were then aligned and used to construct the dendrogram using the PhyML software. Based on the analysis, these *Bacillus* bacteria were categorized into three major clades: i) *B. subtilis* (95 isolates); ii) *B. amyloliquefaciens* (31 isolates); and iii) *B. cereus* (14 isolates). It is concluded from the comparative sequence analysis that the use of the 16S rRNA gene sequence can provide a means for the rapid and accurate classification and identification of the *Bacillus* strains in these products.

B2_005_OA: PREVALENCE OF PHAGES INFECTING *Bacillus cereus* IN THUA NAO

Ratarat Kaewnak, Wallapat Phongtang, Ekachai Chukeatirote*
School of Science, Mae Fah Luang University, Chiang Rai 57100, Thailand
*e-mail: ekachai@mfu.ac.th

Abstract: *Bacillus cereus*, one of the most important foodborne pathogenic bacteria, is commonly found in the environment. *B. cereus* is associated mainly with foodborne illnesses, causing diarrhea and vomiting. In this study, the prevalence of bacteriophages infecting *Bacillus cereus* in Thua Nao, a Thai fermented soybean was investigated. Five *B. cereus* strains (three type strains and two strains from fermented food products) were used to enrich the phage cultures of 26 Thua Nao samples. After propagation, the filtrates were prepared from these Thua Nao samples by using a 0.2-micron filter membrane. Of these, three different phages were isolated, based on plaque morphology, and purified. According to the host range test, these three phages exhibited different abilities in lysing *B. cereus* strains, and were not able to lyse other tested Gram-positive (including *B. subtilis*) and Gram-negative bacteria (*Enterobacter aerogenes* and *Escherichia coli*). Besides, addition of salt was not required for plaque formation. Existence of these *B. cereus* phages may offer an additional tool to tackle problems related to *B. cereus* contamination.

B2_006_OA: PREVALENCE OF BEGOMOVIRUSES INFECTING HOT PEPPER IN THAILAND

Amisa Laprom, Ekachai Chukeatirote, Somrudee Nilthong*
School of Science, Mae Fah Luang University, Chiang Rai 57100, Thailand
* e-mail: somrudee@mfu.ac.th

Abstract: Begomoviruses have become a serious threat for many vegetable crops especially for those in the *Solanaceae* family. Their association with pepper yellow leaf curl disease has been reported worldwide including Thailand, although it should be noted that only a few studies have been performed to date. In this work, filed survey for pepper showing Begomovirus-like diseased symptom was conducted in north, central and north-eastern parts of Thailand. Initially, a total of 689 diseased leaf samples were screened with ELISA and PCR to confirm the existence of the Begomoviruses. The infected samples were then selected for further study using a rolling circle amplification. The amplified products were directly cloned to the circular pQE80L plasmid vector, and six successful clones were selected and submitted for DNA sequencing using pQE-F and pQE-R primers. Based on this result, five samples were found to contain DNA-A of Pepper yellow leaf curl Thailand virus, and there was only one sample of DNA-B Begomovirus. This study revealed an incidence of the begomoviruses and this hence should be taken into consideration for pepper disease management.

B2_007_OF: CHARACTERIZATIONS OF TRIMETHOPRIM-SULFAMETHOXAZOLE RESISTANCE IN ENTEROBACTERIACEAE ISOLATED FROM SONGKLANAGARIND HOSPITAL

Kalyarat Kaewnirat[1], Sarunyou Chusri[2], Rattanaruji Pomwised[3,*]

[1]Department of Biomedical Sciences, Faculty of Medicine, Prince of Songkla University, Hat Yai Campus, Songkhla, Thailand

[2]Department of Internal Medicine, Faculty of Medicine, Prince of Songkla University, Hat Yai Campus, Songkhla, Thailand

[3]Department of Microbiology, Faculty of Science, Prince of Songkla University, Hat Yai Campus, Songkhla, Thailand

*e-mail: rattanaruji.p@psu.ac.th

Abstract: The objective was to investigate *sul* genes and their related with class I integron in Enterobacteriaceae isolated from patients. Thirty-five bacterial isolates were recovered from 29 patients who were admitted to the medicine ward, Songklanagarind hospital. The isolates were identified as *Klebsiella pneumoniae* (85.7%), *Escherichia coli* (8.6%), *Enterobacter cloacae* (2.9%), and *Proteus mirabilis* (2.9%) by biochemical testing. The *sul1* gene was mostly found in these isolates (94.3%) and almost associated with *intI1* gene (82.8%). The *sul2* gene was found 20.0% of all isolates and *sul3* was not found in our study. From our study, we can conclude that now the occurrence rate of the *sul1* gene was very high, and it might have increased the opportunity to spread to other bacteria species.

B2_008_OF: CHARACTERISTICS OF BACTERIOPHAGES AGAINST *Vibrio* spp.

Natwara Dangnordang[1], Ampapan Naknaen[2], Jumroensri Thawonsuwan[3], Noodchanath Kongchouy[4], Rattanaruji Pomwised[1]*

[1]Department of Microbiology, Faculty of Science, Prince of Songkla University, HatYai Campus, Songkhla, Thailand

[2]Department of Environment Management, Faculty of Environment management, Prince of Songkla University, HatYai Campus, Songkhla, Thailand

[3]Coastal Aquatic Animal Health Research Institute, Department of Fisheries, Songkhla, Thailand

[4]Department of Mathematics and Statistics, Faculty of Science, Prince of Songkla University, HatYai Campus, Songkhla, Thailand

*e-mail: rattanaruji.p@psu.ac.th

Abstract: *Vibrio* is a gram-negative short rod curved bacterium with polar flagella with sheaths. *Vibrio* is facultative anaerobe, low tolerance to acid, and prefer alkaline. It can cause diseases in both aquatic animals and humans. Therefore, contamination of *Vibrio* in seafood is the public safety concern. The present study was to isolate vibriophages from marine water, seafood samples, and shrimp aquaculture by double-layer agar plaque assay using *V. vulnificus* VVA5, and VVA6 as host. Five vibriophages, V6T04, V6T12 and V5W07, V5W12, V5W13 with prominent zone, plaques sized 0.1 to 0.5 mm, and phage titers ranged from 104 to 107 were selected for determining host range specificity with 49 *Vibrio* isolates. The result showed that they inhibited 3 main *Vibrio* spp. (*V. parahaemolyticus* and *V. vulnificus* and *V. alginolyticus*) isolated from frozen seafood factories, suggesting that they are broad host range phages. From this result, 2 vibriophages, V5W07, and V6T12 were selected to study further: phage survival determination with various temperature, salinity, pH and chlorine. The result indicated that both vibriophages survived and were active at the temperature 0 °C and 5 °C and stable at 20 ° C, the salinity of 0 – 5 % NaCl and pH 5 – 11 but unable to survive at pH 2 and pH 13. Besides, with increasing concentration of chlorine, the number of phages decreased slightly from 5 to 50 ppm, and all of them cannot survive at chlorine 100 ppm. One-step growth curve revealed that V6T12 phage presented a shorter latent period than V5W07 phage. The results suggested that they might be useful in providing an alternative method to reduce the contamination of the *Vibrio* spp. in industry and aquaculture

B2_009_OF: TESTING THE PHENOTYPIC EFFECTS OF *Acinetobacter baumannii* ANTIBIOTIC RESISTANT GENE IN *Escherichia coli* BY USING A HIGH-THROUGHPUT CLONING APPROACH

Asmita Khaniya*, Iyarit Thaipisuttikul
Department of Microbiology, Faculty of Medicine Siriraj Hospital, Bangkok, Thailand
*e-mail: ashmita.khaniya1@gmail.com

Abstract: *Acinetobacter baumannii* is a major gram-negative nosocomial pathogen found ubiquitously in hospital environments. Currently, *A. baumannii* has been resisted to almost all commercially available antibiotics. The emergence of multidrug resistant (MDR) and extensively drug resistant (XDR) strain in *A. baumannii* is challenging. Unfortunately, colistin is the last line treatment option for XDR *A. baumannii*. Previously, researchers found *A. baumannii* has possessed the mechanism to sense the external environment and induced resistance against colistin. Though, the exact colistin resistance inducer and its regulatory mechanisms were still controversial. The RcnB protein was previously found in *Escherichia coli* as a regulator for nickel and cobalt efflux but the contribution of this protein against colistin in *A. baumannii* is still unknown. However, it was hypothesized as a regulator for nickel and cobalt efflux. Our knowledge up to now on *A. baumannii* resistant mechanism is limited due to the paucity of genetic tools and the narrow host range. This study aimed to test the effect and the suitability of protein (RcnB) from *A. baumannii* to NEB stable *E. coli* host cell by using the previously published high-throughput cloning approach based on homologous recombination in *E. coli*. The *rcnB* gene of *A. baumannii* was amplified with primers incorporated with homologous sequences similar to the vector backbone and was transformed into *E. coli* along with the linearized vector. The transformation was directly performed in *E. coli* by KCM based method within one and half hour. The minimum inhibitory concentration (MIC) of *E. coli* with *rcnB* gene from *A. baumannii* was 2- folds increased compared to *E. coli* with blank before and after induced with Isopropyl β-D-1-thiogalactopyranoside (IPTG). This result suggested that the cloned *rcnB* gene from *A. baumannii* in NEB-stable *E.coli* could function in the same manner as in wild type strain. The cloning technique in this study is less time consuming, easy to perform and economical. Since *A. baumannii* has a narrow host range, it is important to find other alternative hosts to study the function of unknown genes in crucial role of antibiotic resistance. This study could provide the new gateway in the field of molecular genetic analysis of MDR and XDR *A. baumannii* in near future.

B2_010_OA: DEVELOPMENT OF A LOOP-MEDIATED ISOTHERMAL AMPLIFICATION ASSAY FOR DETECTION OF THE PATHOGENIC OOMYCETE *Pythium insidiosum*

Zin Mar Htun[1], Piengchan Sonthayanon[2], Suthee Mangmee[2], Thidarat Rujirawat[3], Tiwa Rotchanapreeda[3], Pattarana Sae-Chew[3], Yothin Kumsang[3], Chalisa Jaturapaktrarak[3], Penpan Payattikul[3], Tassanee Lohnoo[3], Wanta Yingyong[3], Aree Laikul[4], Watcharapol Pathomsakulwong[4], Chompoonek Yurayart[5], Piriyaporn Chongtrakool[1], Theerapong Krajaejun[6,*]

[1]Department of Microbiology, Faculty of Medicine, Siriraj Hospital, Mahidol University, Bangkok, Thailand; [2]Department of Molecular Tropical Medicine and Genetic, Faculty of Tropical Medicine, Mahidol University, Bangkok, Thailand; [3]Research Center, Faculty of Medicine, Ramathibodi Hospital, Mahidol University, Bangkok, Thailand; [4]Equine Clinic, Faculty of Veterinary Medicine, Kasetsart University, Kamphaeng Saen campus, Nakhon Pathom, Thailand; [5]Department of Microbiology and Immunology, Faculty of Veterinary Medicine, Kasetsart University, Bangkok, Thailand; [6]Department of Pathology, Faculty of Medicine, Ramathibodi Hospital, Mahidol University, Bangkok, Thailand

*email: mr_en@hotmail.com

Abstract: The oomycete *Pythium insidiosum* causes the life-threatening infectious disease, called pythiosis, in humans and animals worldwide. Pythiosis patients usually present with clinical features associated with vascular, ocular or cutaneous infection. High morbidity and mortality of pythiosis are directly related to the lack of early and accurate diagnosis, prompt and effective treatment. Currently, diagnosis of pythiosis relies on culture identification and immunodiagnostic assays, which require time, technical skills, and some equipment. Here, we developed a loop-mediated isothermal amplification (LAMP) assay, as an alternative method for rapid detection of *P. insidiosum*. Four LAMP primers were designed to specifically target the ITS region of the rDNA repeat. Genomic DNA (gDNA) samples extracted from 25 samples of *P. insidiosum* and 27 samples of other fungi were recruited for an initial evaluation of the LAMP diagnostic efficiency. The LAMP reaction employed the single strand displacement amplification at 65°C for 60 minutes. The lowest detectable amount (LOD) of gDNA template by the LAMP assay was 10^{-4} ng for the reference strains. For the tested samples, 10^{-3} ng, ten times higher than LOD was used. As a result, LAMP showed 96% detection sensitivity and 90% detection specificity. In conclusion, we successfully developed the LAMP assay for detection of *P. insidiosum*, with relatively-high diagnostic efficiency. Short turnaround time and simple procedure are advantages of this assay. We planned to evaluate a visualized detection method, which relies on precipitation or colorimetry, to facilitate a rapid and convenient interpretation of the LAMP result.

B2_011_PF: ANTIBACTERIAL AND ANTIBIOFILM ACTIVITIES OF RAMBUTAN (*Nephelium lappaceum* L.) PEEL EXTRACT ON *Vibrio parahaemolyticus* and *Escherichia coli* ISOLATED FROM FOODS

Tittita Aksonkird[1], Sutima Preeprem[2], Nattida Pankaew[3], Pichamon Srisawad[3], Pimonsri Mittraparp-arthorn[1,*]

[1]Department of Microbiology, Faculty of Science, Prince of Songkla University, Hat Yai, Songkhla, Thailand

[2]Microbiology Program, Faculty of Science Technology and Agriculture, Yala Rajabhat University, Yala, Thailand

[3]School of Science, Mae Fah Luang University, Chiang Rai, Thailand

*e-mail: pimonsri.m@psu.co.th

Abstract: *Vibrio parahaemolyticus* and *Escherichia coli* are significant food-borne pathogens associated with acute diarrhea in human. The formation of biofilms by these bacteria plays various roles in nature and also food safety. The aim of this study were to investigate the antibacterial and antibiofilm activities of rambutan peel extract (RPE) on food isolates of *V. parahaemolyticus* and *E. coli*. RPE had the minimum inhibitory concentrations (MICs) values of 0.5 to 1 mg/ml for *V. parahaemolyticus* and ≥4 for *E. coli* isolates. Meanwhile results of minimal bactericidal concentrations (MBCs) values were in the range of 2 to 4 and >4 mg/ml for *V. parahaemolyticus* and *E. coli*, respectively. Moreover, RPE inhibited the biofilm formation and caused the reduction of pre-formed biofilm of both *V. parahaemolyticus* and *E. coli* at the sub-MIC concentrations (0.5 MIC and 0.25 MIC). The results revealed that RPE exhibits antibacterial and antibiofilm activities against *V. parahaemolyticus* and *E. coli*, which can be considered as an alternative substance for inhibit biofilms or removal of these pathogens on food contact surfaces.

B2_012_PA: ANTI-ENTEROVIRUS 71 SUBGENOTYPE B5 ACTIVITIES OF DIFFERENT PARTS OF *Oroxylum Indicum in vitro*

Thongkoon Priengprom[1], Natsajee Nualkaew[2], Artit Wongsa[1], Chidchanok Ritkamrop[1], Jantip Saelee[1], Kirakorn Pongpan[1], Chintana Phawong[3], Boonrat Tassaneetrithep[1,*]

[1]Center of Research Excellence in Immunoregulation Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok 10700, Thailand

[2]Faculty of Pharmaceutical Sciences, Khon-Kaen University, Khon-Kaen 40002, Thailand

[3]College of Allied Health Sciences, Suan Sunandha Rajabhat University, Bangkok 10300, Thailand

*e-mail: boonrat.tas@mahidol.ac.th

Abstract: Enterovirus 71 (EV71) and coxackievirusA16 are the common causative agent of hand foot and mouth disease (HFMD) which epidemic in the Asia-Pacific region including Thailand. Some EV71-infected individuals can develop severe complications such as fatal neurological and cardiopulmonary complications. The currently specific antienteroviral are under development process. Various parts of *Oroxylum indicum* were used as the main ingredient for many traditional medicinal preparations. Several studies reported that *O. indicum* has anti-viral activity. Therefore, this study aimed to investigate the *in vitro* anti-EV71 activity from *O. indicum*. Root, root bark and stem bark of *O. indicum* were extracted in methanol. The post-treatment effects of *O. indicum* were evaluated using the 200 µg/ml (non-toxic dose) of *O. indicum* methanol extracts as determined by MTT assay. The results showed that the methanol extracts of root, root bark, and stem bark at a concentration of 200 µg/ml can inhibit EV71 infection in Vero cell by 34.50%, 9.52% and 10.85%, respectively. These results indicated that root of *O. indicum* has a significant potential effect on the EV71 subgenotype B5 but less toxicity to a normal cell *in vitro*. This *O. indicum* could potentially be developed as anti-EV71 agent.

B2_013_PA: ANTIBACTERIAL ACTIVITY OF CRUDE EXTRACTS FROM *Xylaria psidii* (SDBR-CMU308) AND PURIFICATION OF ITS EXTRACTED METABOLITES

Pichamon Srisawad[1], Surat Laphookhieo[1,4], Natsaran Saichana[1,3], Nakarin Suwanarach[2], Saisamorn Lumyong[2], Pattana Kakumyan[1,*]

[1]School of Science, Mae Fah Luang University, Chiang Rai 57100, Thailand

[2]Department of Biology, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

[3]Microbial Products and Innovation Research Unit, Mae Fah Luang University, Chiang Rai 57100, Thailand

[4]Center of Chemical Innovation for Sustainability (CIS), Mae Fah Luang University, Chiang Rai 57100, Thailand

*e-mail: pattana.kak@mfu.ac.th

Abstract: *Xylaria psidii* is a macro fungus that shows several bioactivities such as antioxidant and antimicrobial activities. *X. psidii* (SDBR-CMU308) was isolated from northern Thailand. The influences of culture media, temperature, and pH on the mycelial growth of *X. psidii* (SDBR-CMU308) was evaluated in different solid media. The results showed that the fungus could grow in various media, but it showed the maximum growth on Czapek-Dox agar as well as Malt extract agar (MEA). Optimal pH and temperature were pH 7.0 and 28°C, respectively. Crude extracts from ethyl acetate extraction were prepared and antibacterial activities against Gram-positive bacteria (*Bacillus cereus* and *Staphylococcus aureus*) and Gram-negative bacteria (*Escherichia coli* and *Salmonella typhimurium*) was investigated. It was found that the crude extracts only showed inhibitory activities against Gram-positive bacteria. Then, the crude extracts were subjected to separation by various chromatographic techniques to obtain six compounds (1–6). These compounds were identified as (*E*)-methyl-3-(4-methoxyphenoxy)acrylate (1), eucalyptene A (2), eucalyptene B (3), (*E*)-methyl-4-(3'-methylbut-2'-enyloxy)cinnamate (4), 2,5-dihydroxyacetophenone (5), and 4-hydroxybenzoic acid (6) by comparison of their NMR spectroscopic data with published values.

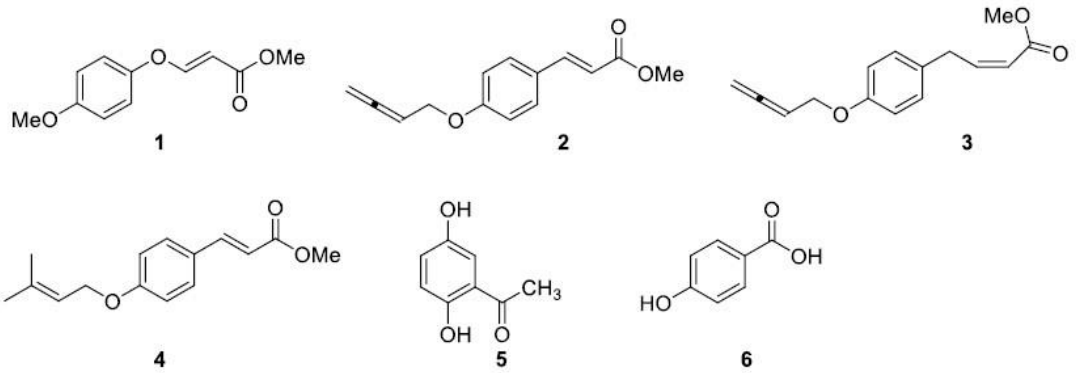


Figure 1. Structure of isolated compounds.

B2_014_PA: SELECTION OF PHAGE DISPLAY HUMAN SCFV SPECIFIC TO *Pseudomonas aeruginosa*

Sanruethai Pongsakunpassorn[1], Worawit Mawongwan[1], Montarop Yamabhai[3], Nanthanit Jaruseranee[1,2,*]

[1]School of Science, Mae Fah Luang University, Chiang Rai 57100, Thailand

[2]Microbial Products and Innovation Research Unit, Mae Fah Luang University, Chiang Rai 57100, Thailand

[3]Molecular Biotechnology Laboratory, School of Biotechnology, Institute of Agricultural Technology, Suranaree University of Technology, Nakhon Ratchasima, 30000, Thailand

*e-mail: Nanthanit.jar@mfu.ac.th

Abstract: *Pseudomonas aeruginosa* is one of the antibiotic-resistance bacteria that produce biofilm acting as a diffusion barrier for antibiotics usage. Many diseases caused by *P. aeruginosa* including respiratory system infections, urinary tract infections, dermatitis, soft tissue infections, bacteremia, bone and joint infections, gastrointestinal infections and a variety of systemic infections, particularly in patients with severe burns, cancer and AIDS patients who are immunosuppressed. An alternative method for the treatment of *P. aeruginosa* infection is desired. Phage display is a powerful technique selecting biomolecule which binds to the target of interest with high affinity from a large number of nonspecific phage clones. Phage display human scFv is the fragment of an antibody with function in antigen-binding activities that display on the filamentous phage. Library of phage display scFv composes of a large variety of antibody repertoire. It is an immense scFv source for *in vitro* affinity selection. A compact phage display human scFv library name YAMO which comprises approximately 10^8 scFv varieties was screened with *P. aeruginosa* in biopanning. After the first round of panning, the amplified selected phage library showed specific binding to the *P. aeruginosa* target in Enzyme-linked immunosorbent *assay* (ELISA) experiment. Moreover, this selected library bound both freeze and live *P. aeruginosa* cells. This study reflected the potential of phage display technology to select specific scFv to bacterial cell targets. These amplified selected phages display human scFv will be prospectively applied as detecting and tracking agent in a *P. aeruginosa* treatment plan in the human body.

B2_015_PA: BINDING OF SPECIFIC PHAGE DISPLAY HUMAN scFv TO *Escherichia coli*

Worawit Mawongwan[1], Sanruethai Pongsakunpassorn[1], Montarop Yamabhai[3], Nanthanit Jaruseranee[1,2,*]

[1]School of Science, Mae Fah Luang University, Chiang Rai 57100, Thailand

[2]Microbial Products and Innovation Research Unit, Mae Fah Luang University, Chiang Rai 57100, Thailand

[3]Molecular Biotechnology Laboratory, School of Biotechnology, Institute of Agricultural Technology, Suranaree University of Technology, Nakhon Ratchasima, 30000, Thailand

*e-mail: Nanthanit.jar@mfu.ac.th

Abstract: *Escherichia coli* is a bacterium that can be contaminated in the environment and harmful to human and animal health. The presence of *E. coli* indicates water quality and it is considered as fecal contamination. A conventional method for *E. coli* detection takes several days. An alternative method such as rapid *E. coli* detection or dipstick is available in the market. An antibody is a molecule that specifically binds with its antigen. An antibody specific to *E. coli* is a powerful tool in detection and diagnostic to explore infection and contamination in a shorter time comparing to the conventional enrichment method. Phage display human scFv specific to *E. coli* was selected from YAMO phage display scFv library constructed from a healthy Thai people. Live *E. coli* cells were used as a target in biopanning. The confirmation of selected scFv by Enzyme-linked immunosorbent assay (ELISA) showed the ability of phage display scFv in binding to both live and freeze cell. These selected scFvs are a vulnerable source of *E. coli* sensing molecules. Further cross binding reaction of phage scFv that recognized freeze cell will be defined to produce a simple *E. coli* test format.

SESSION B3:
MOLECULAR BIOLOGY

B3_001_PF: DRAFT INTESTINAL MICROBIOTA OF SEA CUCUMBER (S*tichopus horrens*) FOR AQUACULTURE SYSTEMS

Wachira Jaengkhao[1], Warapond Wanna[2,*]
[1]Department of Molecular Biotechnology and Bioinformatics, Faculty of Science, Prince of Songkla University, Hat-Yai, Songkhla 90112
[2]Center for Genomics and Bioinformatics Research, Faculty of Science, Prince of Songkla University, Hat-Yai, Songkhla 90112
*e-mail: wwanna_1@hotmail.com

Abstract: 16S rRNA gene sequencing has been used to identify microbiota of many animal species, but that of marine invertebrate organisms is still poor. *Stichopus horrens (*Gamat sea cucumber) is one of highly valued sea cucumber that contains rich nutritional value and pharmacological properties and is widely used in traditional medicine to treat various illnesses. In this study aims to study the microbiota in intestine of *Stichopus horrens* by high throughput sequencing based on 16S rRNA gene sequences, which provide culture-independent information of bacteria and archaea diversity. The results showed that the anterior intestine is dominated by Proteobacteria (65.28%) and Bacteroidetes (12.46%), the posterior intestine is higher in Proteobacteria (92.89%) but lower Bacteroidetes (2.52%), the third dominant were different with Firmicutes 2.36% in anterior intestine while the posterior intestine are high relative abundance of Actinobacteria with 2.45% relative abundance. In conclusion, this study is the first high-throughput study characterizing the microbiota of the intestine of *Stichopus horrens*, which present the core microbiota of intestinal organism, and provides important changes the microbiota in each part of the intestine.

B3_002_PA: IMMUNE RESPONSE OF MICE VACCINATED WITH COMBINE VACCINE CONTAINING RECOMBINANT *Fasciola gigantica* saposin-LIKE PROTEIN 2 AND LEUCINE AMINOPEPTIDASE

Werachon Cheukamud, Natee prasertmunkongdee, Narawit intarashot, Sukanya Sukathanarak, Narin Changklungmoa, Pornanan Kueakhai*
Faculty of Allied Health Sciences and Research unit of vaccine and diagnosis of parasitic diseases, Burapha University, Thailand
*e-mail: earn_patho@hotmail.com, pornanan@go.buu.ac.th

Abstract: Leucine aminopeptidase, expressed in all stage of *Fasciola gigantica*, has been known as metallo-exopeptidases that cleaves N-terminal residues from proteins and saposin-like protein 2 (SAP-2) that produced by early stage up to adult of the liver fluke is used as a lytic protein for blood cell lysis in host. Our previous studies show that these proteins have high potentials as an individual vaccine for *F. gigantica* prevention in mice. In this study, recombinant *F. gigantica* saposin-like protein 2 and leucine aminopeptidase (rFgSAP-2 and rFgLAP) were cloned and expressed in *Escherichia coli* BL21 (DE3). Each was used singly or in combination to vaccinate Imprinting Control Region (ICR) mice (n = 10) by subcutaneous injection. Two weeks after the second boost, mice were orally infected with 15 metacercariae per mouse. Level of antibodies showed that all vaccinated groups could response to the antigens, IgG1 titers were higher than IgG2a titers which indicated the mixed T helper (Th) 1/Th2 responses with Th2 predominating. Combine vaccinated group could response to both SAP-2 and LAP and had a potential of protection. These demonstrated that a combine vaccine containing rFgSAP-2 and rFgLAP could be a new strategy to increase the protective efficacy for fasciolosis in mice.

B3_003_PF: PHYSIOLOGICAL FUNCTION ANALYSIS OF NOVEL GENE CASSETTE CONFERRING PARAQUAT SUSCEPTIBILITY IN *Pseudomonas aeruginosa*

Chanapimon Keerathiwattanarat[1], Jintana Duangnkern[2], Khwannarin Khemsom[1,3], Skorn Mongkolsuk[2], Adisak Romsang[1,3,*]

[1]Department of Biotechnology, Faculty of Science, Mahidol University, Bangkok 10400, Thailand

[2]Laboratory of Biotechnology, Chulabhorn Research Institute, Bangkok 10210, Thailand

[3]Center for Emerging Bacterial Infections, Faculty of Science, Mahidol University, Bangkok 10400, Thailand

*e-mail: adisak.rom@mahidol.ac.th

Abstract: *Pseudomonas aeruginosa* is in the WHO-listed critical concerned opportunistic pathogen in healthcare units and hospitals. It is a Gram-negative bacterium and commonly found in any environments. In response to biological degradation under several circumstances including during host infection or chemically biocide exposure, *P. aeruginosa* has cellular defenses to reactive oxygen species (ROS). Superoxide anion, one of common ROS form, can be generated by agriculture-used biocide named paraquat, one of the most widely used herbicides in the world. *P. aeruginosa* adapted itself to tolerate the paraquat toxicity via its genetic materials and transcriptional control. In this study, we identified the novel gene cassette that contributed to the paraquat resistance. We constructed a specific gene knockout mutant in the *P. aeruginosa* PA01 strain and compared its growth ability under superoxide generators including paraquat, plumbagin, and menadione exposure. Mutation at the *pqiS* (paraquat inducible susceptibility) in the *P. aeruginosa* PA01 caused a significantly increased susceptibility (more than 50 folds) against paraquat compared to the PA01 wild-type strain. Moreover, the paraquat-sensitive phenotype in the *pqiS* mutant was completely restored by an ectopic expression of *pqiS* in the pBBR vector, suggesting a critical role of this gene in response to the paraquat toxicity in *P. aeruginosa*. In-depth analysis of this gene product in further progression may be beneficial to develop an alternative strategy to fight against hospital-acquired infection by this bacterium *P. aeruginosa*.

B3_004_PA: CLONING OF ASPARAGINYL ENDOPEPTIDASE OR LEGUMAINS 3 FROM *Fasciola gigantica*

Phawiya Suksomboon, Phonlawat janpiw, Supawadee Osotprasit, Narin Changklungmoa, Pornanan Kueakhai*
Faculty of Allied Health Sciences and Research unit of vaccine and diagnosis of parasitic diseases, Burapha University, Long-Hard Bangsaen Road, Mueang District, Chonburi 20131, Thailand
*email: earn_patho@hotmail.com

Abstract: Asparaginyl endopeptidases or legumains have been found in plants, mammals, and also the trematodes *Schistosoma spp.* and *Fasciola spp.* The role of legumains may be involved in the evasion of host immunity, nutrition uptake and are essential for parasite survival in host. In this study, the full-length cDNA encoding *F. gigantica* legumain 3 (FgLGMN-3) was cloned from an adult stage of *F. gigantiga* by polymerase chain reaction (PCR) and then amplified fragment was inserted into the pGEM-easy vector. Afterward, the cDNA sequence was determined and deduced amino acid sequence were analyzed by BLAST, SignalIP, Expasy and ClustalW programs. The full-length of FgLGMN-3 cDNA showed 1,423 bp and open reading frame (ORF) of 423 amino acid, with molecular weight of 48.4 kDa and isoelectric point of 5.8. The FgLGMN-3 signal peptide contains 23-24 amino acid residues. The deduced amino acid sequence of FgLGMN-3, compared to the other legumains from *Opisthorchis viverrini* (ABD64147), *Schistosoma japonicum* (CAX72774) and *Homo sapiens* (AA03061) revealed 40.91%, 40.29% and 32.28% similarity, respectively. Therefore, these studies could lead to novel drug target and vaccine candidate development for fasciolosis in domestic livestock by *F. gigantica.*

B3_005_OA: ASSESSMENT OF THE INHIBITORY EFFECT OF THAI PLANTS ON THE INTERACTION BETWEEN *Plasmodium falciparum* AND HUMAN RECEPTORS

Todsaporn Bunpote[1], Benyakan Pongkitwitoon[1], Triwit Rattanarojpong[1], Pongsak Khunrae[1,*]
[1]King Mongkut's University of Technology Thonburi, Thon Buri, Bangkok, Thailand, Department of Microbiology
[2]Mahidol University, Sri-Ayuthaya Rajathevi, Bangkok, Thailand, Faculty of Pharmaceutical Sciences
*e-mail: Pongsak.khu@kmutt.ac.th

Abstract: *Plasmodium falciparum* is a parasitic organism responsible for causing severe malaria in humans by precipitating the red blood cells (Rosetting and Cytoadhearance) which kill more than 200 million people today. There were also been reported that the mutating parasite can resist antimalarial drugs. However, in Thailand have a traditional reported that there are more than 100 herbs/traditional medicines that can use to cure wild fever disease or malaria. Therefore, this research aims to search and screen the important substances from the Thai herb that could inhibit the interaction between NTS-DBL1 domain from PfEMP1 protein with Heparan sulfate (the human receptor molecule components), which is an important interaction that causes severe malaria by using the ELISA assay technique. Surprisingly, the result showed that the chemical named Tiliacorinine and Yanangcorinine extracted from the plant called "Yanang" (*Tiliacora triandra*) can appreciably inhibit more than 60% of NTS-DBL1/Heparan sulfate interactions. The finding of the research has the potential to use as a base for researching and studies of these two compounds functions on inhibiting blood cytoadherence and rosetting from Plasmodium falciparum in the future and develop certain curing for severe malaria in the future.

Keywords: NTS-DBL1 domain, PfEMP1, *P. flacipalum*, Yanang, Severe malaria

B3_006_OA: DEVELOPMENT OF A NON-LETHAL DETECTION OF TILAPIA LAKE VIRUS IN NILE TILAPIA

Chutipong Chiamkunakorn[1], Vimbai Irene Machimbirike[1], Saengchan Senapin[2,3], Pongsak Khunrae[1], Ha Thanh Dong[4], Triwit Rattanarojpong[1,*]

[1]Department of Microbiology, Faculty of Science, King Mongkut's University of Technology Thonburi (KMUTT), Bangkok, Thailand

[2]Fish Health Platform, Center of Excellence for Shrimp Molecular Biology and Biotechnology (Centex Shrimp), Faculty of Science, Mahidol University, Bangkok, Thailand

[3]National Center for Genetic Engineering and Biotechnology (BIOTEC), National Science and Technology Development Agency (NSTDA), Pathum Thani, Thailand

[4]Faculty of Science and Technology, Suan Sunandha Rajabhat University, Bangkok, Thailand

*e-mail: triwit.rat@kmutt.ac.th

Abstract: Sampling for Tilapia Lake virus (TiLV) in tilapines has been based mainly on obtaining internal organs after the fish has been euthanized. However, lethal sampling might be not viable to broodstock and economically important ornamental cichlids. To contribute towards screening of the virus in asymptomatic infected fish, a subclinical infected population of Nile tilapia obtained from a local farm was preliminarily tested to compare different non-lethal sampling for example, liver biopsy, gill biopsy, fin clip, mucus, faeces and blood for detection of TiLV. Only liver and blood samples gave positive results by PCR. Since blood sampling is relatively simpler, it was further used for 40 red tilapia and 20 Nile tilapia adults from two other different farms. The results showed that from 38/40 blood samples of red tilapia adults tested positive for TiLV by PCR. Sequencing representative PCR amplicons of positive samples confirmed sequence identity to TiLV. We can safely conclude that both blood and liver biopsy give good sampling platforms for TiLV detection in cichlids with blood being superior. The method will be useful for fish health screening purposes, surveillance, pathogen control at farm level as well as biosecurity policy making.

Key words: Blood, non-lethal detection, liver biopsy, TiLV, tilapia

B3_007_PA: MOLECULAR CLONING OF SERINE PROTEASE ENCODING GENE FROM *Fasciola gigantica*

Komsil Rattanasroi, Chortip Khokerd, Thodsapon Sutthiphibun, Pornanan Kueakhai, Narin Changklungmoa*
Faculty of Allied Health Sciences and Research unit of vaccine and diagnosis of parasitic diseases, Burapha University, Long-Hard Bangsaen Road, Mueang District, Chonburi 20131, Thailand
*email: narinchang@go.buu.ac.th, narin_bio@hotmail.com

Abstract: Fasciolosis caused by infection with *Fasciola gigantiga* is one of the most common parasitic disease in the tropical. *F. gigantica* excreted the serine proteases (SPs) via excretory-secretory (ES) products for food digestion. The SPs can be categorized based on their substrate specificity such as chymotrypsin-like, trypsin-like and subtilisin-like. In this study, the cDNA encoding serine protease was cloned by polymerase chain reaction (PCR) from newly excysted juveniles (NEJs) of *F. gigantica*. After that, we inserted the gene into the pGEM-T Easy vector and transformed into *Escherichia coli* (DH5α). Finally, the plasmid was purified by GeneJET Plasmid Miniprep Kit; the insert was sequenced, and the sequence was analyzed by BLAST, SignalP, ExPASy and ClustalW program. The full-length sequence of FgSP-encoding gene revealed 1,456 bp which contain 153-bp 5'UTR, 313-bp 3'UTR, 27-bp poly-A tail and open reading frame (ORF) 963 bp. The amino acid sequence of FgSP revealed 47.14%, 62.83%, 64.47%, 30.45% and 29.96% identity to the serine protease from human parasites (*Schistosoma haematobium, Schistosoma mansoni, Schistosoma japonicum*) and hosts (*Bos taurus, Homo sapiens*), respectively. Therefore, FgSP is a novel target, as well as aim of our study to develop the fasciolosis detection kit.

B3_008_OA: BIOLOGICAL ACTIVITIES OF EPIDERMAL GROWTH FACTOR DOMAIN FROM THROMBOSPONDIN OF BANANA SHRIMP (*Fennerpenaeus merguensis*)

Monwadee Wonglapsuwan[1,2], Natthaporn Khwanmuang[1], Passanee Deachamag[1,2], Wilaiwan Chotigeat[1, 2,*]

[1]Department of Molecular Biotechnology and Bioinformatics, Faculty of Science, Prince of Songkla University, Hatyai, Songkhla, 90112, Thailand

[2]Center for Genomics and Bioinformatics Research, Faculty of Science, Prince of Songkla University, Hatyai, Songkhla, 90112, Thailand

*e-mail: wilaiwan58@hotmail.com

Abstract: Thrombospondin (TSP) is one of the extracellular matrix proteins involving in blood vessel regeneration and control cell morphology. Five types of TSPs are reported including TSP1, TSP2, TSP3, TSP4, and TSP5/COMP. TSPs from Banana shrimp (*Fennerpenaeus merguensis*) contains epidermal growth factors (EGF) domain at their carboxy-terminal end. Human EGF plays a role in cell proliferation and development and has been used for wound healing in diabetic patients. The EGF domain from banana shrimp TSP (TSP3-2) was cloned into the pCold vector, and the sequence was analyzed. The recombinant His-TF-TSP3-2 was evaluated for proliferation, cytotoxicity and collagen production on skin fibroblast cell line. Also, genotoxicity was determined by HPRT Mutation Assay, and thermal stability of His-TF-TSP3-2 was analyzed by Thermo shift assay. The nucleotide sequence of TSP3-2 shared 30% similarity to human EGF. Fibroblast cell proliferated from 1.4-1.2 folds after treated the cell with 0.5-30 mg/mL of His-TF- TSP3-2. By comparing the rate migration of the scratch assay from 0 to 24, 36 and 48 h of the His-TF- TSP3-2 treated cell with His-TF control. The percentage migration of the 0.5 mg./mL His-TF- TSP3-2 was faster than the controls. Also, the collagen was produced at 1.7 and 1.2 folds compared with the control after treated with His-TF-TSP3-2 at 0.5 and 1.0 µg/ml, respectively. No significant mutant frequency in the His-TF-TSP3-2 treated cells was found. TSP3-2 has the proliferation, activation collagen synthesis properties and less toxicity to the genome, so it has potential use for renewal or anti-wrinkle skin.

B3_009_PA: ANTIMICROBIAL ACTIVITY AND A NEW COMPOUND FROM *Fusarium oxysporum*

Supawan Meena[1], Wilaiwan Chotigeat[1,2], Natchapong Choungsom[3], Yaowapa Sukpondma[3], Souwalak Phongpaichit[4], Vatcharin Rukachaisirikul[3], Monwadee Wonglapsuwan[1,2]*

[1]Department of Molecular Biotechnology and Bioinformatics, Faculty of Science, Prince of Songkla University, Songkhla, 90112, Thailand

[2]Center for Genomics and Bioinformatics Research, Faculty of Science, Prince of Songkla University, Songkhla, 90112, Thailand

[3]Department of Chemistry, Faculty of Science, Prince of Songkla University, Songkhla, 90112, Thailand

[4]Department of Microbiology, Faculty of Science, Prince of Songkla University, Songkhla, 90112, Thailand

*e-mail: Monwadee.wo@psu.ac.th

Abstract: *Fusarium* has been reported as prolific sources of a new compound for applications in agricultural and pharmaceutical industries. In this study, three parts of crude extract from *Fusarium oxysporum* were investigated an antimicrobial activity against 11 bacterial strains. Both mycelium ethyl acetate extract (CE) and mycelium hexane extract (CH) showed minimal inhibitory concentration (MIC) and minimal bactericidal concentration (MBC) against *Streptococcus mutans*, a cariogenic bacterium that is leading cause of tooth decay and cavities, at 8 µg/mL. Moreover, we found a new compound which is an imidazolidinone derivative from the CE. The new imidazolidinone derivative showed MIC and MBC against *S. mutans* at 4, 128 µg/mL, respectively. Interestingly, the new imidazolidinone derivative also revealed MIC and MBC value against *Vibrio parahaemolyticus* causing gastrointestinal illness in human at 8 µg/mL. Moreover, the new imidazolidinone showed MBC against Methicillin-resistant *Staphylococcus aureus* (MRSA) at 16 µg/mL. This study demonstrated the potential extracts and a new compound from *F. oxysporum* in antimicrobial activity. These *F. oxysporum* extracts could be developed for pharmaceutical drugs or antibiotic in the future.

B3_010_OA: *In vivo* TRANSFER OF PLASMID DNA EXPRESSING dsVP28 FROM RECOMBINANT *Bacillus subtilis* TO PROTECT SHRIMP FROM WHITE SPOT SYNDROME VIRUS

Hirun Saelim[1,2], Suvit Loprasert[3], Amornrat Phongdara[1,2]

[1]Department of Molecular Biotechnology and Bioinformatics, Faculty of Science, Prince of Songkla University, Hat-Yai, Songkhla, 90112, Thailand

[2]Center for Genomics and Bioinformatics Research, Faculty of Science, Prince of Songkla University, Hat-Yai, Songkhla, 90112, Thailand

[3]Laboratory of Biotechonology, Chulabhorn Research Institute, Vibhavadee-Rangsit Highway, Laksi, Bangkok 10210, Thailand.

Abstract: White spot syndrome virus (*WSSV*) is a potent shrimp viral pathogen responsible for significant economic losses to shrimp aquaculture all over the world. Several studies have demonstrated efficient RNAi-based approaches for suppressing the viral gene and reducing shrimp mortality. However, the application has been difficult in real practical use. The present work aims to develop an efficient approach for delivery of VP28 specific-siRNA using *Bacillus subtilis*, a novel live oral vaccine vehicle, for protecting shrimp against *WSSV* infection. A plasmid that could function in both bacteria and eukaryotic cells was developed by combining a pBE-sDNA and the pCMV promoter from pcDNA4 plasmid to obtain pBE:cDNA4. Subsequently, to evaluate the efficacy of pBE:cDNA4 *in vivo*, dsGFP-expressed pBE:cDNA4 (pBE:cDNA4-dsGFP) and dsVP28 expressed pBE:cDNA4 (pBE:cDNA4-dsVP28) were used to knock down the target transcript in *WSSV*-infected shrimps. The high survival rate was found in *WSSV*-infected shrimps injected with pBE:cDNA4-dsVP28 at 7 days post-infection (dpi). The pBE:cDNA4-dsVP28 plasmid was transformed into *B. subtilis* and used *B. subtilis* as the delivery vehicle in oral feeding. *WSSV*-infected shrimps that were fed with *B. subtilis* carrying pBE:cDNA4-dsVP28 had 91.67% survival when compared to the control that survived only 28.579%. The results here demonstrate the efficient delivery of specific siRNA by using bactofection *B. subtilis*.

B3_011_PF: EXPRESSION ANALYSIS OF *Drosophila melanogaster* INNATE IMMUNITY GENES DURING *Pseudomonas aeruginosa* INFECTION

Chutimon Tangaiad[1], Saifon Nopnipa[2], Jintana Duangnkern[3], Scorn Mongkolsuk[1,2,3], Adisak Romsang[1,2,*]

[1]Department of Biotechnology, Faculty of Science, Mahidol University, Bangkok 10400, Thailand
[2]Center for Emerging Bacterial Infections, Faculty of Science, Mahidol University, Bangkok 10400, Thailand
[3]Laboratory of Biotechnology, Chulabhorn Research Institute, Bangkok 10210, Thailand
*e-mail: adisak.rom@mahidol.ac.th

Abstract: *Pseudomonas aeruginosa* is a bacterium adapted to infect a wide range of hosts including fruit fly and human. *Drosophila melanogaster* was used as a host model for *P. aeruginosa* infection due to its similar innate immune response (IIR) components as in human. An interaction between *P. aeruginosa* infection and IIR components in *Drosophila melanogaster* host model was less studied. In this study, the *D. melanogaster* gene expression analysis focused on IIR components in IMD, Toll, and other alterative signalling pathways under *P. aeruginosa* infection. End-pointed RT-PCR results showed that all tested genes in IMD pathway were highly expressed in the *P. aeruginosa*-infected fly samples. Whereas slightly induction of the genes in the Toll pathway and no significantly different expression level of genes in the other alternative pathways were observed. The results suggested that the IMD pathway could be a major innate immune system in *D. melanogaster* in response against *P. aeruginosa* infection. The IMD pathway in *D. melanogaster* could generate bactericidal antimicrobial peptides (AMPs), which may be effective against *P. aeruginosa* infection. We further tested to infect the flies with the *fprB* mutant, which is represented as the stress-hypersensitive strain. The gene expression analysis results showed that an induction of the IMD pathway genes was decreased under an infection with the *fprB* mutant suggesting that the IMD pathway in *D. melanogaster* could related to the generation of the stressful condition to the infected bacteria. Data presented are preliminary shown a correlation between *D. melanogaster* innate immunity against stress responsive mechanism in *P. aeruginosa*.

B3_012_PF: TRANSCRIPTIONAL RESPONSES OF *Pseudomonas aeruginosa* TO REACTIVE CHLORINE STRESS

Nannipa Phuphuripan[1], Jintana Duang-nkern[2], Kritsakorn Saninjuk[1], Skorn Mongkolsuk[1,2,3], Adisak Romsang[1,3,*]

[1]Department of Biotechnology, Faculty of Science, Mahidol University, Bangkok 10400, Thailand
[2]Laboratory of Biotechnology, Chulabhorn Research Institute, Bangkok 10210, Thailand
[3]Center for Emerging Bacterial Infections, Faculty of Science, Mahidol University, Bangkok 10400, Thailand
*e-mail: adisak.rom@mahidol.ac.th

Abstract: Reactive chlorine species (RCS) are including strong oxidizing property, which facilitates a powerful antimicrobial activity. RCS play an important role in microbial killing in host defenses mechanism. However, overuse of RCS-containing disinfectants can promote the spread of resistant bacteria. Two P. aeruginosa paralogue genes, *brpR1* and *brpR2,* encoding for a putative transcriptional regulator related to the RCS response were characterized. Purified BrpR1 and BrpR2 were produced in *Escherichia coli* M15 resulting in more than 95% purity based on the intensity under SDS-PAGE. The results in non-reducing SDS-PAGE showed the oligomer structure of both purified proteins and their stability was strongly shown under the RCS treatment with the concentration of less than 1 ppm. *In vitro* electrophoretic mobility shift assay (EMSA) results suggested that RCS promote the binding affinity of BrpR1 to *brpA1* targets but no effect on the binding of BrpR2 protein. In addition, the β-galactosidase activity controlled by *brpA* promoter was showed that their activity strongly increased under RCS treatment particularly in the extended promoter region covering the regulator gene. Data presented suggest that two paralogous BrpR transcriptional regulators control the expression of *brpA* genes under RCS exposure leading to an activation of RCS stress responsive mechanism, which could be a part of RCS tolerance in this versatile bacterium.

B3_013_PF: FUNCTIONAL CHARACTERIZATION OF A GENE ENCODING A PUTATIVE GLUTATHIONE S-TRANSFERASE ON METAL AND ANTIMICROBIAL RESISTANCE IN *Pseudomonas aeruginosa*

Thanaphat Auwattanamongkol[1], Jintana Duang-nkern[2], Skorn Mongkolsuk[2,3], Adisak Romsang[1,3,*]

[1]Department of Biotechnology, Faculty of Science, Mahidol University, Bangkok 10400, Thailand
[2]Laboratory of Biotechnology, Chulabhorn Research Institute, Bangkok 10210, Thailand
[3]Center for Emerging Bacterial Infections, Faculty of Science, Mahidol University, Bangkok 10400, Thailand
*e-mail: adisak.rom@mahidol.ac.th

Abstract: The objective of this study was to identify a novel resistance mechanism in *Pseudomonas aeruginosa* against antimicrobial agents. A Genomic library of *P. aeruginosa* PAO1 strain was constructed by using conventional techniques in recombinant DNA technology. In this study, some modifications from the standard method had been made. The modified library was resulted in higher resistance efficiency with lower false-positive resistance clones compared with that from the conventional library. Testing the library with antimicrobial agents, the modified library gave 4-fold greater number of resistance cassettes compared to that from the conventional library. From DNA analysis of the resistance clones, known genes which are mainly membrane components, transporters of small molecules and metal transporters were found. 30% of unknown genes annotated as a hypothetical protein were obtained. Amongst candidate resistance cassettes, one of them covered a gene encoding a probable glutathione S-transferase (GST). The *gst*-knockout mutant was constructed by an insertional inactivation using pKNOCK system. The *gst*-overexpression mutant was constructed by using pBBR system. The *gst*-knockout mutant exhibited an increased susceptibility against antimicrobial agent such as a bleaching agent compared to the wild type. We extended the experiments against other stresses and found that the *gst*-knockout mutant developed resistance against ferrous salt. Overall data indicated a useful of modified genomic library in *P. aeruginosa* to identify the novel antimicrobial targeting molecules such as *gst* and resistance-related mechanisms including glutathione (GSH) for mapping the genomic resistance network in this pathogen. The correlation between GST and antimicrobial resistance will be elucidated in order to expand the genetic resistance network in this bacterium against antimicrobial agents.

SESSION B4:
BIOMEDICAL SCIENCE

B4_001_OA: ESTROGENIC ACTIVITY OF EIGHT COMMERCIAL TRADITIONAL WOMEN REMEDIES ANALYZED BY YEAST TWO HYBRID SYSTEM

Palita Paewthaisong, Sineenat Siri*
School of Biology, Institute of Science, Suranaree University of Technology, Nakhon Ratchasima 30000, Thailand
*e-mail: ssinee@sut.ac.th

Abstract: Thai traditional medicine is an array of indigenous medical practice that has been passed down from generation to generation. Some traditional formulas have been long used for remediation of gynecological symptoms and eventually commercialized as traditional medicines and dietary supplements, especially for peri- and post-menopausal women. This work hypothesizes that these traditional women remedies and supplements may possess estrogenic activity; however, no evaluation has been done. Thus, this study aims to assess the estrogenic activity of 8 traditional women remedies, commercially available for the treatment of unbalanced menstruation symptoms, designated as brands S1, S2, S3, S4, S5, S6, S7, and S8. These powder samples (1 g) were extracted in boiling water (10 ml) for 1 h. The estrogenic activity was evaluated by the yeast two-hybrid (Y2H) system consisting of the ligand binding domain of human estrogen receptor alpha (hERα) and the receptor interaction domain of human transcriptional intermediary factor 2, together with the β-galactosidase gene as the reporter. The estrogenic activity of 8 water-extracted samples (1×10^{-10} to 5×10^{-2} g/ml) was determined by the β-galactosidase activity of the Y2H system. Among 8 samples, only three samples (S1, S2, and S3) had the weak estrogenic activity as compared with the standard estradiol; the estrogenic relative potency (RP) of 527.0×10^{-2}, 39.7×10^{-2} and 1.4×10^{-2}, respectively. The results of this work suggested that some commercially traditional women remedies possessed the estrogenic activity via the interaction with hERα, which would be useful information for users and traditionally medicinal industries.

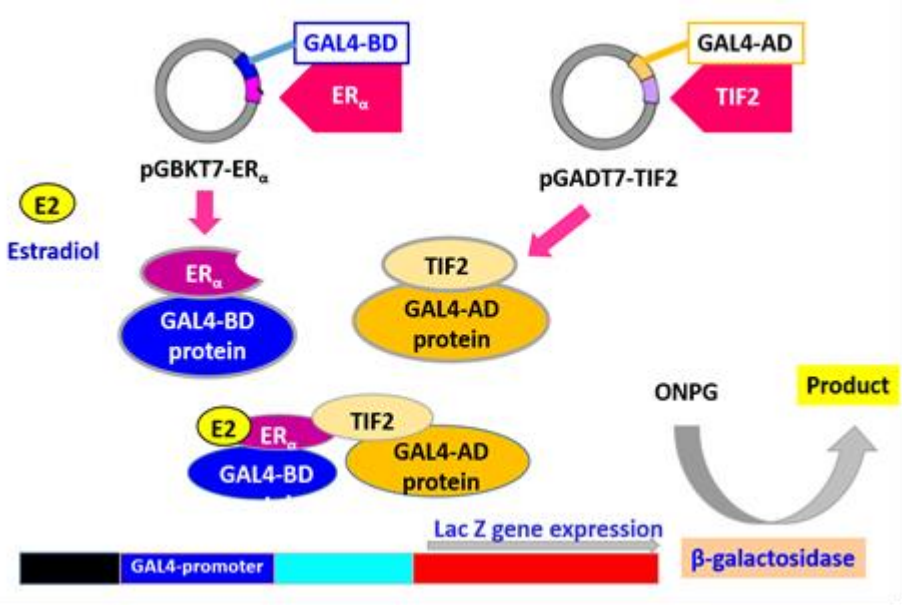


Figure 1. Schematic diagram of the produced yeast two hybrid system to determine the estrogenic activity.

B4_002_PA: CHIMERIC ANTIGEN RECEPTOR (CAR) T CELL AGAINST CHRONIC HEPATITIS C VIRUS INFECTION

Chulanetra Monrat*, Glab-ampai Kittirat, Chaicumpa Wanpen
Siriraj Center of Research Excellent on Therapeutic proteins and antibody engineering, Department of Parasitology, Faculty of Medicine Siriraj Hospital. Mahidol University, Thailand
*e-mail: monrat.chl@mahidol.ac.th

Abstract: Hepatitis C virus (HCV) infection is a chronic liver-infection which affects health and economy worldwide as a leading cause of advanced liver diseases and sometimes bringing consequences such as hepatic fibrosis and hepatocellular carcinoma. There is no vaccine for preventing the infection, moreover, resistance to the direct-acting antiviral drug, which is the recent-effective-therapeutic approach, have been reported. Therefore, the alternative treatment of HCV infection is required. Among HCV-infected patients, only 30% are able to clear the infection, besides T cell exhaustion is one of the causes of viral clearance failure. Chimeric antigen receptor (CAR) T cells against HCV could be an alternative treatment of the infection because it could together perform an anti-viral activity and recovering the viral-specific T cell function.

In this study, NS3 and NS5A are the HCV proteins expressed on the surface of the chronic-HCV-infected Huh7 cells, identified by immunofluorescence staining. Human single-chain antibody fragments (HuScfvs) which bound to the surface-HCV protein were selected from the phage-displayed Huscfv library. The HuScfvs were expressed and tested binding ability to the infected cells. Then, the *antigen-bound huscfv* gene was cloned into the CAR-plasmid backbone and transduced to Jurkat cell line. The CAR-transduced-Jurkat cells were able to produce interferon-ɣ after co-culturing with the chronic HCV infected cells (Figure1).

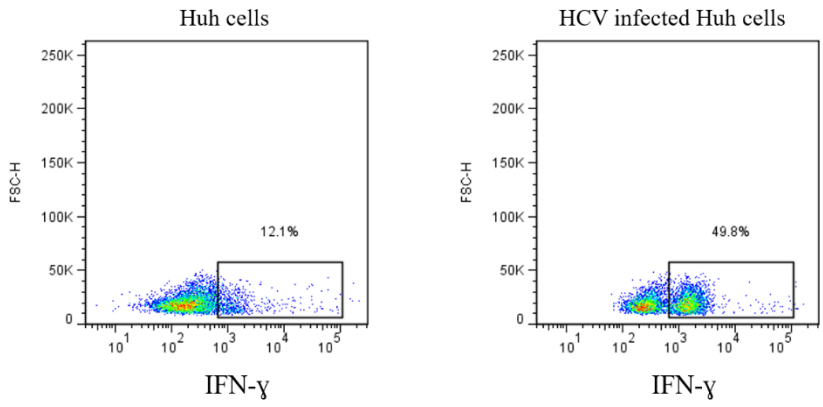


Figure 1.

B4_003_PA: DEVELOPMENT OF REAL-TIME LAMP FOR QUANTIFICATION OF URINE IP-10 mRNA BIOMARKER OF LUPUS NEPHRITIS USING A PORTABLE TURBIDIMETER

Jantana Kampeera[1], Narong Arunrut[1], Thitima Benjachat Suttichet[2], Assawapong Sappat[3], AdisornTuantranont[3], Yingyos Avihingsanon[2], Wansika Kiatpathomchai[1,*]

[1]Bioengineering and Sensing Technology Research Team, National Center for Genetic Engineering and Biotechnology, National Science and Technology Development Agency (NSTDA), Pathum Thani 12120, Thailand

[2]Department of Medicine, Faculty of Medicine, Center of Excellence in Immunology and Immune-mediated Diseases, Chulalongkorn University, Bangkok, Thailand

[3]Graphene and Printed Electronics for Dual-Use Applications Research Division (GPERD), National Science and Technology Development Agency (NSTDA), Pathum Thani 12120, Thailand

*e-mail: wansika@biotec.or.th

Abstract: Lupus nephritis (LN), the severe form of Systemic lupus erythematosus (SLE), could lead to the end-stage kidney disease or death. Although a kidney biopsy is essential for diagnosis, re-examination is difficult because the patient is injured by kidney puncture and suffered from complications. Attempts have been made to determine the expression of mRNA and protein associated with the pathogenesis of LN in urine by molecular techniques for use as biomarkers without causing pain. Urine Interferon-inducible protein-10 (IP-10) is an important biomarker that can be used for diagnosis and prognosis including monitoring response to treatment. Here, we report a successful development of a sensitive, highly specific and quantitative real-time Loop-mediated isothermal amplification (real-time LAMP) technique to detect IP-10 gene mRNA using a portable turbidimeter. The optimized conditions at 63 °C for 1 h using a set of IP-10 specific LAMP primers gave the detection limit at 1000 copies of RNA *in vitro* transcripts. After evaluation with 50 urine samples, the real-time LAMP (at 41 min cut off) showed 100% sensitivity, 95.23% specificity, and 98% accuracy when compared to the real-time PCR. The one-step real-time LAMP using a portable turbidimeter is quite simple and inexpensive therefore it could be able to practical use in the hospital.

B4_004_PA: COMBINED LOOP-MEDIATED ISOTHERMAL AMPLIFICATION AND LATERAL FLOW DIPSTICK FOR SENSITIVE DETECTION OF *Mycobacterium tuberculosis*

Pakapreud Khumwan[1], Wansadaj Jaroenram[1], Jantana Kampeera[1], Narong Arunrut[1], Sarawut Sirithammajak[1], Angkana Chaiprasert[2], Wansika Kiatpathomchai[1,*]

[1]Bioengineering and Sensing Technology Research Team, National Center for Genetic Engineering and Biotechnology (BIOTEC), National Science and Technology Development Agency (NSTDA), Pathum Thani 12120, Thailand

[2]Research Affairs, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok 10700, Thailand

*e-mail: wansika@biotec.or.th

Abstract: Tuberculosis (TB) is listed among the leading infectious diseases by the World Health Organization (WHO) that accounts for millions of deaths annually and causes tremendous burden to the global economy. With a high prevalence of TB in developing countries, there is a critical need for a highly accessible and affordable point-of-care (POC) test for TB diagnosis. In response to this challenge, we herein report the development of rapid POC test for *Mycobacterium tuberculosis* (*Mtb*) based on the principles of loop-mediated isothermal amplification (LAMP) integrated with lateral flow dipstick (LFD). Our technique can be conveniently performed at 65°C for 1 hour, followed by probe hybridization and analysis on the LFD that could achieve a one-cell equivalent limit of detection. In addition, the DNA probe exhibited great specificity to *Mtb* without cross-reacting with other 23 non-TB bacteria. Hence, we were able to demonstrate a 100% diagnostic accuracy of tuberculosis from the cohort of 104 blinded clinical samples. Together with the platform's inherent robustness and portability, our novel *Mtb*-LAMP-LFD sensor is a suitable screening tool for resource-limited settings.

B4_005_PF: OPTIMISATION OF HIGH RESOLUTION MELTING CURVE ANALYSIS (HRMA) TO DETECT MUTANT CALRETICULIN IN *JAK2* NEGATIVE MYELOPROLIFERATIVE NEOPLASM PATIENTS

Htoo Pyei Hlaing[1], Jarichad Toosaranont[1], Rattaphan Lamoon[2], Dusit Jit-ueakul[3], Boonrat Tassaneetrithep[4], Archrob Khuhapinant[2], Chalermchai Mitrpant[1,5,*]

[1]Department of Biochemistry, Faculty of Medicine, Siriraj Hospital, Mahidol University, Bangkok, Thailand

[2]Division of Haematology Department of Medicine, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand

[3]Department of Internal Medicine, Faculty of Medicine Vajira Hospital, Navamindradhiraj University, Bangkok, Thailand

[4]Office for Research and Development, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand

[5]Perron Institute for Neurological and Translational Science, Perth, Western Australia, Australia

*e-mail: chalermchai.mit@mahidol.edu

Abstract: Myeloproliferative neoplasms are chronic haematologic malignancies characterized by abnormally increased production of blood cells in bone marrow. Chronic myeloid leukemia (CML), polycythemia vera (PV), essential thrombocythemia (ET), and primary myelofibrosis (PMF) are included in this group and three major clonal markers associated with these diseases are somatic mutation on Janus kinase 2 (*JAK2)*, thrombopoietin receptor (*MPL*) or calreticulin (*CALR*). In our previous work, we used heteroduplex mobility assay (HMA) to detect somatic mutation of CALR in patients with essential thrombocythemia or primary myelofibrosis. Our HMA assay using 6% polyacrylamide gel electrophoresis (PAGE) can detect 52 base pair deletion (type I mutation), 5 base pair insertion (Type II mutation) and other types of mutations. However, the limit of detection was at 25% for type I mutation. We optimized the high-resolution melting analysis (HRMA) to detect type I CALR mutation. Wild type and mutant alleles were isolated and re-amplified to perform the Sanger sequencing to confirm its identity. Amplified wild type allele was used for assay optimization using different pairs of primer encompassing exon9 of *CALR*. Mixture of wild type and mutant amplicons were prepared as 50%, 25%, 12.5%, 6.25%, 3.125%, 1.5% and 0.75% respectively, and were utilized to determine limit of detection. Limit of detection of our assay was at 6.25%. The work provides information on the assay that could be used for diagnosis in this group of patients.

B4_006_PA: ANTICANCER ACTIVITY OF STILBENE DERIVATIVES FROM PEANUT HAIRY ROOT CULTURE ON CHOLANGIOCARCINOMA

Donruetai Thalapphet, Apinan Limmongkol, Suchada Phimsen*
Department of Biochemistry, Faculty of Medical Science, Naresuan University, Phitsanulok, 40002, Thailand
*e-mail: suchadaph@nu.ac.th

Abstract: Cholangiocarcinoma (CCA) is still a health problem in Thailand especially north and northeastern. All currently available anticancer agents for CCA have disadvantages due to the resistance and side effects. Recent report demonstrated that the peanut hairy root extract (PHRE) has high antioxidant activity and rich of stilbene derivatives compound such as resveratrol, arachidin-1 and -3. Here, we aimed to investigate the effect of stilbene derivatives from peanut hairy root culture on the viability, apoptosis and migration/invasion of human CCA cell lines. PHRE treatment on CCA cell viability, apoptosis, migration and invasion were investigated using MTT, Annexin V /7AAD staining, Hoechst33342 staining, wound healing and Transwell invasion assays. The cell viability showed that PHRE exhibited potent anti-proliferative activity in all CCA cell lines namely KKU-055 (a poorly differentiated adenocarcinoma), KKU-214 (moderately differentiated adenocarcinoma), KKU-213 (well differentiated adenocarcinoma) and KKU-213L5 (high metastatic CCA) in a dose-and time-dependent manners but it was strongest effect in high metastatic CCA cells (the lowest IC50). We further found that PHRE treatment significantly induced cell apoptosis by increased DNA condensation and fragmentation. In addition, low doses of PHRE were effectively suppressed CCA cells migration and invasion. These results suggested that stilbene derivatives from peanut hairy root culture can be a potentially used to inhibit CCA cell growth and metastasis.

B4_007_OF: PlASMA EXOSOME miR-21 AS THE INTERSTITIAL FIBROSIS AND TUBULAR ATROPHY(IF/TA) BIOMARKER IN KIDNEY TRANSPLANTATION

Sunaree Saejong[1], Natavudh Townamchai[2], Poorichaya Somparn[3], Pattarin Tangtanatakul[4], Asada Leelahavanichkul[5,*], Nattiya Hirankarn[5]

[1]Medical Microbiology Interdisciplinary Program, Graduate School, Chulalongkorn University, Bangkok 10330, Thailand

[2]Center of Excellence in Solid Organ Transplantation, Division of Nephrology, Department of Medicine, Chulalongkorn University, Bangkok 10330, Thailand

[3]Center of Excellence in Systems Biology, Faculty of Medicine; Chulalongkorn University, Bangkok 10330, Thailand

[4]Department of Transfusion Medicine and Clinical Microbiology, Faculty of Allied Health Sciences; Chulalongkorn University, Bangkok 10330, Thailand

[5]Center of Excellence in Immunology and Immune-Mediated Diseases, Department of Microbiology, Faculty of Medicine; Chulalongkorn University, Bangkok 10330, Thailand

*e-mail: a_leelahavanit@yahoo.com

Abstract: Interstitial fibrosis and tubular atrophy (IF/TA) are major cause of chronic allograft rejection in post kidney transplantation (post-KT). A non-invasive biomarker to diagnose and predict IF/TA is still absent. Plasma exosomes has possibly become a potential biomarker in various conditions including fibrosis since plasma exosomes is found to carry microRNAs(miRs) which modulate the interaction between cell. In this study, we aim to investigate whether the expression of miR-21 in plasma exosomes are associated with the severity of IF/TA in post-KT patients. The plasma samples of post-KT-patients were categorized into 4 groups based on histopathology including IF/TA grade I (5-25%) (n=5), grade II (26-50%) (n=5), grade III (≥50%) (n=5) and stable graft function(n=5). Isolated plasma exosomes and miR-21 expression were characterized by nanoparticle tracking analysis and qPCR (quantitative Polymerase Chain Reaction), respectively. The correlation between miR-21 expression and kidney functions was evaluated. The result showed that plasma exosomes miR-21 expression was significantly increased in patients with IF/TA grade II when compared to patients with stable graft function ($p < 0.01$), while IF/TA grade I and III were not significantly different ($p = 0.9634$, $p=0.8657$ respectively). Plasma exosomes miR-21 expression was not significantly correlated with serum creatinine and proteinuria. This data suggested that plasma exosomes miR-21 might represent the pathological changes during a progression of fibrosis specifically in patients with IF/TA grade II but not in the patients with IF/TA grade I and III. Increasing sample size is necessary to validate the association between plasma exosomes miR-21 and IF/TA.

B4_008_PF: THE STUDY OF *UT2B17* POLYMORPHISM IN REPRESENTATIVE THAI MUSLIM POPULATION IN SONGKHLA PROVINCE

Sirikanya Anantasena, Wandee Udomuksorn*
Department of Pharmacology, Faculty of Science, Prince of Songkla University, Hat Yai, Songkhla 90110, Thailand
*e-mail: wandee.u@psu.ac.th

Abstract: The human UDP glucuronosyltransferase 2B17 (UGT2B17) is an enzyme in phase 2 metabolism which has a major role in xenobiotic and endobiotic glucuronidation, especially testosterone. UGT2B17 is encoded by *UGT2B17* gene. The *UGT2B17* polymorphism may affect to an abnormal transcription and lack of enzyme activity. A deletion polymorphism in *UGT2B17* gene has a high prevalence in Asian. However, there is no report in Thai population. The purpose of this study was to investigate *UGT2B17* polymorphism in representative Thai-Muslim population in Songkhla province. Fifty genomic DNAs were extracted from Thai-Muslim neonates cord blood samples and then were amplified the exon1 region of *UGT2B17* gene by PCR. The mutations were detected by direct sequencing. The result showed that 35 of the 50 neonates (70%) were homozygous deletion (del/del), 10 (20%) were heterozygous deletion (del/ins), and 5 (10%) were wild type homozygous insertion (ins/ins) of *UGT2B17* gene. There was 60 bps insertion at position -111 in the promoter region of *UGT2B17* gene and the sequence became to be *UGT2B15* gene, which indicated that this sample lack of *UGT2B17* gene. Conclusions, *UGT2B17* deletion polymorphism is the highest prevalence in representative Thai-Muslim population which is similar to Japanese and Korean.

B4_009_PF: BIOLOGICAL ACTIVITIES OF PAPER MULBERRY EXTRACT (*Broussonetia papyrifera* (L.) Vent.)

Orawan Wanachewin[1], Rujirek Chaiwongsa[2], Kanyamas Choocheep[2], Prachya Kongtawelert[3], Wipawan pukumpuang[1,*]

[1]Program in Biological Sciences, Chiang Rai Rajabhat University, Chiang Rai, Thailand

[2]Faculty of Associated Medical Sciences, Chiang Mai University, Chiang Mai, Thailand

[3]Thailand Excellence Center for Tissue Engineering and Stem Cells, Department of Biochemistry, Faculty of Medicine, Chiang Mai University, Chiang Mai, Thailand

*e-mail: wipawan.pu@gmail.com

Abstract: This study aimed to evaluate the effects of *B. papyrifera* the antibacterial activities against various bacteria, cytotoxicity against RAW 264.7, and nitric oxide production. Various parts of the plant were extracted using hot water to obtain young leave (YL), old leave (OL), stem (S) and bark (B) extracts. The crude extracts (500 mg/ml) were determined for their antibacterial activity against *Staphylococcus aureus* TISTR 746, methicillin-resistant *Staphylococcus aureus* (MRSA), *Bacillus cereus* TISTR 2372, *Escherichia coli* TISTR 527, *Pseudomonas aeruginosa* TISTR 2370 and *Salmonella enterica* TISTR 2519 using agar disc diffusion method. The result showed that all aqueous extracts exhibited the growth of the tested bacteria with inhibition zone ranged from 7.17 – 10.00 mm. The B extract gave the highest antibacterial against all Gram positive bacteria with inhibition zone ranged from 8.33 – 9.83 mm. In addition, the cytotoxicity on RAW 264.7 cell was evaluated using MTT assay. The anti-inflammatory effect was investigated using *in vitro* a lipopolysaccharide (LPS) induced nitric oxide (NO) production on RAW 264.7 macrophage model. All parts of the extracts (0.1-1000 µg/ml) had low cytotoxicity except S, and B extracts with 1000 µg/ml that caused cell death up to 40%. The S extract at 100 µg/ml possessed the highest inhibitory effect on NO production with 93% inhibition of NO level relative to lipopolysaccharide (LPS)-induced control. In conclusion, *B. papyrifera* is an interesting plant further used for applying as natural health products.

B4_010_PA: SELECTION OF SPECIFIC ANTIBODIES AGAINST ADVANCED GLYCATION END PRODUCTS (AGEs)

Rungthiwa Tosaard[1], Areerat Ruankham[1], Nanthanit Jaruseranee[1,2], Montarop Yamabhai[3], Natsaran Saichana[1, 2], Plaipol Dedvisitsakul[1,*]

[1]School of Science, Mae Fah Luang University, Chiang Rai 57100, Thailand

[2]Microbial Products and Innovation Research Unit, Mae Fah Luang University, Chiang Rai 57100, Thailand

[3]Molecular Biotechnology Laboratory, School of Biotechnology, Institute of Agricultural Technology, Suranaree University of Technology, 111 University Avenue, Nakhon Ratchasima 30000, Thailand

*e-mail: plaipol@mfu.ac.th

Abstract: Advanced glycation end products (AGEs) are irreversible posttranslational protein modifications that are generated by non-enzymatic reactions between protein and sugar molecules. The modifications lead to protein alterations that affect protein structure and function resulting in various pathologies. Accumulation of AGEs is a key mechanism that mediates complications in diabetes. In this study, bovine serum albumin (BSA) was modified by an *in vitro*-glycation process and the glycated BSA molecules were used as target for selection of AGEs-specific antibodies from a phage display library of human single-chain fragment variable (scFv). In our preliminary study, many AGEs-bound phages were selected after extensive washing and subtraction against BSA. The Enzyme-linked immunosorbent assay (ELISA) showed that the AGEs-bound phage fraction has more than 2.48±0.07 folds higher affinity to AGEs than those of the BSA molecules. These AGEs-bound phages could be potential sources of scFv antibodies against AGEs molecules derived from BSA. The further selection of scFv antibodies against AGEs molecules from these AGEs-bound phages may be beneficial to the development of antibodies for the detection or quantification of AGEs in biological samples.

B4_011_PA: THE INHIBITION OF ADVANCED GLYCATION END PRODUCTS FORMATION BY SOME VEGETABLES

Areerat Ruankham[1], Jirapat Chinapunjaphol[1], Salitta Supanam[1], Siriwan Chaikwang[1], Lalida Chanchaem[1], Kanchana Watla-iad[1, 2], Plaipol Dedvisitsakul[1,*]

[1]School of Science, Mae Fah Luang University, Chiang Rai 57100, Thailand

[2]Center of Chemical Innovation for Sustainability Research Unit, Mae Fah Luang University, Chiang Rai 57100, Thailand

*e-mail: plaipol@mfu.ac.th

Abstract: Chronic hyperglycemia can lead to the formation of advanced glycation end products (AGEs). The accumulation of the AGEs is a crucial mechanism that causes complications in diabetes such as retinopathy, cataract, kidney disease, peripheral neuropathy, cardiovascular diseases, and Alzheimer's disease. The aim of this study was to investigate the inhibition of AGEs formation property of crude ethanolic extract from common vegetables presented in the northern of Thailand using fluorescent spectrometric method. The results suggested that some vegetable crude extracts have potential to inhibit the AGEs formation. The IC_{50} values for the inhibition of AGEs formation of *Jasminum adenophyllum* Wall, *Melientha suavis* Pierre, *Polygonum odoratum* Lour, and *Gymnema inodorum* were 0.50, 0.44, 0.32 and, 0.59 mg/ml, respectively. All tested extracts inhibited AGE formation in a dose-dependent manner. However, the AGEs inhibition activities of these vegetable extracts were less than that of the Aminoguanidine (IC_{50} < 0.12 mg/ml), a synthetic AGEs inhibition drug, which was used as a positive control. This work provided the fundamental information for alternative drug discovery and nutritional recommendation for diabetic patients.

SESSION B5:
BIODIVERSITY

B5_001_PA: GENETIC DIVERSITY OF THE ORIENTAL GARDEN LIZARD *Calotes versicolor* (Daudin, 1802) IN NORTHERN THAILAND

Watee Kongbuntad[1], Weerachai Saijuntha[2,*]
[1]Program in Biotechnology, Faculty of Science, Maejo University, Chiang Mai 50290, Thailand
[2]Walai Rukhavej Botanical Research Institute (WRBRI), Mahasarakham University, Maha Sarakham 44150, Thailand
*e-mail: warachai.s@msu.ac.th

Abstract: In Thailand the Oriental Garden Lizard, *Calotes versicolor* (Daudin, 1802) is currently listed as a protected wild animal in Thailand. Its population is likely to be dramatically reduced due to massive hunting in several areas in this country. Basic information on its population genetics is therefore needed to facilitate its conservation. Thus this study was performed to determine the genetic diversity of *C. versicolor* from ten different localities in northern Thailand. A total of 47 samples were analyzed using the mitochondrial cytochrome c oxidase subunit 1 (COI). The result showed that genetic diversity of the lizard was quite high with 34 haplotypes observed. In addition, there was no shared haplotype between different localities. These haplotypes were classified into six haplogroups (Cv-1 to Cv-6) corresponds to the geographical localities. Haplogroup Cv-1 contained 9 and 2 specimens from Kamphaeng Phet and Phetchaboon Provinces, respectively. Haplogroups Cv-2 to Cv-5 contained 12, 4, 5, and 3 specimens from Phichit, Tak, Uttaradit and Phetchaboon Provinces, respectively. Whereas haplogroup Cv-6 contained 12 specimens from Chiang Rai, Sukhothai, Lampang, and Phayao Provinces. This study reveals that *C. versicolor* in northern Thailand represent a species complex. However, morphological comparisons and genetic investigations using more specimens from other regions are needed to further evaluate the taxonomic relationship between the populations and better understand the evolution of *C. versicolor* in Thailand, as well as other areas in *C. versicolor* distribution ranges.

B5_002_OF: GENETIC DIVERSITY AND REINTRODUCTION SOURCE OF THE COMMON BUTTERFLY LIZARD, *Leiolepis belliana* (SQUAMATA: AGAMIDAE), ON PHRA ISLAND, CHON BURI PROVINCE

Nutthanun Khantasup, Thongchai Ngamprasertwong, Nontivich Tandavanitj*
Department of Biology, Faculty of Science, Chulalongkorn University, Bangkok, Thailand 10330
*e-mail: Nontivich.T@chula.ac.th

Abstract: Species translocation has currently been a common practice for conservation of threatened or endangered species. The common butterfly lizard, *Leiolepis belliana* (Hardwicke & Gray, 1827), is among such species, which have experienced population decline and have been reintroduced in the wild. However, information related to population genetic structure and genetic diversity of *L. belliana* is inadequate. The objectives of this study are to assess the genetic diversity and investigate the origin of the putative reintroduced *L. belliana* on Phra Island, Chon Buri Province, which is a conservation site for the butterfly lizards, using mitochondrial cytochrome *b* sequences. Tail tissue samples (n = 9) were collected from Phra Island and some mainland localities. Mitochondrial cytochrome *b* sequences (1,040 bps) revealed no genetic variation (h = 0, π = 0) with one unique haplotype (N = 1). Moreover, comparison of sequences from Phra Island and other mainland localities revealed the potential source of reintroduction, which was possibly southern Thailand. The results obtained from this study highlighted the need for serious conservation plan in the near future to maintain genetic uniqueness and strengthen genetic diversity of *L. belliana* population on the island.

B5_003_PA: PRELIMINARY ANATOMICAL CHARACTERS IN GENUS *Kadsura* (SCHISANDRACEAE) IN THAILAND

Kwanchanok Virasiri[1], Jantrararuk Tovaranonte[2,*]

[1]Mae Fah Luang Botanical Garden, Mae Fah Luang University, Tasud, Muang, Chiang Rai 57100
[2]School of Science Mae Fah Luang University, Tasud, Muang, Chiang Rai 57100
*e-mail: Jantrararuk@mfu.ac.th

Abstract: *Kadsura* has belonged to the Schisandraceae and comprises two species of woody climbers in Thailand. They had distributed in hill evergreen forest at elevation of 800–1460 meters above the sea level in northern Thailand and their fruit was edible. Due to their distribution and usefulness, they had been assigned as rare species. Therefore, the botanical description of each species was needed for taxonomic work. This study aimed to examine the anatomical characters to support the taxonomic work. The result showed that epidermal cells were usually irregular, polygonal and jigsaw in shape. Patterns of anticlinal walls were straight, sinuous and sinuate. The stomata types were anomocytic or paracytic. Therefore, the shape of epidermal cell can be used to distinguish into species level.

Keywords: Anatomy, Schisandraceae, Thailand

B5_004_OF: EFFECTS OF HYPO-OSMOTIC SHOCK ON THE RESPONSE OF HEMOLYMPH OSMOLALITY IN THE MUD CRAB *Scylla olivacea* (Herbst, 1796)

Phurich Boonsanit, Supanut Pairohakul*
Department of Marine Science, Faculty of Science, Chulalongkorn University, Bangkok, Thailand
*e-mail: Supanut.P@chula.ac.th

Abstract: The mud crab *Scylla olivacea* are an ecologically and commercially important crab species in Thailand. These crabs inhabit mainly in mangroves where they could face salinity fluctuations. Salinity changes especially acute low salinity could lead to physiological stresses for these mud crabs in term of osmoregulation. Thus, this study aims to examine the effects of hypo-osmotic shock on hemolymph osmolality of the mud crab *Scylla olivacea*. Adult males *S. olivacea* were acclimated at salinity of 25 psu (the control group) for a week prior to the experiment. After the acclimation period, the crabs were transferred from 25 psu to 15 and from 25 psu to 5 psu immediately. Hemolymph osmolality of the crabs in each salinity treatment was measured within 3, 6, 12, 24 and 72 hours as well as 7 days after the exposure to salinity changes. The results showed that the crabs were hyperosmoregulators at salinities of 5, 15 and 25 psu. After acute salinity changes, hemolymph osmolality reached and was constant within 12 and 72 hours after exposure to the salinity of 15 psu and 5 psu respectively. The results demonstrated that *S. olivacea* had well adapted to salinity changes in term of hypo-osmotic shock. Furthermore, different salinity levels of hypo-osmotic shock can also affect osmoregulatory performance of the crabs. The crabs that faced with the lower amplitude of salinity changes showed well responses compared with the higher amplitude.

B5_005_PA: PLANTS DIVERSITY OF DOI NGAM, MAE FAH LUANG UNIVERSITY

Peerapol Saisaard[1], Jantrararuk Tovaranonte[2,*]
[1]Mae Fah Luang University Botanical Garden, 333 Moo1, Thasud, Muang, Chiang Rai 57100
[2]School of Science Mae Fah Luang University, 333 Moo1, Thasud, Muang, Chiang Rai 57100
*e-mail: Jantrararuk@mfu.ac.th

Abstract: The aim of this study was to investigate the plant diversity in Doi Ngam which located in Mae Fah Luang University. Doi Nagm composed of two small mountain whose peaks situates at elevations of height 673 and 694 meters above sea level. The study showed the diversity of plant was 34 families 39 genera Amongst 145 species, five had been designated, there were five species which designed as threatened plants in Thailand, *Spondias bipinnata* Airy Shaw & Forman, *Dillenia ovata* Wall., *Flemingia brevipes* Craib., *Phylacium majus* Collett & Hemsley and *Phanera ornata* (Kurz) Thoth.var.*burmanica* (K. Larsen & S.S. Larsen) Bandyop., P.P. Ghoshal & M.K. Pathak. Leguminoceae-Papilionaceae had been commonly found with 25 species. Poaceae - Bambusoideae was dominant and grew very well in huge area. Moreover, *Platycerium wallichii* Hook. f. was discovered only on the peak of mountains. Therefore, all document will be used to establish the nature trails in Doi Ngam for botanical education and nature appreciation.

Keywords: plant diversity, Doi Ngam, Nature appreciation

B5_006_OF: OVIPOSITIONAL PREFERENCES AND LARVAL DEVELOPMENT OF TAWNY COSTER *Acraea terpsicore* (LINNAEUS, 1758) (LEPIDOPTERA: NYMPHALIDAE) ON FOUR PASSION VINES

Chitsanuphong Phanthian[1,2], Chatchawan Chaisuekul[2,*]
[1]Zoology Program, Department of Biology, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand
[2]Center of Excellence in Entomology: Bee Biology, Biodiversity of Insects and Mites, Department of Biology, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand
*e-mail: chatchawan.c@chula.ac.th

Abstract: Acraea terpsicore (Linnaeus, 1758), a common butterfly in SE Asia that utilized wild passion vine plants (genus *Passiflora*) as host plants, is being exposed to several exotic fruits and ornamental *Passiflora* plants due to the expansion of urbanization and globalization. The increasing choices of passion vine plants may affect the preferences of this butterflies. Therefore, this study aimed to compare the ovipositional preferences of adults *A. terpsicore* on 4 passion vine plants between one wild host plant, *Passiflora foetida*, and three exotic cultivated plants, *P. edulis*, *P. x alata-caerulea* and *P. x coccinea-caerulea*, as well as to compare the survivorship and developmental times of *A. terpsicore* caterpillars on these passion vine plants. Wild *A. terpsicore* females were caught from eastern central plain of Thailand for the oviposition preferences experiment in laboratory. From a total of 27 wild mated females, only 8 females oviposited in this study. Most eggs from the total of 457 eggs were found on *P. edulis* (60.54%) and *P. foetida* (33.88%), while limited number of eggs were found on *P. x alata-caerulea* (2.89%) and *P. x coccinea-caerulea* (2.69%). All of caterpillars hatched from eggs on *P. edulis* (100.00%), but they died within 24 hours. In contrast, the caterpillars on *P. foetida* had the lowest hatching rate (11.59%), but most of hatched caterpillars can complete the development to adult. Only caterpillars on *P. foetida* and *P. x coccinea-caerulea* can completed the development to adult. The developmental times of caterpillars on these two plants were not significantly different (Wilcoxon rank sum test with continuity correction, $W = 141$, $P\text{-value} = 0.1012$), but pupal stage on *P. foetida* was significantly longer than *P. x coccinea-caerulea* ($W = 169.5$, $P\text{-value} = 0.0016$**). Caterpillars of *A. terpsicore* can utilize some exotic plant, *P. x coccinea-caerulea*, probably due to similar morphologies and chemical profile to wild host plant, *P. foetida*.

B5_007_PA: PRELIMINARY RESULTS OF THE PLANT DIVERSITY SURVEY, PHA HUNG LIMESTONE MOUNTAIN, MAE SAI DISTRICT, CHIANG RAI PROVINCE

Suchaphat Kongthong[1], Martin van de Bult[2], Jantrararuk Tovaranonte[3,*]

[1]Mae Fah Luang Botanical Garden, Mae Fah Luang University, Tasud, Muang, Chiang Rai, 57100

[2]Doi Tung Development Project, Mae Fah Luang Foundation Under Royal Patronage, Mae Fah Luang, Chiang Rai, 57240

[3]School of Science, Mae Fah Luang University, Tasud, Muang, Chiang Rai, 57100

*e-mail: Jantrararuk@mfu.ac.th

Abstract: PHA HUNG is the highest limestone mountain in Doi Tung, Mae Sai district, with an elevation of 1,425 meters above sea level. This unique limestone outcrop, of approximately 5 km² in size, supports a very high number of endemic plant species and is acknowledged as a biodiversity hotspot of high biological importance. The aim of this study is to investigate plant diversity. We recorded a total of 49 species in 32 families. Among these plant species, 15 species were considered as rare, vulnerable and endangered. Rare plants include *Goniothalamus cheliensis* Hu, *Mitrephora wangii* Hu, *Polygonatum kingianum* Collett & Hemsl., *Synotis cappa* (Buch. – Ham. ex D. Don) C. Jeffrey & Y.L. Chen, *Agapetes lobbii* C.B.Clarke, *Dicellostyles zizyphifolia* (Griff.) Phup., *Wrightia karaketii* D.J.Middleton. Vulnerable plants include *Euonymus sootepensis* Craib, *Agapetes megacarpa* W.W.Sm., *Hiptage bullata* Craib, *Coelogyne flaccida* Lindl., *Acer chiangdaoense* Santisuk. Endangered plants include *Sapria himalayana* Griff., *Cheirostylis spathulata* J.J.Sm. and *Sauropus poomae* Welzen & Chayam. Our preliminary results supports that Pha Hung is a limestone mountain of significant importance for plant diversity and therefore, management plans for limestone areas like this, should be in place for the sustainable conservation of these unique biodiversity hotspots.

Keywords: Limestone, plant diversity, Chiang Rai

B5_008_OF: AVIFAUNA IN PUBLIC PARKS IN BANGKOK AND THE EFFECTS OF PARK AREA

Sutanan Pinmaneenopparat, Pongchai Dumrongrojwatthana*
Department of Biology, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand
*e-mail: pongchai.d@chula.ac.th

Abstract: In an urbanizing world, public parks in urban landscape could play an important role in diversity conservation especially for birds. Park area was identified as a key factor that influence the bird diversity in the park. But scientific research to prove this is still scarce in Thailand. Thus, this study was conducted to survey bird diversity in 24 public parks in Bangkok metropolis and test relationships between diversity indicators and park area. A total of 71 species of birds were found and 51 species were resident species. *Copsychus saularis*, *Pycnonotus blanfordi*, *Passer montanus* and *Psilopogon haemacephalus* were observed in every park. More than half of the observed species were found less than 33% of study sites. Two species which have conservation status were found in the area. Within 24 parks, resident species richness ranged between 14 to 37 with an average of 22±5. The number of species of resident birds were increase with the park area. In conclusion, the public park in the city can provide habitats for birds including migratory species and even species with conservation status and the large parks tend to harbor more resident bird species.

B5_009_PA: ABUNDANCE AND COMPOSITION OF JUVENILE CORALS IN MU KO CHANG AND MU KO SAMET,THE EASTERN GULF OF THAILAND

Wanlaya Klinthong*, Charernmee Chamchoy, Thamasak Yeemin, Makamas Sutthacheep
Marine Biodiversity Research Group, Department of Biology, Faculty of Science, Ramkhamhaeng University, Bangkok 10240, Thailand
*e-mail: klinthong_fai@hotmail.com

Abstract: Knowledge on temporal and spatial variation in coral recruitment patterns is very important for understanding on population dynamics and applying for effective management of coral reefs in the marine protected areas. It is also necessary for measuring the coral reef resilience to natural and human impacts. The impacts of coral bleaching events on reduction of coral recruitment are recognized at several reef sites. In this study, we aimed to examine composition and density of juvenile corals at fifteen reef sites in Mu Ko Chang and Mu Ko Samet, the Eastern Gulf of Thailand. At each study site, quadrats (16x16 cm^2 for each) were randomly placed on available substrates using SCUBA diving and number of juvenile coral colonies (≤ 5 cm in diameter) was carefully observed and counted. Juvenile coral densities were in the range from 7.3 to 37.53 colonies/m^2. The highest density of juvenile corals was observed at Ao Lung Dam while the lowest one was found at Ko Kudi. A total of 19 genera of juvenile corals were commonly observed, including Acropora, Pocillopora, Galaxea, Pseudosiderastrea, Psammocora, Pavona, Fungia, Herpolitha, Lithophyllon, Hydnophora, Turbinaria, Lobophyllia, Symphyllia, Favia, Favites, Goniastrea, Oulastrea, Leptastrea, and Porites. The juvenile corals in the family Faviidae were dominant at all study sites. The juvenile coral densities were significantly different among the study sites (One-way ANOVA, p<0.05). This study provides necessary information for managing coral reefs in the Gulf of Thailand under the impacts of climate change and anthropogenic disturbances.

B5_010_PA: LICHEN FAMILY GRAPHIDACEAE IN MANGROVE FOREST OF PRACHUAP KHIRI KHAN AND PHETCHABURI PROVINCES

Vasun Poengsungnoen*, Pachara Mongkolsuk, Kawinnat Buaruang
Lichen Research Unit, Department of Biology, Faculty of Science, Ramkhamhaeng University, Bangkok, 10240
*e-mail: vasunpoeng@gmail.com

Abstract: Lichen is a composite organism consisting of fungus and algae and/or cyanobacteria functioning in a symbiotic association. Thailand has high diversity of lichens with about 1,300 species however, most of which were reported from northern and northeastern parts. *Graphidaceae* is the largest family of tropical crustose lichens and it is one of the most common inhabitants in mangrove forests. The objective of this study was to explore the diversity of lichen family Graphidaceae in mangrove forests of Prachuap Khiri Khan and Phetchaburi provinces. One hundred and thirty-six specimens were collected from barks of 20 species of mangrove phorophytes during 29–30 March 2019. The morphological and anatomical features of thalli and ascoma were examined with dissecting binocular microscope and light microscope. The secondary compounds were characterized by spot test and thin layer chromatography. All the specimens were identified as 15 species in 7 genera; *Diorygma* Eschw., *Dyplolabia* A. Massal., *Glyphis* Ach., *Graphis* Adans., *Leucodecton* A. Massal., *Phaeographis* Müll. Arg. and *Sarcographa* Fée. The genus *Graphis* showed the highest species diversity with 8 species. It was followed by genus *Phaeographis* (2 spp.) and the rest genera with one species each were recorded. *Graphis sundarbanensis* Jagad. Ram & G.P. Sinha, *Graphis crebra* Vain. and *Graphis analoga* Nyl. were the common lichens. The *Excoecaria agallocha* L., *Bruguiera parviflora* Roxb. and *Rhizophora apiculata* Blume were found as the most preferred phorophyte as they housed 6, 5 and 4 species of lichens, respectively.

B5_011_PA: THE RECOVERY POTENTIAL OF CORALS IN MU KO ANGTHONG, SURAT THANI PROVINCE, THE GULF OF THAILAND

Charernmee Chamchoy*, Wanlaya Klinthong, Thamasak Yeemin, Makamas Sutthacheep
Marine Biodiversity Research Group, Department of Biology, Faculty of Science, Ramkhamhaeng University, Bangkok 10240, Thailand
*e-mail: charernmee14@hotmail.com

Abstract: Coral recovery after bleaching events is controlled by coral larval supply, available substrate, settlement and survival rate of juvenile corals. Larval connectivity among coral populations is a very important aspect for understanding the recovery potential of coral reefs following natural and anthropogenic disturbances. Reef connectivity depends on oceanographic conditions and the sources of coral larval supply. There are varying degrees of self-seeding on coral reefs. This study investigated the coral recruitment patterns and their relationships with adult coral communities at six study sites in Mu Ko Ang Thong, Surat Thani Province, the Western Gulf of Thailand. Live coral covers were in a range of 35.4-49.7 % while dead coral covers were in a range of 34.9-58.8 %. The live coral cover at Ko Hindap and Ko Wua Kantang was significantly higher than those of other reef sites. Low coral recruitment was recorded at Ko Hindap, Ko Sam Sao (East) and Ko Thaiphlao. The brooding coral *Pocillopora* spp. at all study sites showed self-seeding. The broadcast spawning coral Favites showed high degrees of coral self-seeding at the study sites. Recruits of *Pseudosiderastrea tayamai*, Fungia and Turbinaria were frequently observed without their parent colonies. The inter reef connectivity and local coral recruitment are required for further studies to provide proper management strategies of coral reefs in the Gulf of Thailand.

B5_012_PA: ASSESSING FORAMINIFERA ABUNDANCE ON CORAL COMMUNITIES IN CHUMPHON PROVINCE, THE WESTERN GULF OF THAILAND

Sirirat Jaiharn*, Rattanawadee Niamsiri, Laongdow Jungrak, Orathep Mue-suea, Parichat Niyomthai, Makamas Sutthacheep, Thamasak Yeemin
Marine Biodiversity Research Group, Department of Biology, Faculty of Science, Ramkhamhaeng University, Bangkok 10240, Thailand
*e-mail: pattysirirat222@gmail.com

Abstract: Coral reef ecosystems harbor high diversity of benthic organisms. Foraminifera is an important group of meiofauna and can be found in all marine habitats. Scientific data on the ecology of particular foraminifera species lead to the determination of foraminifera as an important bioindicator for understanding about oceanographic status and biogeochemical processes. Previous studies have focused on relationships among species or communities and the environmental factors of the seawater and marine sediments. However, studies on foraminifera from coral reefs are very limited, particularly in the Southeast Asian countries. This study examined the abundance of foraminifera on coral communities in Mu Ko Chumphon, the Western Gulf of Thailand in 2017. The samples were collected at 3-5 cm below the sediment-water interface by SCUBA divers at sixteen study sites, then stained and sieved through 63µm mesh net in a laboratory. The total densities of foraminifera were significantly different among the study sites. The low densities of foraminifera were found at Ko Mattra, Ko Kula, Ko Lawa, Ko Rang Kachiu, and Ko I Raet while the highest one was recorded at Ko Maphrao. The influences of river discharge, organic matter and turbidity may contribute to foraminiferal communities on coral reefs in Mu Ko Chumphon. This study provides important baseline data of foraminifera on the coral communities in the Gulf of Thailand.

B5_013_PA: POPULATION DENSITY OF THE GIANT CLAMS *Tridacna* spp. ON SHALLOW REEF FLATS IN THE WESTERN GULF OF THAILAND

Siriluck Rongprakhon*, Thamasak Yeemin, Makamas Sutthacheep
Marine Biodiversity Research Group, Department of Biology, Faculty of Science, Ramkhamhaeng University, Huamark, Bangkok 10240 Thailand
*e-mail: sirilux_joy128@hotmail.com

Abstract: Giant clams in the family Tridacnidae play various ecological roles in coral reef ecosystems. Populations of the giant clams are remarkably reduced due to overharvesting. They are under the protection of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Knowledge on population ecology of giant clams on shallow reef flats are limited although it is very important aspects for managing coastal living resources. This study aimed to examine the population densities of the giant clams *Tridacna* spp. on shallow reef flats in the Western Gulf of Thailand. The field surveys were conducted at five island groups in the Western Gulf of Thailand, including Mu Ko Chumphon, Chumphon Province, Ko Tao, Ko Samui, Ko Phangan, Mu Ko Angthong, Surat Thani Province. The giant clams were surveyed on the shallow reef flat of each study site by using a belt transect method with three replicates of 1x50 m^2. There were two giant clam species, namely *T. crocea* and *T. squamosa* found during the field surveys. The population of T. *crocea* were observed in only few study sites in Ko Tao and Mu Ko Angthong. The population densities of *T. crocea* and *T. squamosa* were relatively high in Ko Tao. There was no giant clams at several study sites, particularly in Mu Ko Angthong and Ko Phangan. This study provides current status of giant clam populations in the Western Gulf of Thailand and implies that the giant clam restoration projects in Thailand can enhance their population densities on the coral reefs.

B5_014_PA: DISTRIBUTION AND POPULATION DENSITY OF THE SEA URCHIN *Diadema setosum* ON SHALLOW REEF FLATS IN THE WESTERN GULF OF THAILAND

Ploypailin Rangseethampanya*, Wiphawan Aunkhongthong, Makamas Sutthacheep, Thamasak Yeemin
Marine Biodiversity Research Group, Department of Biology, Faculty of Science, Ramkhamhaeng University, Bangkok 10240, Thailand
*e-mail: ploypailinr@outlook.com

Abstract: Sea urchins are important herbivores and bioeroders in coral communities. High population density of sea urchins has been reported to control the abundance and composition of macroalgae and their primary productivity. Shallow reef flat is a large proportion of many reef sites which is constituted of intertidal coral communities. It provides habitat and food for many reef organisms. Some benthic invertebrates may adapt to the extreme environment of shallow reef flats. However, the data on population ecology of several reef associated invertebrates on shallow reef flats are very limited. The aim of this study was to examine distribution and population density of the sea urchin *Diadema setosum* on shallow reef flats in the Western Gulf of Thailand. The field studies were carried out at 24 reef sites within three provinces, including Prachuap Khiri Khan, Chumphon and Surat Thani Provinces. At each study site, the divers surveyed the population density of D. setosum by using a belt transect method with three replicates of 1x50 m2. The result showed that the highest population density of sea urchin was found at Ko Sang in Prachuap Khiri Khan Province, followed by Ko Thaiphlao and Ko Samsao (North) in Mu Ko Angthong of Surat Thani Province. There were no sea urchin populations observed at some study sites in Prachuap Khiri Khan Province, Ko Tao, Ko Samui and Ko Phangan in Surat Thani Province. Moreover, sea urchins were found commonly in other sites, such as Mu Ko Chumphon as well. This study provides important data for further analyses on coral recruitment patterns and reef bioerosion in the shallow reef flats.

B5_015_PA: SPECIES DIVERSITY AND COMMUNITY STRUCTURE OF CORALS ON SHALLOW REEF FLATS IN CHUMPHON PROVINCE, THE WESTERN GULF OF THAILAND

Wiphawan Aunkhongthong*, Sittiporn Pengsakun, Thamasak Yeemin, Makamas Sutthacheep
Marine Biodiversity Research Group, Department of Biology, Faculty of Science, Ramkhamhaeng University, Bangkok 10240, Thailand
*e-mail: toeytoeywiphawan@gmail.com

Abstract: Shallow reef flat communities are in extreme environment, particularly high temperature and light intensity. They can provide important habitats for some benthic organisms under the global climate change crisis. Some scleractinian corals can survive in these conditions, particularly the susceptible corals to bleaching events. This study aimed to assess species diversity and community structure of corals on shallow reef flats at five reef sites, including Ko Kula, Ko Rang Kachiu, Ko Lawa, Ko Maphrao and Ko Mattra, in Chumphon Province, the Western Gulf of Thailand. The field surveys were conducted on shallow reef flats, about 1 m in depth, during high tides by using a belt transect method. The highest percentage of live coral cover was recorded at Ko Mattra (67.5%) while the lowest one was found at Ko Kula (9.7%). Fifteen coral species were commonly observed. The most abundant coral was *Porites lutea*, followed by *Pavona frondifera*, *Favites abdita, Pocillopara acuta, Pocillopora damicornis, Favia favus, Goniopora columna, Pavona decussata, Fungia fungites, Diploastrea heliopora, Galaxea fascicularis, Symphyllia radians, Turbinaria mesenterina, Platygyra sinensis* and *Favia pallida*. This research provides important data for the coral reef database in Thailand and can be used to establish proper management plans for coral reef conservation in the Gulf of Thailand.

B5_016_PA: COMPARING ABUNDANCE AND COMPOSITION OF INFAUNA ON SANDY BEACH AND CORAL REEF COMMUNITIES AT KO MATTRA, THE WESTERN GULF OF THAILAND

Laongdow Jungrak*, Rattanawadee Niamsiri, Thamasak Yeemin, Makamas Sutthacheep
Marine Biodiversity Research Group, Department of Biology, Faculty of Science, Ramkhamhaeng University, Bangkok 10240, Thailand
*e-mail: Laongdow8853@gmail.com

Abstract: Macroinvertebrates in sedimentary environment of coastal habitats such as sandy beach, mangrove and coral reef are one of important components of coastal ecosystems. Knowledge on connectivity between coral reef and its associated communities is needed to better understand the complexity of food webs in marine and coastal ecosystems. There are no studies on gradient of infaunal communities between coral reef and sandy beach at the same location. This study aimed to investigate composition and abundance of infauna living in sandy beach and soft bottom of coral reef at Ko Mattra, Chumphon Province, the Western Gulf of Thailand. Nematodes and polychaetes were the major groups at both sandy beach and coral reef habitats. The diversity of infauna on coral reef community was much higher than that of sandy beach. The densities of nematodes, polychaetes and amphipods on coral reef were also much higher than those of sandy beach. Several polychaete taxa were found only on the coral reef. However, the polychaete *Polydora* sp. was found abundantly on the sandy beach. This study implies application of infauna for a bioindicator of sandy beach and coral reef ecosystems as well as utilization for fisheries, mariculture and natural products for pharmaceutical and cosmetic industry.

B5_017_PA: SEASONAL VARIATION OF PHYTOPLANKTON AT HAT PAK MENG, THE ANDAMAN SEA

Orathep Muresare*, Parichat Niyomthai, Supakarn Paodung, Rattanawadee Niamsiri, Thamasak Yeemin, Makamas Sutthacheep
Marine Biodiversity Research Group, Faculty of Science, Ramkhamhaeng University, Bangkok, Thailand
*e-mail: sfxlr@hotmail.com

Abstract: Production of phytoplankton at Hat Pak Meng is a very important food source for economically important marine organisms, particularly bivalves. However, ecological studies of phytoplankton in Thai waters are quite limited. The seasonal variation of phytoplankton in coastal areas is related to several physico-chemical and biological factors. This study aimed to examine the seasonal variation of composition and abundance of phytoplankton at Hat Pak Meng, Trang Province, the Andaman Sea. This phytoplankton sampling was carried out in summer months (February, March and April) and a rainy season (September, October, November and January) during 2017 – 2018. Phytoplankton samples were collected by using a standard 20 µm mesh plankton net with a mouth diameter of 30 cm, equipped with a flow meter, by horizontal hauls in the day time. Thirty-three major taxa of phytoplankton were recorded. The dominant phytoplankton groups in the summer season were *Coscinodiscus* sp., *Rhizosolenia* sp. And *Chaetoceros* sp. but in the rainy season *Rhizosolenia* sp., *Chaetoceros* sp. and *Ceratium* sp. were abundant groups. The high temporal variation taxa were *Bacillaria paxillifera*, *Gyrosigma* sp. and *Leptocylindrus* sp. The water exchange and the impact of human activities influence changes of physico-chemical and biological factors which lead to seasonal variation of the composition of phytoplankton taxa.

B5_018_PA: PROTECTION OF COASTAL EROSION BY CORAL REEFS IN THE EASTERN GULF OF THAILAND

Arirush Wongnutpranont[1,*], Supawadee Hamanee[2], Sittiporn Pengsakun[1], Wanlaya Klinthong[1], Bancha Lawang[1], Makamas Sutthacheep[1], Thamasak Yeemin[1]

[1]Marine Biodiversity Research Group, Department of Biology, Faculty of Science, Ramkhamhaeng University, Bangkok 10240

[2]School of Business Administration, Sripatum University, Jatujak, Bangkok 10900

*e-mail: Arirush.wong@gmail.com

Abstract: The coastal erosion problems are seriously concerned in most Southeast Asian countries, especially Thailand. The role of coral reefs in coastal erosion protection is well documented in some areas but the scientific data about this issue are very limited in Thailand. This study examined how coral reefs in the Eastern Gulf of Thailand can act as a natural submerged breakwater to protect the shoreline from erosion. We also calculated the economic values of coral reef ecosystem services for coastal erosion protection in four provinces along coastlines of the Eastern Gulf of Thailand, namely Chonburi, Rayong, Chantaburi and Trat Provinces. The results showed that coastal erosion protection by coral reefs in the Eastern Gulf of Thailand was obviously observed. The protected shorelines in Chonburi, Rayong, Chantaburi, and Trat Provinces are about 40, 5, 0.3 and 33 kilometers, respectively. The total economic value of coral reef ecosystem services for coastal erosion protection was about 500 million US$. The coral reefs in the Eastern Gulf of Thailand have been degraded by severe coral bleaching events, particularly in 1998 and 2010, and impacts from coastal development, fishing, and tourism. Therefore, proper management strategies are urgently needed for enhancing coral reef resilience and recovery from natural and anthropogenic disturbances. This study highlights the necessity of economic valuation of coral reef ecosystems in Thailand and other Southeast ASEAN countries. The economic values of coral reefs for coastal protection should be considered for coastal management plans.

B5_019_PA: DIVERSITY OF LICHENS GENUS *Artonia* IN MANGROVE FOREST OF EASTERN THAILAND

Mattika Sodamuk[1,*], Pachara Mongkolsuk[1], Kawinnat Buaruang[1]
[1]Department of Biology, Faculty of Science, Ramkhamhaeng University, Bangkok, 10240
*e-mail: mattika.so2529@gmail.com

Abstract: *Arthonia* is crustose lichens in family Arthoniaceae. It has been reported 11 species found in Thailand. This study aimed to study diversity to fill the data gap for the lichen distribution in Thailand. Two hundred and forty-six lichen specimens were collected from mangrove forests of Chachoengsao, Chon Buri, Rayong, Chanthaburi, and Trat province during November 2010 - March 2016. They were identified as 9 species according to the taxonomy principle as *Arthonia catenatula* Nyl., *A. collectiva* Stirt., *A. ilicina* Taylor, *A. punctiformis* Ach, *A. rubella* (Fée) Nyl., *A. simplicascens* Nyl., *A. subgyrosa* Nyl., *A. trilocularis* Müll. Arg., and *A. varia* (Ach.) Nyl. However, *A. collectiva* Stirt., *A. subgyrosa* Nyl.; *A. punctiformis* Ach., *A. rubella* (Fée) Nyl.; and *A. trilocularis* Müll. Arg. were only found in Chachoengsao, Rayong, and Chanthaburi province, respectively. While *A. varia* (Ach.) Nyl. was the most common species in this study areas where found in 4 provinces such as Chachoengsao, Chon Buri, Rayong, and Chanthaburi.

B5_020_PF: DIVERSITY OF FOLIICOLOUS LICHENS ON *Acrostichum aureum* L. IN MANGROVE FOREST FROM CHUMPHON PROVINCE

Udomrak Meethong*, Pachara Mongkolsuk, Kawinnat Buaruang
Lichen Research Unit, Department of Biology, Faculty of Science, Ramkhamhaeng University, Bangkok, 10240
*e-mail: gateudomrak@gmail.com

Abstract: Foliicolous lichens grow entirely on the living leaves of vascular plants. Thailand has high foliicolous lichens with about 180 species which most of them were reported from the high altitudes in northern and northeast parts. Whereas, a few of foliicolous lichens in mangrove forest have been studied. The aim of this study was to investigate the diversity of foliicolous lichens on *Acrostichum aureum* L. in mangrove forests of Chumphon province. A total of 152 specimens were collected from living leaves of *Acrostichum aureum* L. during 14-16 February 2018. The external morphology was determined under a dissecting binocular microscope. The anatomical characters of the thallus and ascomata were studied by free hand section and observed under a compound microscope. Lichen substances were characterized by spot tests. In the present study 5 families, 6 genera and 7 species were recorded including *Arthonia lividula* Vain., *Byssoloma subdiscordans* (Nyl.) P. James, *Calopadia fusca* (Müll. Arg.) Vězda, *Calopadia puiggarii* (Müll. Arg.) Vězda, *Dirinaria confluens* (Fr.) D.D. Awasthi, *Porina nitidula* Müll. Arg. and *Tricharia demoulinii* Sérus. Among them, *Porina nitidula* was commonly found with 70 observing specimens. The key to all species of foliicolous lichens that colonizing on live leaves of *Acrostichum aureum* L. was provided together with their pictures.

B5_021_PA: THE CRUSTOSE LICHEN FAMILY PYRENULACEAE FROM KOH KOOD, TRAT PROVINCE

Supattara Phokaeo*, Wetchasart Polyiam, Kawinnat Buaruang
Lichen Research Unit, Department of Biology, Faculty of Science, Ramkhamhaeng University, Bangkok, 10240
*e-mail: phokaeo_s@hotmail.com

Abstract: Pyrenulaceae is a group of crustose lichens producing perithecia as sexual reproductive structure and mostly growing on smooth shaded bark, which strongly adherent within on the substratum. The objective of this study was to investigate crustose lichen family Pyrenulaceae from Koh Kood, Trat Province. During November 2006-July 2019, one hundred and five lichen specimens were identified based on morphological, anatomical and chemical characters such as thallus, pseudocyphyllae, size of ascomata, hymenium layer included paraphyses ascus and ascospores as size, colour grey brown to dark brown, muriform or trans-septate together with fusiform to ellipsoid shapes. The results showed that the Pyrenulaceae lichens in this study area comprised of 2 genera 14 species namely, *Anthracothecium macrosporum*, *Pyrenula acutispora*, *Pyrenula aggregate*, *Pyrenula anomala*, *Pyrenula aspistea*, *Pyrenula atropurpurea*, *Pyrenula castanea*, *Pyrenula immissa*, *Pyrenula laetior*, *Pyrenula leucostoma*, *Pyrenula mamillana*, *Pyrenula mastophoriza*, *Pyrenula sexlocularis* and *Pyrenula thailandica*. The highest number of samples and common crustose lichens family Pyrenulaceae were *Pyrenula anomala* and *Pyrenula aspistea*.

Keywords: Pyrenulaceae, Perithecia, *Pyrenula anomala*.

B5_022_PA: DIVERSITY OF BASIDIOLICHENS ON KOH KOOD, TRAT PROVINCE

Phimpha Nirongbut*, Wetchasart Polyiam, Kawinnat Buaruang
Lichen Research Unit, Department of Biology, Faculty of Science, Ramkhamhaeng University, Bangkok, 10240
*e-mail: ami_takizawa1022@hotmail.com

Abstract: This is a preliminary study of Basidiolichens taxa collected at Koh Kood, Trat province. The Basidiolichens in which the fungus component is a basidiomycete lichen with crusty patches on soil. Nine samples were systematically identified into 2 genera and 2 species as new record in Thailand, including *Baeomyces rufus* characterized by thallus of minute, whitish-green to green, cushion-shaped granules, often individually tinged pink, forming a thin crust, with dark lines between adjacent thalli; apothecia stalked, stalks white, discs convex, often saddle-shaped, pink-brown to brown and *Sulzbacheromyces sinensis* characterized by thallus crustose, distinct, membranaceous, green to dark green with basidiome solid, clavarioid, or cylindrical, sometimes fusiform, simple, orange to red orange, turning ochraceous upon drying.

Keywords: Basidiolichens, Basidiomycota, soil surface

B5_023_PA: ASSESSING IMPACTS OF MARINE DEBRIS ON CORAL COMMUNITY AT AN UNDERWATER PINNACLE IN CHUMPHON PROVINCE

Sittiporn Pengsakun[1,*], Naengnoy Yossundara[2], Somyos Yossundara[2], Tasawan Khawsejan[3], Thamasak Yeemin[1], Makamas Sutthacheep[1]

[1]Marine Biodiversity Research Group, Department of Biology, Faculty of Science, Ramkhamhaeng University, Bangkok 10240, Thailand

[2]Save Our Sea, 162/6 Sukhumvit, Klongtoey, Bangkok

[3]Department of Fisheries, Ministry of Agriculture and Cooperatives, Jatujak, Bangkok 10900, Thailand

*e-mail: marine_ru@hotmail.com

Abstract: Marine debris pollution has become a serious global environmental issue, particularly in the Southeast Asian countries and its impacts on marine biodiversity. Marine benthic organisms and ecosystems are likely to be risky to marine debris because most of the debris accumulates on the seafloor. A reef cleanup program led by a volunteer group for conservation of Thai waters (Save Our Sea) and researchers was carried out in July 2019 at Hin Mai, a small underwater pinnacle, in Chumphon Province, located about 5 kilometers off the coast of Lang Suan District. The coral community at Hin Mai was about 8-10 m in depth and the live coral cover was 20%. The dominant coral cover was *Porites lutea*, *Goniopora columna* and *Pavona decussata*. The results from the cleanup activities showed that all marine debris were abandoned fishing gears (575 kg) which can be divided into four categories, i.e. bottom trawl nets (74%), gill nets (13%), squid hook lines (12%) and fish traps (1%). The impacts were partial mortality of coral colonies of *P. lutea*, *G. columna*, *P. Decussata, Pocillopora damicornis*, *Galaxea fascicularis* and *Platygyra sinensis,* fragments of *P. damicornis* and *P. decussata* and white band disease of *P. lutea.* Moreover, some fishes, crabs, sea urchins and several macrobenthic invertebrates were caught by the abandoned fishing nets. Lessons learned from this study can be applied for managing marine debris in the Gulf of Thailand.

B5_024_PA: A PRELIMINARY STUDY ON LICHEN LITTERFALL IN A TROPICAL SECONDARY FOREST IN THAILAND

Sumrit Senglek, Pitakchai Fuanngkeaw*, Chaiwat Boonpeng, Kansri Boonpragob
Lichen Research Unit, Department of Biology, Faculty of Science, Ramkhamhaeng University, Bangkok 10240, THAILAND
*e-mail: pfuangkeaw@gmail.com

Abstract: Lichens are important for ecosystems, involving in nutrient cycles, being food sources and nesting materials for some creatures. The natural loss rate of lichens is essential for conservation purpose and maintaining ecological integrity. Thus, the main objective of this study was to preliminarily observe lichen litter falls in a successional forest. Foliose (lobed-like) lichen litterfall was surveyed in 25 2-m radius circular plots in each of 3 locations at the secondary forest in Khao Yai National Park. Tree density at each location was estimated using the Point Center Quarter Method. Diameters of tree branches that hosted the lichens were also measured. A total of 626 lichen thalli, 7 genera, 9 species were found at 47 out of 75 plots. Overall, there were 6,645 thalli/ha could be seen in this forest ecosystem. *Parmotrema* spp., *Bulbothix* sp. and *Dirinaria* sp. were common lichens. A higher number of thalli and frequency of occurrence were discovered at locations with lower tree density and smaller tree branches. This result suggests that the lichen loss rate could be influenced by tree density. More information such as seasonal effects, forest types and floristic data on lichen litterfall are necessarily for the conservation of lichens and forest management at this area.

B5_025_PF: BIODIVERSITY OF DISCOLICHES IN MANGROVE FOREST AT CHUMPHON PROVINCE, THAILAND

Phimpisa Phraphuchamnong*, Kawinnat Buaruang, Patchara Mongkolsuk
Lichen Research Unit. Department of Biology. Faculty of Science. Ramkhamheang University. Huamark, Bangkapi, Bangkok 10240, Thailand
e-mail: phimna191@gmail.com

Abstract: The Discolichens are a lichenized discomycetes is a group of lichens with disc-shaped fruiting bodies (apothecia), which fruiting bodies of this type will produce ascospore in ascus. During February 2018, six hundred and forty-four discolichens samples collected from seventeen phorophytes in mangrove forests at Chumphon province were compiled and taxonomically catalogued into nine families twelve genera and twenty-three species (plus two species to be expected). Whereas the highest species diversity was *Cresponia proximata,* followed by *Malmidea aurigera*, *Bacidia submedialis*, and *Lecanora helva* frequently found respectively.

B5_026_PA: EFFICACY OF ENDOPHYTIC FUNGI ON INHIBITING GROWTH OF GRAY LEAF SPOT DISEASE (*Stemphylium solani*) IN TOMATO

Thanyarat Onlamun[1], Antikan Klomchit[1], Surangkana Chimthai[2], Siraprapa Brooks[1,2,*]
[1]School of science, Mae Fah Luang University, Chiang Rai, Thailand
[2]Center of Excellent in Fungal Research, Mae Fah Luang University, Thailand
*e-mail: siraprapa.bro@mfu.ac.th

Abstract: *Stemphylium solani* is a plant pathogen that causes target leaf spot on tomato, and this disease is the greatest concern in tomatoes production worldwide. The pathogen is able to colonize tomato leaves and produce numerous ascospores and conidia that are capable of infecting tomatoes. Therefore, in this study, we are investigating endophytic fungi, which are considered valuable for their ability in control this disease. Secondary metabolites were extracted from 40 fungal endophytes and then evaluated for their antifungal activity against *Stemphylium solani*, TSM-LB 13 by disc diffusion assay. Out of 40 endophytic fungi, three fungal endophytes displayed antifungal activity against *S. solani*, TSM-LB 13. The mycelium extract from fungal endophytes *Hypoxylon griseobrunneum*, NNSE4CL that isolated from leaves of Mangrove (*Rhizophora apiculata*) displayed 89.68% mycelium growth inhibition (at 0.9 mg/ml). Another fungal endophyte, *Xylaria feejeensi*, SRNE2EP and *Pestalotiopsis sp.*, SRNE13AR that were isolated from petiole of *R. mucronata* and aerial roots of *R. apiculata*, respectively also exhibited strong mycelium growth inhibition. At concentration of 0.3 mg/ml, crude extract from culture broth of *Xylaria feejeensi*, SRNE2EP and *Pestalotiopsis sp.*, SRNE13AR were able to inhibit mycelium growth of tested pathogen as high as 95.69% and 73.63%, respectively. This study revealed that three species of endophytic fungi (*Pestalotiopsis sp.*, SRNE13AR, *Xylaria feejeensi*, SRNE2EP and *Hypoxylon griseobrunneum*, NNSE4CL) have high potential to develop into important biological agents against *Stemphylium solani* in the future.

B5_027_PA: THE EFFECT OF FUNGAL ENDOPHYTES, *Xylaria feejeensis*, SRNE2BP ON SEED GERMINATION AND SEEDLING VIGOR OF SPINACH AND TOMATO

Pichayaporn Junmaha[1], Nootchanat Klinjan[2], Siraprapa Brooks[3,*]
[1]School of Science, Mae Fah Luang University, Chiang Rai 57100, Thailand
[2]Center of Excellent in fungal Research, Mae Fah Luang University, Chiang Rai 57100, Thailand
*e-mail: 6031105025@landuan.mfu.ac.th,Siraprapa.bro@mfu.ac.th

Abstract: Endophytes can produce a plethora of bioactive natural products, especially *Xylaria feejeensis*, SRNE2BP, which isolated from petiole of Mangrove (*Rhizophora mucronata*). At least 12 bioactive compounds were identified from secondary metabolites extract from this strain. Most of those bioactive compounds such as Cycloepoxydon, Phomopsiketone B, and trans-4-hydroxy-6-deoxyscytalone are responsible for antifungal activity against plant pathogen. Interestingly, two bioactive compounds including Pestalotin and (1'S)-dehydropestalotin also present in a complex of bioactive compound produced by this fungal endophyte. Interestingly, these two compounds are known as GA synergist. Thus, the effect of *X. feejeensis*, SRNE2BP on seed germination and seedling growth was investigated in this study. Liquid culture of *X. feejeensis*, SRNE2BP were able to accelerate seed emergence of tomato seeds "Sida variety" and spinach "TA026" seed. To At three day after germination, 70.89% of seeds treated with 10% liquid culture germinated while seeds in control treatment only 59.67% were germinated. To Similarly, percent germination of spinach seeds that treated with 10% liquid culture (82.99%) was higher than in control (73.78%). More importantly, shoot length and root length of tomato seedling from seeds treated with liquid culture (shoot length = 3.39 cm, root length = 2.01 cm) was significantly increased when compared with control treatment (shoot length = 2.11 cm, root length = 1.73 cm). These data suggested that the application of liquid culture of *X. feejeensis*, SRNE2BP was an effective strategy to improve seed germination and seedling vigor especially in tomato and spinach seeds.

B5_028_PF: SYSTEMATIC REVIEWS OF RHINOBATIFORMES IN THAI WATERS BASED ON 80 MORPHOMETRIC CHARACTERS

Apinya Huskul[1], Tassapon Krajangdara[2], Jes Kettratad[3,*]
[1]Department of Marine Science, Faculty of Science, Chulalongkorn University, Bangkok, Thailand
[2]Upper Andaman Sea Fisheries Research and Development Center (Phuket), Phuket, Thailand
[3]Department of Marine Science, Faculty of Science, Chulalongkorn University, Bangkok, Thailand
*e-mail: jes.kettratad@gmail.com

Abstract: Intensive systematic reviews of the fishes in the order of Rhinobatiformes has been attempted in the past. Most studies utilized single diagnostic character approach which could not give overall differences among species. We opted to use principal component analysis and discriminant function analysis of 80 morphometric characters from 50 specimens. Our specimens were collected from two sources: the fish market and museum collection. Principal component score plot reviewed 9 distinct clusters: *Rhina ancylostoma, Rhynchobatus australiae*, *R. laevis*, *Glaucostegus thouin*, *G. granulatus, G. obtusus*, *Rhinobatos annandalei*, *R. ranongensis*, and the last cluster was *G.* cf *granulatus*. Discriminant function analysis suggested only one specimen of *R. australiae* could be misidentified with *R. laevis*. Characters that are useful for species identification of fish in order Rhinobatiformes included first dorsal-fin anterior margin, first dorsal-fin length, interspiracular space, first dorsal-fin base, pectoral-pelvic space, pre-first dorsal length, pre-second dorsal length, pelvic-fin length, pelvic-fin base, pectoral-fin base, eyeball length, corneal length, anterior nasal flap length, spiracle length, interdorsal space, preorbital length, prenarial length and pelvic-fin posterior margin.

B5_029_OA: ADVANCES IN THE TAXONOMY OF PHYTOPATHOGENIC FUNGI

Yasmina Marin Felix*
Department Microbial Drugs, Helmholtz Centre for Infection Research, Inhoffenstrasse 7, 38124 Braunschweig
*e-mail: Yasmina.MarinFelix@helmholtz-hzi.de

Abstract: Phytopathogenic fungi are among the dominant causes of plant diseases, resulting in major annual losses to agricultural and forestry industries. Since the advent of molecular DNA techniques, many species of plant pathogenic fungi have been shown to represent species complexes or to be members of genera that are para- or polyphyletic. Resolving these generic and species concepts is thus of the utmost importance for plant health and global trade in food and fibre. To address these issues, the "Genera of Phytopathogenic Fungi" initiative was launched. The main objective is to provide a stable platform for the taxonomy of phytopathogenic fungi. Moreover, serious problems encountered in the taxonomy of this group of fungi are that for many genera and species type material has not been designated or/and that the vast majority of these taxa were described before the DNA phylogenetic era and thus lack DNA barcodes. Therefore, a further aim is to secure the application of names by generating DNA barcodes of type species of genera and type specimens of species. In those cases where no type material has been preserved, taxa need to be recollected, and epi- or neotypes designated with a MycoBank Typification (MBT) number to ensure traceability of the nomenclatural act. A final objective is to move to a single scientific name for fungi for which asexual-sexual links have been resolved.

For each genus treated in the "Genera of Phytopathogenic Fungi" project, a morphological description and information about its pathology, distribution, hosts and disease symptoms are provided. In addition, these data are linked to primary and secondary DNA barcodes of the presently accepted species. Hitherto, 62 genera of phytopathogenic fungi have been studied. For some of these genera new barcodes were generated allowing us to redefine them, e.g. *Dichotomophthora* and *Metulocladosporiella*. Moreover, new species and new genera such as *Verkleyomyces* and *Wingfieldomyces* were introduced to accommodate new taxa. Numerous new combinations were proposed to correct the classification of known species of phytopathogenic fungi. Finally, some asexual-sexual links were resolved, as in the case of *Pyrenophora* and *Drechslera*.

Since the start of the "Genera of Phytopathogenic Fungi" project, 62 genera have been treated, resulting in the introduction of five new genera, 88 new species, 38 new combinations, four new names and 13 typifications. This project has therefore revealed huge potential for advancing the taxonomy of phytopathogenic fungi.

B5_030_OF: GENETIC DIVERSITY OF THE ISLAND FLYING-FOX, *Pteropus hypomelanus* (CHIROTERA: PTEROPODIDAE), IN THAILAND

Patcharapon Jumsri, Nontivich Tandavanitj, Thongchai Ngamprasertwong*
Department of Biology, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand
*e-mail: thongchai.n@chula.ac.th

Abstract: Study on genetic diversity can provide vital information for conservation of threatened species, including island flying fox *Pteropus hypomelanus,* a species with high extinction risk due to limited dispersal ability, small home range, and high hunting pressure. In Thailand, *P. hypomelanus* can be found on islands along the coasts of the Gulf of Thailand and the Andaman Sea. This study aims to investigate the genetic diversity of *P. hypomelanus* in Thailand. DNA was extracted from fecal samples (n = 40) obtained from 6 localities in both Eastern and Southern Thailand. Mitochondrial control region (D-Loop) was amplified and sequenced. A total of 26 haplotypes (585 bps) were obtained and 24 haplotypes were specifically assigned to certain sampling localities, indicating population isolation and limited gene flow between islands. Overall nucleotide diversity ($\pi \pm$ SD) was 0.034 ± 0.004, whereas overall haplotype diversity ($h \pm$ SD) was 0.970 ± 0.013. Genetic diversity of Thai *P. hypomelanus* was lower and colony size was smaller on non-protected islands compared to those designated on protected islands. The results suggested that there is a potential risk of local extinction on non-protected islands, and hence proper management to conserve this species at local scale should be implemented. These genetic diversity data could be useful as baseline data for subsequent population genetic studies and conservation in the future.

SESSION C1
ANALYTICAL CHEMISTRY

C1_001_OF: FLUORESCENT DETERMINATION OF SOLUBLE PYROPHOSPHATE LEVEL IN SYNOVIAL FLUID AS A MARKER OF PSEUDOGOUT DISEASE

Nattha Yongwattana[1], Wannee Thepsing[1], Supasara Ounsuk[1], Tulyapruek Tawonsawatruk[2], Itaru Hamachi[3], Akio Ojida[4], Jirarut Wongkongkatep[1,*]

[1]Department of Biotechnology, Faculty of Science, Mahidol University, Bangkok 10400, Thailand

[2]Department of Orthopedics, Faculty of Medicine Ramathibodi Hospital, Mahidol University, Bangkok 10400, Thailand

[3]Department of Synthetic Chemistry and Biological Chemistry, Graduate School of Engineering, Kyoto University, Kyoto 615-8510, Japan

[4]Graduate School of Pharmaceutical Sciences, Kyushu University, Fukuoka 812-8582, Japan

*e-mail: jirarut.chu@mahidol.ac.th

Abstract: Pseudogout is one of the joint inflammations caused by the deposition of calcium pyrophosphate (CaPPi) crystal in the affected joint. The formation of crystal starts from inorganic pyrophosphate (PPi), which is generated from the decomposition reaction of an extracellular adenosine triphosphate (ATP), then forms complex with calcium to create CaPPi crystal and deposit in articular cartilage leading to pseudogout disease. Nowadays, there are few diagnostic methods such as radiography and polarized light microscopy for the crystal observation, but the discrepancy of the methods seems to be problematic. Therefore, the purpose of this study is to apply the PPi specific sensor for fluorescent detection of soluble PPi in synovial fluid of the arthritis patients. The sensor comprised of xanthene as a fluorophore and the Dpa/Zn(II) as two specific binding sites for PPi. Each patient synovial fluid was titrated with the sensor in aqueous solution for the evaluation of PPi level. The sensor displays a rapid detection of the soluble PPi with a large fluorescence enhancement, showing that the patient with high level of PPi in synovial fluid have high possibility to be pseudogout. Furthermore, the ENLITEN® ATP Assay System showed that the ATP levels of the patient synovial fluids were 3-order lower than the detection limit of the sensor, demonstrating that this sensor is promising for the diagnosis of pseudogout disease.

C1_002_PF: A CHEMICAL SENSOR FOR FORMALDEHYDE DETECTION USING NITROGEN-DOPED GRAPHENE QUANTUM DOTS

Teerapong Jantarat[1,3], Chotika Neamchey[1,3], Proespichaya Kanatharana[1,3], Panote Thavarungkul[2,3], Dhassida Sooksawat[1,3], Chongdee Thammakhet-Buranachai[1,3,*]

[1]Department of Chemistry and Center of Excellence for Innovation in Chemistry (PERCH-CIC), Faculty of Science, Prince of Songkla University, Hat Yai, Songkhla 90112, Thailand

[2]Department of Physics, Faculty of Science, Prince of Songkla University, Hat Yai, Songkhla 90112, Thailand

[3]Center of Excellence for Trace Analysis and Biosensor, Prince of Songkla University, Hat Yai, Songkhla 90112, Thailand

*e-mail: chongdee.t@psu.ac.th

Abstract: Formaldehyde (FA) is a one of the most concerned contaminants in food especially seafood since it has illegally been used as seafood preservative to keep them fresh and to prevent a spoilage from transportation. There is a need, therefore, of the analytical method for FA detection which can be applied to detect this compound in seafood samples. Herein, we propose a nitrogen doped graphene quantum dots (N-GQDs) based chemical sensor. N-GQDs was easily synthesized in the microwave oven under mild condition, the obtained N-GQDs provided bright blue fluorescent emission under the UV-radiation. Several techniques were used to characterize N-GQDs including, UV-Vis spectrophotometry, fluorescence, and FT-IR. The fluorescence intensity N-GQDs decrease linearly with the concentration of FA in the range of 2.5 – 100 mg L^{-1}. In addition, the selectivity of the developed sensor was investigated using the analogous carbonyl compound and the existential interferences in seafood samples such as different types of salts. The results showed that N-GQDs provided the response to only acetaldehyde whereas no response from other compounds was observed. We believe that after optimization, the sensor can be applied to detect FA in real sample.

C1_003_PF: IN-HOUSE METHOD VALIDATION FOR TOTAL ACID NUMBER IN BIODIESEL BY POTENTIOMETRIC TITRATION

Songsuda Promthong, Watchara Kaewsuwan*
Scientific Equipment Center, Prince of Songkla University, Hat Yai Campus, Songkhla, 90110, Thailand
*e-mail: watchara.kae@psu.ac.th

Abstract: The use of certified reference materials (CRMs) in the total acid number (TAN) measurement for the method of validation is well recommended. However, the cost of the CRMs is very expensive. To reduce the service cost and provide the biodiesel producers in the method for the accurate study, this research article aimed to develop an in-house method validation for assessing the accuracy (% Recovery) of the total acid number (TAN) determination in the biodiesel sample refers to ASTM D664. Pure formic acid (98-100 %) has been chosen to be a representative acid in the biodiesel sample. The total acid number in the studied biodiesel sample was found at (0.4384±0.0083) mg KOH/g (n=3). The suitable volume of standard formic acid spiking in the biodiesel sample was found at 2 µL and 4 µL. The accuracy at 2 µL and 4 µL of standard spiking showed acceptable values of (84.17±2.33) % and (94.20±3.35) %, respectively. Therefore, the development of in-house method validation for the total acid number in the biodiesel sample was successfully developed and can be applied to verify the testing at the scientific equipment center. The method is not only cost-effective but also reliable and good recovery.

Keywords: Potentiometric autotitrator, Biodiesel sample, Standard formic acid, % Recovery

C1_004_PA: DETERMINATION OF IODINE VALUE IN COOKING OIL

Pimpimol Phukpattaranont[1,*], Wilairat Cheewasedtham[2]
[1]Scientific Equipment Center, Prince of Songkla University, Songkhla 90110, Thailand
[2]Department of Science, Faculty of Science & Technology, Prince of Songkla University, Pattani, Thailand
*e-mail: ppimpimo@yahoo.com

Abstract: Iodine value (IV) is one of the most important analytical parameters of oil. Iodine value measures the unsaturation content or double bonds of unsaturated fatty acids which can react with iodine. It is defined as the percentage of iodine absorbed by the oil under the test conditions. The standard method for iodine value determination is the Wijs method in AOAC Official Method of Analysis (2012). It is based on the classic wet chemical (Cyclohexane-Acetic acid) method, which fat or oil is mixed with iodine monochloride solution to halogenate double bonds in fat or oil. Excess iodine monochloride is reduced to free iodine in the presence of potassium iodide, and free iodine is measured by titration with sodium thiosulfate using starch as an indicator. Iodine value (IV), calculated as eg iodine absorbed per g of sample (%iodine absorbed), is a measure of unsaturation of fats and oils. In this work, we proposed an unsaturated fatty acid, oleic acid (C18: 1) as a standard for in-house verification of the accuracy of the standard method. This proposed method showed high accuracy and precision in detecting the iodine value of the standard and % recovery was achieved from 98 to 104% with acceptable SD as %CV < 2.

C1_005_PA: DETERMINATION OF COENZYME Q10 IN FISH BLOOD WASTE BY MEANS OF HIGH PERFORMANCE LIQUID CHROMATOGRAPHY

Wilairat Cheewasedtham[1,*], Najwa Leema[1], Thitima Rujiralai[1,2], Chonlatee Cheewasedtham[3]

[1]Analytical Chemistry and Environment Research Unit, Division of Chemistry, Department of Science, Faculty of Science and Technology, Prince of Songkla University, Pattani 94000, Thailand

[2]Department of Chemistry, Faculty of Science, Prince of Songkla University, Hat Yai 90110, Thailand

[3]Ecological Aquaculture Research Unit, Division of Fishery Technology, Department of Technology and Industry, Faculty of Science and Technology, Prince of Songkla University, Pattani 94000, Thailand

*e-mail: wilairat.c@psu.ac.th

Abstract: Fish blood waste (FBW) samples, composed mainly of fat, blood and fish tissues, was collected from the surimi production factory. FBW can be utilized in the cultivation of live feed as plankton, the nutrient property of FBW is, therefore, very important. Coenzyme Q_{10} is one of the important super antioxidants which can be found in both plant and animal tissues. The concentration of coenzyme Q10 may promote the cultivation of plankton. To determine coenzyme Q10 in FBW, the extraction of coenzyme Q_{10} in FBW with triple-phase partitioning (TPP) technique, which sample mixtures will be separated into three layers, was investigated and the extracted coenzyme Q_{10} was determined by high performance liquid chromatography with diode array detection. The separation of CoQ_{10} was performed on a reversed phase C18 column with a mixture of ethanol and methanol (95:5 v/v) as the mobile phase. The detection was set at 275 nm. The linearity in coenzyme Q_{10} determination was found in the range of 1.0 to 20.0 µg mL^{-1}, with the correlation equation as $y = 20.695(\pm3.049)x - 0.3489(\pm0.003)$ and the correlation coefficient (R^2) equals 1.000. The concentration of coenzyme Q_{10} in fish blood waste, at chemical oxygen demand equals 21,158 mg L^{-1}, was found at 23.34 µg g^{-1} wet weight. This is the first report of coenzyme Q_{10} quantitation in FBW.

C1_006_OF: SPECIFIC AND SENSITIVE DETECTION METHOD FOR CHROMIUM (VI) IN ORANGE JUICE USING DOUBLE REACTIONS

Indiah Ratna Dewi[1]*, Chatchai Putson[2], Thitima Rujiralai[1, 3], Wilairat Cheewasedtham[1]

[1]Analytical Chemistry and Environment Research Unit, Division of Chemistry, Department of Science, Faculty of Science and Technology, Prince of Songkla University, Pattani 94000 Thailand

[2]Center of Excellence in Nanotechnology for Energy (CENE), Prince of Songkla University, Hatyai, Songkhla 90112, Thailand

[3]Department of Chemistry and Center of Excellence for Innovation in Chemistry, Faculty of Science, Prince of Songkla University, Hat Yai, Songkhla 90112, Thailand

*e-mail: indiah.dardanela@gmail.com

Abstract: The specific and sensitive method for hexavalent chromium determination in aqueous solution has been developed based on two chemical reactions, complex formation with dithizone (DTZ) and redox oxidation. The analysis were carried out based on absorbance measurement by mean of spectrophotometry, which the ratio of absorbance at A_{370}/A_{550} was investigated. The optimum reducing agent and chromium (VI) ratio and DTZ concentration in the system were 25:1 and 0.03 mM, respectively. The color of the reactions changed from dark green to red and further changed into magenta after reacted with the chromium hexavalent. In comparison with the conventional method which employed only complex formation reaction which diphenylcarbazide (DPC) is used as chromium (VI) complexing agent, this developed method shows higher sensitivity than that of DPC for up to 1.4 times. The linearity range of the developed method was found in the concentration range of 0 to 10 µg mL^{-1} of chromium (VI) with very satisfied mean recovery of 94.29%. Moreover, the specificity of DTZ complexation and redox reaction was profen by no intering effect by other major metal element in water, such as iron (II) and manganese (II). In addition, some commercial orange juice samples from supermarket have been investigated using this deleveloped method.

C1_007_PF: ENANTIOMERIC SEPARATION OF 1-PHENYLALKANOLS BY GC USING METHYLATED BETA-CYCLODEXTRIN CHIRAL STATIONARY PHASE

Suchada Muangsri, Aroonsiri Shitangkoon*
Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand
*e-mail: aroonsiri.s@chula.ac.th

Abstract: Chiral alcohols are useful chemicals for many industries. Enantiomers of a chiral compound have identical physical and chemical properties. However, they may show different biological activities and, in some cases, one enantiomer may show unwanted property. Gas chromatography (GC) is a useful technique for analyses of enantiomeric purity of volatile alcohols. In this study, enantiomeric separation of eleven chiral 1-phenylalkanols were examined by GC using a capillary column of 15 m long, 0.25 mm i.d. and a 0.25 µm thick film of stationary phase. Heptakis(2,3-di-*O*-methyl-6-*O*-*tert*-butyldimethylsilyl)-β-CD mixed with polysiloxane was used as a chiral stationary phase. The effects of type and position of substituent on alcohol structure as well as column temperature on retention and enantioselectivity were studied. Ten chiral alcohols could be separated into their enantiomers using this stationary phase. Results showed that a small methyl substituent at the stereogenic center provided better enantioselectivity than a larger phenyl substituent. Methyl group substituted at the *para*-position of the aromatic ring provided better enantioselectivity than other types of substituent. Optimum condition for complete enantiomeric separation of each chiral alcohol was also obtained. In this study, enantiomers of 1-(4-methylphenyl) ethanol could be separated with shortest analysis time in less than 2 minutes.

C1_008_PA: COMPARATIVE STUDY OF CHEMICAL CONTENS IN DIFFERENT COFFEE LEAVES VARIETIES

Saowaluk Madkoksung[1], Jakkarach Sa-udon[3], Plaipol Dedvisitsakul[1], Natsaran Saichana[1], Kanchana Watla-iad[1,2,*]

[1]School of Science, Applied Chemistry (Analytical Chemistry), Mae Fah Luang University, Chiang Rai, 57100, Thailand

[2]Center of Chemical Innovation for Sustainability, School of Science, Mae Fah Luang University, Muang, Chiang Rai 57100, Thailand

[3]Mae Lod Royal Agricultural Research Station, Royal Project Foundation, Chiang Mai 50150, Thailand

*e-mail: kanchana.wat@mfu.ac.th

Abstract: There are many coffee varieties in the world. Each variety contains specific chemical compound. Analysis of chemical compounds in coffee leaves obtained from various varieties planted in the same area (Mae Lod Royal Agricultural Research Station) was investigated. There are five coffee varieties were used in this work such as Typica, Gaicha, Caturra Vermelho, Liberica and Hibrido de Timor. The leaves were extracted by using methanol before study. Total phenolic content, total flavonoid content and antioxidant activity of methanolic extracts were analyzed by using the Folin-Ciocalteau, aluminium chloride and 2, 2-diphenyl-1-picrylhydrazyl (DPPH) colorimetric assay, respectively. It was found that the Liberica coffee leave present the highest total phenolic content, total flavonoid content and antioxidant activity as 19827.77 mg gallic acid equivalents (GAE)/g, 46.91 mg catechin equivalents (CE)/g and 3403.91 mg ascorbic acid equivalent (AAE)/g respectively. The presented chemical contents in coffee leave varieties might be future used for identifying coffee variety in real fields.

C1_009_PA: HIGH BIOACTIVE COMPOUNDS IN COFFEE CHERRY HUSK TEA

Ketsuda Pawong[1], Jirakan Sriwiyod[1], Kanchana Watla-iad[1,2,*]

[1]School of Science, Applied Chemistry (Analytical Chemistry), Mae Fah Luang University, Chiang Rai, 57100, Thailand

[2]Center of Chemical Innovation for Sustainability, School of Science, Mae Fah Luang University, Muang, Chiang Rai 57100, Thailand

*e-mail: kanchana.wat@mfu.ac.th

Abstract: Coffee is the one of the most popular beverages. So, there are tons of by-products obtained during process. Coffee cherry husk (outer skin and pulp) is one of the main wastes and it also contains with high bioactive compound. Therefore, it was reported to produce as tea beverage also called "Cascara". The conditions used for production of the cascara tea such as drying temperature (40, 60, 70, 80°C and sun-drying) and also roasting process were investigated. Coffee cherry husk samples were obtained from the Royal project of Teen-tok (Chiang Mai, Thailand) and Pangkhon (Chiang Rai, Thailand). The Pangkhon coffee husk was separated into yellow and red cherry. Antioxidant capacity, total polyphenol content and total flavonoid content in the aqueous extracts of all cascara teas were analyzed. The result of the study revealed that the roasted-natural sundried yellow coffee husk teas obtained from the Pangkhon contain high amounts of antioxidant capacity, total polyphenol content and total flavonoid content which were 22.47 mg ascorbic acid equivalents (AAE)/g dried mass (DM), 13.77 mg Gallic acid equivalents (GAE)/g DM, and 6.51 mg catechin equivalents (CE)/g DM, respectively. It may cause from the effect of gamma irradiation on breaking down of some organic compound present in the coffee cherry husk.

C1_010_PF: ALTERNATIVE COLORIMETRIC DETERMINATION OF 2-NAPHTHOL FOR SCREENING OF ALPHA-GLUCOSIDASE ASSAY

Lalida Chanchaem[1], Plaipol Dedvisitsakul[1], Kanchana Watla-iad[1,2,*]

[1]School of Science, Mae Fah Luang University, Muang, Chiang Rai 57100, Thailand

[2]Center of Chemical Innovation for Sustainability, School of Science, Mae Fah Luang University, Muang, Chiang Rai 57100, Thailand

*e-mail: kanchana.wat@mfu.ac.th

Abstract: The aim of this study is to study an alternative colorimetric method for determination of 2-naphthol that will be used for α-glucosidase inhibitory activity. Since a well-known method for the assay, this enzyme is to use *p*-nitrophenyl α-D-glucopyranoside (*p*NPG) as the substrate. When α-glucosidase hydrolyzed the glycosidic bond, it will release *p*-nitrophenol, which can absorb light at maximum wavelength of 405 nm. However, the color of plant extract has become problematic in the assay since the compounds in the extracts usually exhibited overlapping absorption spectrum with *p*-nitrophenol. So, we focused on developing an alternative colorimetric detection system based on creating derivatives of 2-naphthol with several reactants such as $FeCl_3$, $K_3[Fe(CN)_6]$, NaOCl and diazonium salt. Results showed that 2-naphthol reacting with diazonium salt could present the red shift spectrum of the product solution to the maximum absorption wavelength of around 540 nm. This shift in absorption property could solve the interference of the plant extracts. In addition, analytical characteristics such as LOD and LOQ, obtained from using the diazonium salt reacted with 2-naphthol were 0.006 mM and 0.015 mM, respectively. Therefore, the diazoniun salt would be further developed for the colorimetric detection of the released 2-naphthol produced from enzymatic reaction when use *β*-naphthyl α-D-glucopyranoside as the substrate in α-glucosidase assay.

C1_011_PA: PRECONCENTRATION AND TRACE DETERMINATION OF COPPER (II) IN THAI FOOD RECIPES USING Fe_3O_4@Chi–GQDS NANOCOMPOSITES AS A NEW MAGNETIC ADSORBENT

Nunticha Limchoowong[1,2], Phitchan Sricharoen[1], Prawit Nuengmatcha[1,3], Thitiya Sripakdee[1,4], Suchila Techawongstien[5], Saksit Chanthai[1,*]

[1]Materials Chemistry Research Center, Department of Chemistry and Center of Excellence for Innovation in Chemistry, Faculty of Science, Khon Kaen University, Khon Kaen 40002, Thailand

[2]Department of Chemistry, Faculty of Science, Srinakharinwirot University, Bangkok 10110, Thailand

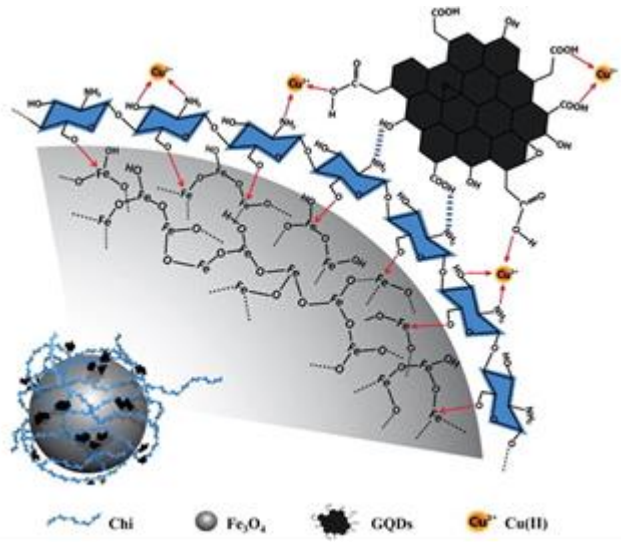
[3]Department of Chemistry, Faculty of Science and Technology, Nakhon Si Thammarat Rajabhat University, Nakhon Si Thammarat 80280, Thailand

[4]Chemistry Program, Faculty of Science and Technology, Sakon Nakhon Rajabhat University, Sakon Nakhon 47000, Thailand

[5]Department of Plant Science and Agricultural Resources, Faculty of Agriculture, Khon Kaen University, Khon Kaen 40002, Thailand

*e-mail: sakcha2@kku.ac.th

Abstract: This study describes the preparation, characterization, and application of a new magnetic chitosan–graphene quantum dots (Fe_3O_4@Chi–GQDs) nanocomposite as an adsorbent for the preconcentration of Cu(II) in Thai food recipes or the so-called "Som Tam" (green papaya salad) prior to determination by inductively coupled plasma–optical emission spectrometry. The spectroscopic and magnetic properties along with the morphology and thermal property were analyzed using FTIR, EDX, XRD, TGA, VSM, and TEM. Preconcentration optimizations including pH, dosage of adsorbent, adsorption–desorption time, concentration and volume of elution solvent, sample volume and enrichment factor, and reusing time were investigated. Good linearity was obtained ranging from 0.05 to 1500 µg L^{-1} with correlation coefficient of 0.999. Limit of detection was 0.015 µg L^{-1}. Relative recoveries of 85.4–107.5% were satisfactorily obtained. This Fe_3O_4@Chi–GQDs has high potential to be used as preconcentration method and can be reused 7 times with high extraction efficiency.



C1_012_PF: APPLICATION OF SILVER AMALGAM ELECTRODE FOR ANODIC STRIPPING VOLTAMMETRIC DETERMINATION OF CADMIUM IN CONTAMINATED SOIL AND PLANT

Mangheny Godfrey[1], Kawinthida Moolsarn[2], Chidkamon Thunkhamrak[2], Jaroon Jakmunee[1,2,3,*]
[1]Master Degree Program in Environmental Science, Environmental Science Research Center, Faculty of Science, Chiang Mai University, Chiang Mai, 50200, Thailand
[2]Department of Chemistry and Research Laboratory for Analytical Instrument and Electrochemistry Innovation, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand
[3]Center of Excellence for Innovation in Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand
*e-mail: jaroon.jakmunee@cmu.ac.th, jakmunee@gmail.com

Abstract: Heavy metals such as cadmium and lead are persistent contaminants in the environment. The analysis and remediation of heavy metals need an analytical method that is reliable, convenient to use, and low-cost. In this research, the silver amalgam electrode was developed for anodic stripping voltammetric (ASV) determination of cadmium and lead. This electrode is more environment-friendly than the commonly used hanging mercury drop electrode. Its property is similar to mercury electrode but lower in toxicity and easy preparation. The optimization of the ASV method with using of silver amalgam electrode was carried out. Under the optimum conditions, the linear analytical ranges of cadmium were 20-80 µg L^{-1} and 90-800 µg L^{-1} and lead were 10-80 µg L^{-1} and 150-1000 µg L^{-1}. Moreover, detection limits were 2.0 and 0.01 µg L^{-1} for cadmium and lead, respectively. The method had percentage recoveries for the determination of those metals in ranges of 81.9-114.1 for cadmium and 86.4-109.5 for lead. The proposed method was applied for the determination of cadmium in soil and plant from a cadmium contaminated site in Tak province. The method is potentially used in the phytoremediation study of cadmium.

C1_013_PF: PAPER-BASED LINER FOR HEADSPACE COLORIMETRIC DETERMINATION OF VOLATILE COMPOUNDS

Kamonwan Meesuwan, Waleed Alahmad, Pakorn Varanusupakul*
Chemical Approaches for Food Applications Research Group, Faculty of Science, Chulalongkorn University, Bangkok, Thailand
Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok, Thailand
*e-mail: pakorn.v@chula.ac.th

Abstract: This work presented a simple alternative method for simultaneous extraction and determination of volatile compounds in complex matrix samples by combining headspace technique with paper based colorimetric method. The method used a paper loaded colorimetric reagent attached to the liner of the cap (paper-based liner) for direct detection of the volatilized compounds in headspace extraction mode. The paper was attached to the liner of the cap. A sample was placed in a vial sealed with the paper-based lined cap. The method was tested for determination of alcohol using ethanol as a model and aldehyde using hexanal as a model in complex matrix samples. Ethanol volatilized and reacted with potassium dichromate in sulfuric acid on the paper forming a green color spot. Hexanal volatilized and reacted with 2,4 dinitrophenylhydrazine reagent on the paper resulting in an intense yellow color spot. The color image was taken by a digital camera and proceeded by Image J program in RGB mode and the blue intensity was taken for quantification. For determination of alcohol, the sample was heated at 40 °C for 5 min. The method was applied for determination of alcohol content in stomahic mixtures. The linear calibration ranged from 0-7 % (v/v) of ethanol with r^2 > 0.96 was obtained. The recovery of 94-120% and the relative standard deviation of less than 3% were achieved. For determination of hexanal, the sample was heated at 70 °C for 10 min. The linear calibration ranged from 0-100 ppm of hexanal with r^2 > 0.98 was obtained. The method was applied for determination of hexanal in grille chicken breast. The recovery of 108% and the relative standard deviation of less than 2% were achieved. The method was rapid and low cost. The paper-based liner would not directly contact the samples minimizing the interference due to color or suspended particles in the matrix.

C1_014_PA: ELECTROCHEMICAL ACTIVATION OF CARBON SURFACES

Treerawat Sangsrijan[1,2], Thaneeya Hawiset[3], Prachak Inkaew[1,2,*]
[1]School of Science, Mae Fah Luang University, Chiang Rai, Thailand
[2]Center of Chemical Innovation for Sustainability, Mae Fah Luang University, Chiang Rai, Thailand
[3]School of Medicine, Mae Fah Luang University, Chiang Rai, Thailand
*e-mail: prachak.ink@mfu.ac.th

Abstract: Carbon is a material of choice for many applications. It can be used as an electrode in electrochemical analysis or as an adsorbent in water and air treatment. In electrochemical analysis, carbon possesses advantages such as low cost, wide potential window, and high conductivity. Carbon surfaces can be activated or modified by various treatments to increase surface area or to generate chemical species on the surfaces. This work describes electrochemical method to activate the carbon surfaces. Carbon particles, diameter less than 5 µm, were activated by applying 5 - 30 V to the particles for different periods. The activated surfaces were characterized by cyclic voltammetry (CV), scanning electron microscopy (SEM), and fourier transform infrared spectroscopy (FTIR). Increasing in oxygen-containing species, surface roughness and surface area was observed with increasing potential and activation time. With some further development, this activation method could be employed as a green alternative method to activate carbon surfaces in industries.

C1_015_OA: PORTABLE AND INEXPENSIVE SPECTROMETER WITH LIGHT EMITTING DIOED FOR STUDY OF STABILITY OF GOLD NANOPARTICLES

Porawach Chin-orn[1], Pakorn Juleang[2], Eakkasit Punrat[1,*]
[1]Department of Chemistry, Faculty of Science, Ramkhamhaeng University, Thailand
[2]Electronics Technology Department, Faculty of Science, Ramkhamhaeng University, Thailand
*e-mail: eakkasit@ru.ac.th

Abstract: Gold nanoparticle (AuNP) is a widely used nanomaterial due to its electrical property and optical property. The synthesis of AuNP from $HAuCl_4$ reduced by gallic acid was investigated. The solution of AuNPs with a particle size less than 50 nm is red color which has an absorption wavelength of 520-530 nm. The stability of AuNPs therefore can be investigated *via* spectroscopic method. In this work, a pocketable spectrometer has been invented in our laboratory using simple and inexpensive components on an open-source electronic platform. A light emitting diode (LED) with red-green-blue light was chosen as the light source. The invented spectrometer has three input-buttons for selection of LED color, zeroing value for a blank solution, and reading an absorbance of a sample solution. The absorbance value and essential information are displayed on the screen. The absorbances of AuNPs solution were carried out by the spectrometer with the green LED, which emits the spectrum wavelength equivalent to absorption wavelength of AuNPs, for several days to study the stability of the AuNPs. For a week of study, the AuNPs solution kept at room temperature (27-30 °C) was not stable resulted in the absorbance decreasing of 20.9% from one at the first day, while the AuNPs solution preserved at -8 °C had a high stability with a relative standard deviation of absorbance of 3.36%. According to results, the portable and inexpensive spectrometer persists in its performances, therefore, it will be a promising alternative spectrometer to apply for quantitative analysis.

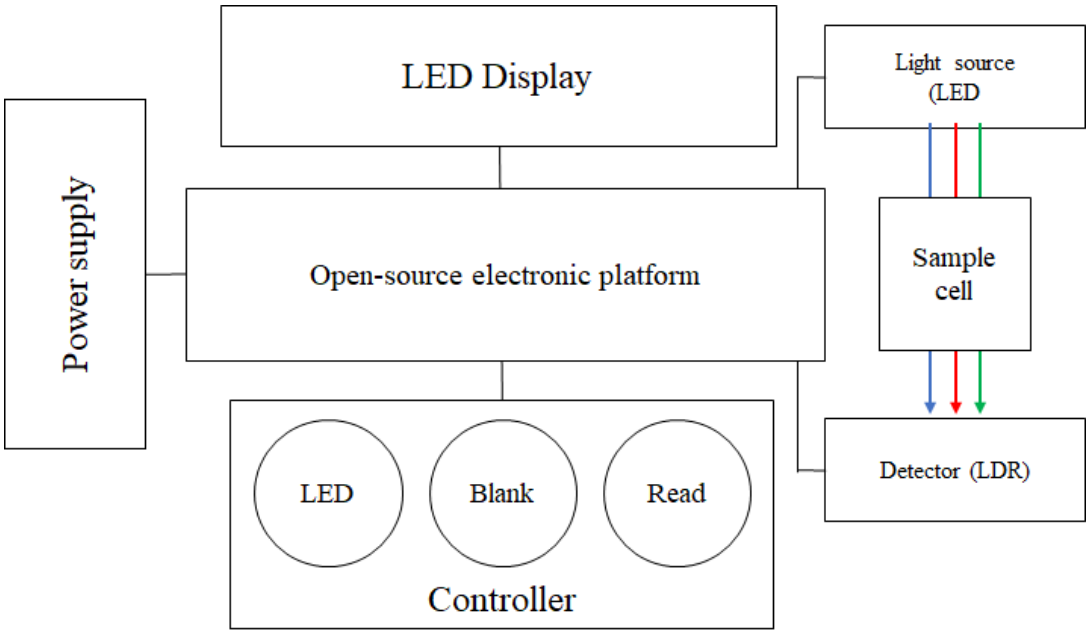


Figure 1. Block diagram of the portable and inexpensive spectrometer.

SESSION C2:
INORGANIC CHEMISTRY

C2_001_PF: SYNTHESIS AND CHARACTERIZATION OF A FLUORESCENT CHEMOSENSOR BASED ON ANTHRAQUINONE DERIVATIVE FOR METAL IONS DETECTION

Chawanakorn Kongsak[1,2], Praput Thavornyutikarn[1,*]

[1]Department of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

[2]Graduate School, Chiang Mai University, 239 Huay Kaew Road, Muang, Chiang Mai 50200, Thailand

*e-mail: praput.th@cmu.ac.th

Abstract: To improve the sensing performance toward metal ions in trace amount, a fluorescent sensor (compound 1) based-on anthraquinone derivative was developed and synthesized combining unique tridentate dipicolylamine (DPA) units as receptor moieties with the overall yields of 47%. The designed sensor 1 showed the absorption maxima in range of 260-430 nm with relatively high molar absorptivities. The emission peak of sensor 1 was observed at *ca*. 511 nm and its Stokes shift was calculated as 79 nm. Moreover, The preliminary optical studies of chemosensor 1 revealed the significant enhancement of fluorescence intensity in the presence of Zn(II) and Cd(II) ions compared to pure chemosensor.

C2_002_OA: AMINO-DECORATING MOF AS A DUAL TURN-ON/TURN-OFF FLUORESCENT SENSOR FOR TNP DETECTION

Theanchai Wiwasuku[1], Juarsup Boonmak[1], Khatcharin Siriwong[1], Vuthichai Ervithayasuporn[2], Sujittra Youngme[1,*]

[1]Materials Chemistry Research Center, Department of Chemistry and Center of Excellence for Innovation in Chemistry, Faculty of Science, Khon Kaen University, Khon Kaen 40002, Thailand

[2]Center for Inorganic and Materials Chemistry and Center of Excellence for Innovation in Chemistry, Department of Chemistry, Faculty of Science, Mahidol University, Bangkok 10400, Thailand

*e-mail: Sujittra@kku.ac.th

Abstract: An amino-decorating Zn(II)-MOF (1) was synthesized, structurally characterized, and further used as dual-responsive fluorescent sensor for the detection of 2,4,6-trinitrophenol (TNP), one of explosive compound. 1 presents non-porous 3D framework decorating with the Lewis basic amino group for recognizing the guest molecule. This MOF able to detect TNP with the unprecedented solvent-dependent fluorescent response. Significantly, 1 not only shows high sensitive fluorescent turn-on upon TNP binding in ethanol but also exhibits fluorescent turn-off toward TNP in water with very low limits of detection of 4.47nM and 0.32µM in ethanol and water, respectively. The fluorogenic changes of 1 induced by TNP can be easily detected by naked eyes and it can be simply and rapidly regenerated, displaying excellent recyclability. This allow the on-site preliminary screening. Also, the sensing mechanisms were discussed in detailed. The strategy explained in this work could pave the way for development fluorescent sensors for hazardous chemicals detection, which is relevant in environmental protection, human health and social security.

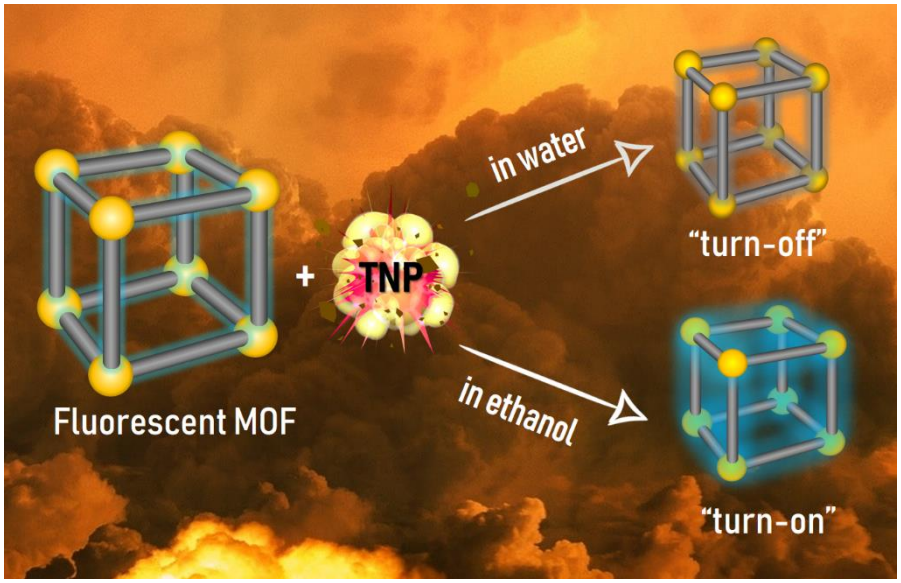


Figure 1. Schematic illustration of applicability of fluorescent MOF for TNP detection via dual responsive fluorescence

C2_003_PA: SLOW-RELEASE OF CAPSAICIN FROM A ZIF-8 FRAMEWORK AS TOPICAL APPLICATION

Christoph Sontag*
University of Phayao, School of Science, Mae Kha, Phayao, Thailand
*e-mail: c.sontag@web.de

Abstract: Capsaicin is the active ingredient in Cayenne Pepper with the typical burning effect on skin and mucous membrane. It has proven medical benefits to reduce Psoriasis and neuropathic pain when applied topically. Therefore many gels and creams have been developed as topical ointments. The drawback is the risk of over-dosing with very unpleasant side-effects. Here a slow-release formulation of Capsaicin is presented, where the active molecule is encapsulated during the preparation of a metal-organic framework (ZIF-8) consisting of zinc ions and 2-methylimidazole. A loading of up to 4% could be achieved with a release of 80% of Capsaicin in a model environment (buffer solution + surfactant) over a course of up to two hours, avoiding in this way a temporary overdose and probably longer lasting effect with only one application.

Figure 1

C2_004_OA: A FLUORESCENT SENSOR FOR THE DETECTION OF COBALT(II) IONS BASED ON GRAPHENE QUANTUM DOTS

Wissuta Boonta, Sirinan Kulchat*
Materials Chemistry Research Center, Department of Chemistry and Center of Excellence for Innovation in Chemistry, Faculty of Science,
Khon Kaen University, Khon Kaen 40002, Thailand
*e-mail: sirikul@kku.ac.th

Abstract: In this work, a sensor is designed for the simple, sensitive and selective detection of Co^{2+} based on nitrogen and sulfur co-doped graphene quantum dots (N, S-GQDs). The N, S-GQDs are prepared by hydrothermal synthesis method using citric acid as a carbon source and cysteamine as nitrogen and sulfur sources. UV-Vis and fluorescence spectrophotometry characterizations indicate the successful synthesis of N, S-GQDs. The chemical compositions and surface functional groups of the prepared N, S-GQDs were characterized by X-ray photoelectron spectroscopy (XPS) and Fourier-transformed infrared spectroscopy (FT-IR). The addition of Co^{2+} into the sensor system causes a color change from colorless to yellow because Co^{2+} can form the complexes with N, S-GQDs. Further, Co^{2+} can quench the fluorescence signal of N, S-GQDs due to electron transfer from N, S-GQDs to Co^{2+} in basic conditions, controlled by Tris-HCl buffer solution. In conclusion N, S-GQDs can be used to detect Co^{2+} and can be applied to make an analytical device.

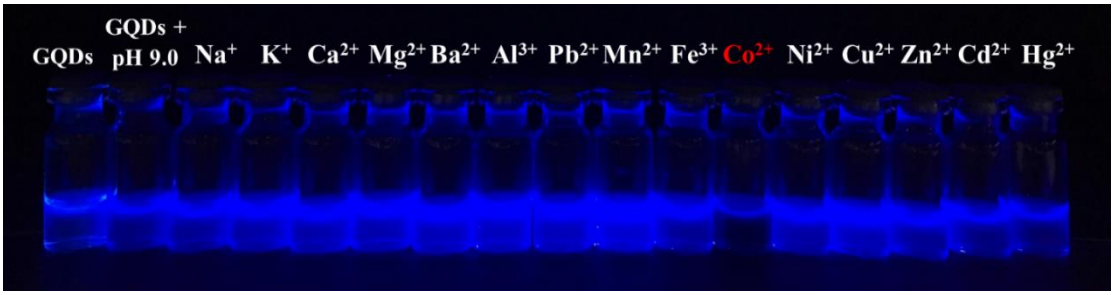


Figure 1. The color changes of the N, S-GQDs in the presence of various cations under UV light irradiation.

C2_005_PF: SYNTHESIS OF TiO_2-SiO_2 COMPOSITE AND ITS APPLICATION AS A PHOTOCATALYST FOR OXIDATIVE DESULFURIZATION

Tu Thi Phuong Nguyen[1], Pawnprapa Pitakjakpipop[2], Wipark Anutrasakda[1,*]
[1]Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand
[2]National Metal and Materials Technology Center (MTEC), 114 Thailand Science Park, Pathumthani, Thailand
*e-mail: wipark.a@chula.ac.th

Abstract: TiO_2-SiO_2 was synthesized by a facile sol-gel method. XRD, N_2 adsorption-desorption, SEM and UV-Vis DRS were used to characterize the photocatalyst. The photocatalytic properties of TiO_2-SiO_2 composite was studied by oxidative desulfurization process using dibenzothiophene (DBT) in dodecane as a model oil. The XRD analysis identified that TiO_2-SiO_2 has anatase phase with low crystallinity. Since TiO_2-SiO_2 has higher surface area, its photocatalytic activity was better than commercial TiO_2 (P25). Under UV irradiation, the DBT conversion over TiO_2-SiO_2 photocatalyst could reach 63% within 3 hours.

C2_006_PF: CYTOTOXICITY OF GOLD(III) PORPHYRIN COMPLEXES AND THEIR DERIVATIVE ON MCF7 CELL LINES

Tossapon Phromsatit[1], Premjit Arpornmaeklong[2], Yuki Shirosaki[3], Thapong Teerawatananond[4], Supakorn Boonyuen[1,*]

[1]Department of Chemistry, Faculty of Science and Technology, Thammasat University, Pathumthani 12120, Thailand

[2]Faculty of Dentistry, Thammasat University, Pathumthani 12120, Thailand

[3]Department of Materials Science, Faculty of Engineering, Kyushu Institute of Technology, Kitakyushu, Japan

[4]Department of Chemistry, Faculty of Science and Technology, Valaya Alongkorn Rajabhat University, Pathumthani 12120, Thailand

*e-mail: chemistrytu@gmail.com

Abstract: A new series of gold porphyrin complexes containing different meso-substituent groups (phenyl, methoxyphenyl, butyloxyphenyl, octyloxyphenyl, and dectyloxyphenyl) were synthesized. All synthesized compounds have been fully characterized by mass spectrometry, UV-visible and fluorescence spectroscopy. The electronic absorption band showed a small red-shift as the number of carbon atoms in the alkyl long chain was increased due to the electronic effect of the alkyl groups. Gold(III) porphyrin complexes continue to be explored for their potential utility as anticancer agent. The *In vitro* anticancer activity of gold(III) porphyrin complexes have been investigated. As judged from MTT assay, all gold(III) porphyrin complexes exhibited the cytotoxicity on MCF7 cell lines. Especially, the AuTPP and AuTOMPP show the cytotoxicity with IC50 value 0.50 µM and 40.47 µM, respectively.

C2_007_PA: BIODIESEL PRODUCTION USING NANOMAGNETIC CaO-BASED CATALYSTS WITH METHANOL TRANSESTERIFICATION OF USED PALM OIL

Chalisa Visvajit[1], Vorapol Assawasongkram[1], Arocha Jatakanont[1], Siwaporn Meejoo Smith[2], Apanee Luengnaruemitchai[3], Supakorn Boonyuen[4,*]

[1]Suankularbwittayalai Rangsit School, 2/617 Soi Rangsit-Nakhon Nayok 31, Klong Si, Klong Luang, Pathumthani 12120, Thailand

[2]Department of Chemistry, Faculty of Science and Technology, Mahidol University, Phuttamonthon, Nakorn Pathom 73170, Thailand

[3]The Petroleum and Petrochemical College, Chulalongkorn University, Pathumwan, Bangkok 10330, Thailand

[4]Department of Chemistry, Faculty of Science and Technology, Thammasat University, Paholyotin, Klong-Nung, Klong-Luang, Pathumthani 12120, Thailand

*e-mail: chemistrytu@gmail.com

Abstract: A magnetic core calcium oxide ($CaO@Fe_3O_4/SiO_2$) nanocatalyst and magnetic core calcium-strontium oxide ($CaO-SrO@Fe_3O_4/SiO_2$) nanocatalyst were synthesized using the Fe_3O_4/SiO_2 core-shell structure as support and CaO as active component. The preparation was carried out by chemical co-precipitation and incipient wetness impregnation followed by calcination at 800 °C for 3 h. The prepared samples were characterized by scanning electron microscopy (SEM), energy-dispersive X-ray spectroscopy (EDS), Fourier transform infrared (FTIR), Brunauer-Emmett-Teller (BET). The basic strength of the catalysts (H_) was first estimated using Hammett indicators method. The results from both catalysts showed the basic strength in range of 9.8 <H_< 15.0. Transesterification of used palm oil (acid value 1.2 mgKOH/g of oil) to methyl esters (biodiesel) in the presence of magnetic core calcium oxide ($CaO@Fe_3O_4/SiO_2$) nanocatalyst was investigated and compared with the magnetic core calcium-strontium oxide ($CaO-SrO@Fe_3O_4/SiO_2$) nanocatalyst. The biodiesel yield over 90 % was achieved under optimum reaction conditions of both catalysts. The obtained glycerol was clear and each catalyst can be separated easily from reaction. The addition of strontium oxide SrO into the magnetic core calcium oxide catalyst improved the conversion of transesterification.

C2_008_PF: COUMARIN-BASED SEMICARBAZIDE AS "TURN-OFF" FLUORESCENT SENSOR FOR Cu^{2+} DETECTION

Pichayanan Srisuwan[1,2], Anirut Suppasombut[1,2], Morakot Kaewpet[1,2], Dhassida Sooksawat[1,2,*]
[1]Department of Chemistry and Center of Excellence for Innovation in Chemistry (PERCH-CIC), Faculty of Science, Prince of Songkla University, Hat Yai, Songkhla, 90110, Thailand
[2]Center of Excellence for Trace Analysis and Biosensor, Prince of Songkla University, Hat Yai, Songkhla, 90110, Thailand
*e-mail: dhassida.s@psu.ac.th.

Abstract: The development of probes for specific Cu^{2+} detection has been widely interested due to the adverse effects to environmental system of Cu^{2+}. Fluorescent chemosensors have become the effective technique to monitor the amount of Cu^{2+} because of their advantages such as high sensitivity and selectivity, low cost and fast response. In this work, a highly sensitive and selective coumarin-based semicarbazide as fluorescent chemosensor for Cu^{2+} detection, CS1, has been synthesized and characterized. CS1's fluorescence was quenched in the presence of Cu^{2+} and behaved as a "turn-off" fluorescent chemosensor. Trace amount of Cu^{2+} was detected by spectrofluorometric method in CH_3CN: H_2O (9:1 v/v). The ligand exhibited excitation and emission maxima at 370 nm and 482 nm, respectively. After addition of Cu^{2+} concentration to CS1 solution, blue shift of absorption band was observed. Based on fluorescence titration with Cu^{2+} concentration was calculated, a good linear range was obtained (R^2= 0.9996). CS1 also exhibits good selectivity for Cu^{2+} over a range of other metal ions. Further study would be applying the sensor to analyse Cu^{2+} in environmental sample.

C2_009_PA: GREEN SYNTHESIS OF SILVER AND GOLD NANOPARTICLES USING PEONY (*Paeonia Lactiflora)* PETAL EXTRACT AND THEIR ANTIOXIDANT AND ANTIMICROBIAL PROPERTIES

Sasikarn Teepakornwornkul[1], Wachiraya Senkunha[1], Naphat Laksanayothin[1], Pariya Na Nakorn[2], Mathivathani Kandiah[3], Supakorn Boonyuen[4,*]

[1]Suankularbwittayalai Rangsit School, 2/617 Soi Rangsit-Nakhon Nayok 31, Klong Si, Klong Luang, Pathumthani 12120, Thailand

[2]Department of Biotechnology, Faculty of Science and Technology, Thammasat University, Paholyotin, Klong-Nung, Klong-Luang, Pathumthani 12120, Thailand

[3]School of Science, BMS, 591, Galle Road, Colombo 06, Sri Lanka

[4]Department of Chemistry, Faculty of Science and Technology, Thammasat University, Paholyotin, Klong-Nung, Klong-Luang, Pathumthani 12120, Thailand

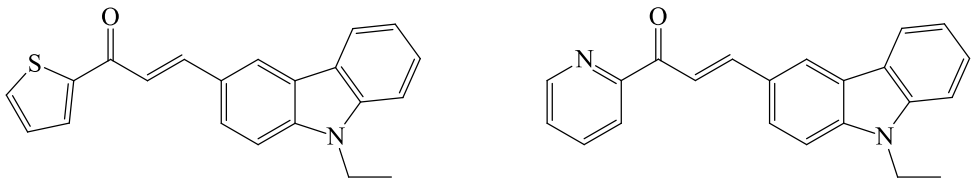
*e-mail: chemistruty@gmail.com

Abstract: Peony (*Paeonia lactiflora)* is commonly used in the traditional Chinese medicine. It is widely used to treat gout, osteoarthritis, fever, respiratory tract illnesses, and cough, due to the rich in antioxidant compounds. Nanotechnology is a science where processes undergo on a scale of approximately 1 to 100 nm, also known as the nanometer scale. Green synthesis of metallo nanoparticles is an eco-friendly, inexpensive and rapid method to biosynthesize nanoparticles. Current work, the possibility of silver and gold nanoparticles (AgNPs and AuNPs) synthesis using crude peony petal extract as reducing agent and stabilizer was investigated. The green synthesis method and identification of antioxidant and antimicrobial properties in comparison to its water extracts using the various assays were studied. The AgNPs and AuNPs were successfully synthesized. In the UV-Vis spectroscopy results, the characteristic peak of AgNPs and AuNPs is observed at 420 and 521 nm, respectively. The antioxidant activity using DPPH was studied. In addition, a total phenolic compound of crude extract was determined by Folin-Ciocalteu method. The results prove that AgNPs have a higher antioxidant activity in comparison to water extracts. SEM image of both AgNPs and AuNPs revealed a spherical shape, with nanometer size. When considering the antibacterial activity against *Staphylococcus aureus* and *Escherichia coli*, AgNPs samples showed higher antibacterial activity compared to water extracts.

C2_010_PA: SYNTHESIS, CHARACTERIZATION AND PHOTOPHYSICAL PROPERTY OF HETEROARYL CHALCONE DERIVATIVES

Parichart Sornwai[1,2], Patcharanan Choto[1,2], Thitipone Suwunwong[1,2,*]
[1]School of Science, Mae Fah Luang University, Chiang Rai 57100, Thailand
[2]Center of Chemical Innovation for Sustainability (CIS), Mae Fah Luang University, Chiang Rai 57100, Thailand
*e-mail: thitipone.suw@mfu.ac.th

Abstract: Heteroaryl chalcone derivatives (1-2) were synthesized by aldol condensation of aldehydes and ketones. The structures were characterized by ^{1}H NMR and IR spectroscopies. In the preliminary method to study the fluorescence property, the fluorescence emissions of compounds 1-2 were screened in 5μM DMSO solution at the highest excitation position of each compound to search for heteroaryl chalcone compound which presents the considerable fluorescence property in order to use as starting materials for synthesis of the pyrazoline derivatives by cyclization at the enone system of these structures. For absorption and fluorescence emission studies of these heteroaryl chalcones, the absorption spectra of synthesized compounds in DMSO solution were observed in the range of 300-500 nm and the emission spectra were observed in the range of 450-600 nm in which the maximum absorptions (λ_{abs}) and emission (λ_{em}) were varied with the different heterocyclic rings.



(1) (2)

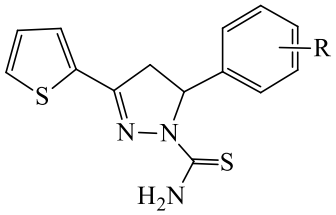
The structures of heteroaryl chalcones 1-2

Keywords: Chalcones, Photophysical property, Absorption, Fluorescence.

C2_011_PA: SYNTHESIS, CHARACTERIZATION AND PHOTOPHYSICAL PROPERTY OF PYRAZOLINE DERIVATIVES

Thitipone Suwunwong[1,2,*], Narumon Phonrung[1,2]
[1]School of Science, Mae Fah Luang University, Chiang Rai, 57100, Thailand
[2]Center of Chemical Innovation for Sustainability (CIS), Mae Fah Luang University, Chiang Rai, 57100, Thailand
*e-mail: thitipone.suw@mfu.ac.th

Abstract: To search for the ligands which include tridentate chelating ring for heavy metal fluorescent sensor, these pyrazoline derivatives (1-2) were synthesized by cyclization of heteroaryl chalcones at the enone system. The structures were characterized by ^{1}H NMR and IR spectroscopies. In the preliminary method to study the photophysical property of these compounds, the adsorption and fluorescence emissions of compounds 1-2 were screened in 10 µM acetonitrile solution to assess its photophysical property. The absorption spectra of compounds 1-2 in acetonitrile solution were observed in the range of 300-400 nm. The fluorescence emission spectra were observed in blue fluorescence region at around 400-500 nm in which the maximum absorption (λ_{abs}) and emission (λ_{em}) were varied slightly with the different substituted group (R) at phenyl ring.



Pyrazolines (1-2)

1; R = 4-$N(CH_3)_2$
2; R = 2,4,5-OCH_3

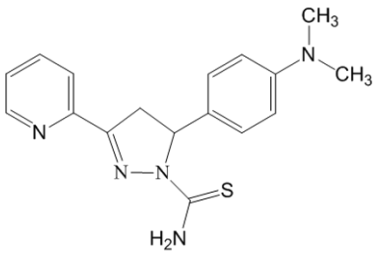
The structures of pyrazolines (1-2)

Keywords: Chalcones, Pyrazoline, Photophysical property.

C2_012_PA: SYNTHESIS OF PYRAZOLINE DERIVATIVE AS FLUORESCENT SENSOR FOR Hg^{2+} AND Pb^{2+} IONS

Narumon Phonrung[1,2], Patcharanan Choto[1,2], Thitipone Suwunwong[1,2,*]
[1]School of Science, Mae Fah Luang University, Tasud, Muang, Chiang Rai 57100, Thailand
[2]Center of Chemical Innovation for Sustainability (CIS), Mae Fah Luang University, ChiangRai 57100, Thailand
*e-mail: thitipone.suw@mfu.ac.th

Abstract: On the propose of finding the new fluorescence sensor for detection of the toxic Pb^{2+} and Hg^{2+} ions contaminated in wastewater, the pyrazoline derivative P1 were designed, and synthesized by cyclization of appropriated heteroaryl chalcone at the enone system with thiosemicarbazide. The synthesized structure was characterized by FT-IR and ^{1}H-NMR spectroscopies. The fluorescence property can be used to determine the emission of the aqueous solution with high selectivity and sensitivity. The fluorescence change of synthesized compound with Hg^{2+} and Pb^{2+} ions was screened to determine whether the synthesized pyrazoline respond to Hg^{2+} and Pb^{2+} ions. The present work may bring out additional evidence on the reaction of pyrazoline derivatives with heavy metals, which could lead to the further development of the fluorescence sensor.



Pyrazoline derivative P1

Keywords: Pyrazoline, Fluorescence, Metal Ions

SESSION C3:
ORGANIC &
MEDICINAL CHEMISTRY

C3_001_PA: CHEMICAL CONSTITUENTS FROM THE AERIAL PARTS OF *Euphorbia antiquorum* L.

Jirapast Sichaem[1,*], Thuc-Huy Duongf[2]
[1]Faculty of Science and Technology, Thammasat University Lampang Campus, Lampang, Thailand
[2]Department for Management of Science and Technology Development, Ton Duc Thang University, Ho Chi Minh City, Vietnam
*e-mail: Jirapast@tu.ac.th

Abstract: *Euphorbia antiquorum* L. (synonym *Euphorbia antiquorum* var. *polygona* Wight; *Euphorbia arborescens* Roxb.; *Tithymalus antiquorus* (L.) Moench) is a species of flowering plant widely distributed throughout the world, mainly concentrated in tropical and subtropical regions. The fresh stems of *E. antiquorum* are commonly used to treat dropsy, toothache, scabies, palsy, skin sores and amaurosis in traditional Chinese medicine while the latex has been used for relieving earaches, toothaches and treatment of nervous diseases. Previous researchers have discovered various diterpenoids, triterpenoids and neolignans from this plant, and most of them have been reported to exhibit anti-infection, antibacterial, cytotoxicity and anti-HIV activities. During our recent chemical investigation on this plant, a new ent-atisane diterpenoid, ent-3*α*-acetoxy-1*β*,16*β*,17-trihydroxyatisane (1), along with four known compounds, 3,3′,4′-tri-*O*-methylellagic acid (2), (*R*)-(+)-lasiodiplodin (3), taraxerol (4) and syringic acid (5) were isolated from the aerial parts of *E. antiquorum* L. To the best of our knowledge, compounds 1 and 3 were first reported in this plant. The structures of all isolated compounds were identified by the interpretation of their spectroscopic data and comparison with those reported in the literature.

C3_002_PF: QUANTITATIVE DETERMINATION OF PHENOLIC AND TANNIN CONTENTS AND ANTIOXIDANT ACTIVITY OF PAPER MULBERRY

Banthot Chomsawan[1,*], Jinda Sirita[1], Piyada Yodsoontorn[1], Kanlaya Jumpatong[2]
[1]Faculty of Science and Technology, Chiang Rai Rajabhat University, Chiang Rai 57100, Thailand
[2]School of Science, University of Phayao, Chiang Rai 56000, Thailand
*e-mail: banthod49@gmail.com

Abstract: This research aimed to determine the quantity of phenolic and tannin contents and antioxidant activity of paper mulberry ethanol extract and to evaluate physical and chemical properties and product satisfaction of the appropriate formulation of soap containing paper mulberry extract. It was found that the dry old leaf extract of paper mulberry gave the highest percent yield (5.09 ± 0.19) and phenolic content (262.25 ± 9.17 mg GAE /100g) while the dry young leaf extract contained the highest tannin content (213.16 ± 24.26 mg/100g). The highest antioxidant activity with IC_{50} value of 0.29 ± 0.02 mg/mL was found in the dry bark extract. When comparing the quantity of phenolic, tannin and antioxidant contents in paper mulberry extract, it showed to be statistically different ($p<0.05$). The dry bark extract was selected for soap production. Moreover, the results indicated that the appropriate ratio for glycerin, paper mulberry bark extract and essential oil was 98.5:0.5:1 which gave clear, brown-green lumps of soap with high foaming volume. The percentage of weight lost after soaking in the water, the corrosion and crevice rate were similar to those of soap products in the market with pH 9.94, chloride content of 0.020 ± 0.0006% w/w and no free hydroxide which corresponded with Thai Industrial Standard 29-2002 and the standard of community product 665/2010. The overall consumer satisfaction was 3.78 ± 0.42, which was high satisfaction.

C3_003_PF: SYNTHESIS AND CYTOTOXICITY OF TETRAHYDROCURCUMIN PYRAZOLE INDOLE DERIVATIVES

Manatchanok Pattanasing, Chopaka Thongbumrer, Boon-ek Yingyongnarongkul, Mayura Thongchuang, Vachiraporn Ajavakom*
Department of Chemistry and Center of Excellence for Innovation in Chemistry, Faculty of Science, Ramkhamhaeng University, Bangkok 10240, Thailand
*e-mail: satcharoen@yahoo.com

Abstract: Tetrahydrocurcumin Pyrazole Indole (TPI) derivatives were designed and synthesized by combining three important heterocyclic units into one molecule in order to create a novel type of biologically active compounds. Construction of pyrazole ring on tetrahydrocurcumin (THC) were carried out successfully by utilizing glacial acetic acid as a catalyst and subsequent coupling with corresponding indole acids (n = 1-3). The present work also aimed to improve the cytotoxic activity of the THC against cancer cells. The cytotoxicity studies of the synthesized and related compounds were described herein. THC bearing an indole scaffold linked with three methylene units (n = 3) exhibited better cytotoxic activities than the parent THC against human cervical adenocarcinoma (HeLa), prostate cancer (PC3), human colon adenocarcinoma (HT29) and human breast adenocarcinoma (MCF-7) cell lines with IC_{50} values of 7.00±0.839 µM, 12.93±1.631, 11.53±0.505 and 21.31±0.794 µM, respectively.

C3_004_PF: FORMALDEHYDE FLUORESCENT SENSORS FROM 1,8-NAPHTHALIMIDE DERIVATIVES

Apicha Maharat[1,3], Paitoon Rashatasakhon[2,3,*]

[1]Program of Petrochemistry and Polymer Science, Faculty of Science, Chulalongkorn University, Phayathai Road, Pathumwan, Bangkok 10330, Thailand

[2]Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

[3]Nanotec-CU Center of Excellence on Food and Agriculture, Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

[*]E-mail: paitoon.r@chula.ac.th; Fax: +66 (2) 2187598; Tel: +66 (2) 2187633

Abstract: Three derivatives of 1,8-naphthalimide were systematically designed and synthesized in order to investigate the effect of substitution pattern on their photophysical properties and sensing behaviors towards formaldehyde in aqueous media. The key substituents, the hydrazino ($-NHNH_2$) and the 2-methoxyethylamino groups ($-NHCH_2CH_2OCH_3$), were installed at the 4-position of 1,8-naphthalimide by a nucleophilic replacement, and at the imide position by a condensation reaction with 1,8-naphthalic anhydride precursor. All target compounds were obtained in good overall yields of 60-80%. Due to the photo-induced electron transfer, these compounds were relatively less emissive compared to typical 1,8-naphthalimide derivatives. A preliminary screening revealed that their fluorescence signals increase upon addition of formaldehyde. The compound with two hydrazine groups exhibited the 5-fold fluorescence enhancement by formaldehyde in 5% aqueous acetic acid solution with a detection limit of 3.0 ppm.

C3_005_OF: THE PRELIMINARY STUDIES ON THE SYNTHESIS AND THE CYTOTOXICITY TOWARDS HepG2 AND Huh7 OF A NEW SERIES OF SORAFENIB ANALOGUES: REPLACEMENT OF ARYL UREA WITH A TRIAZOLE RING

Sarinya Palakhachane[1], Yuwaporn Ketkaew[2], Natthaya Chuaypen[2], Pisit Tangkijvanich[2], Apichart Suksamrarn[3], Panupun Limpachayaporn[1,*]

[1]Department of Chemistry, Faculty of Science, Silpakorn University, Nakhon Pathom 73000, Thailand

[2]Center of Excellence in Hepatitis and Liver Cancer, Faculty of Medicine, Chulalongkorn University, Bangkok 10330, Thailand

[3]Department of Chemistry and Center of Excellence for Innovation in Chemistry, Faculty of Science, Ramkhamhaeng University, Bangkok 10240, Thailand

*e-mail. panupun.lim@gmail.com, limpachayaporn_p@silpakorn.edu; tel. +66 34 255797; fax. +66 34 271356

Abstract: As a preliminary result, seven triazole-containing sorafenib analogues were synthesized successfully *via* Huisgen 1,3-dipolar cycloaddition (click reaction) followed by nucleophilic aromatic substitution. The structure of sorafenib (1), a multikinase inhibitor approved by the Food and Drug Administration of the United States (US FDA) for treatment of hepatocellular carcinoma (HCC), was modified by replacement of aryl urea with a 1,2,3-triazole linked to various substituted phenoxy ring. The *in vitro* cytotoxicity data revealed that the unsubstituted analogue 2a (R = H) was almost inactive. Compound 2e (R = *o*-NO_2) exhibited promising inhibitory activities with IC_{50} values of 72.0 and 52.5 μM towards HepG2 and Huh7, respectively, whereas 2d (R = *p*-F) and 2g (R = *p*-NO_2) inhibited Huh7 selectively with IC_{50} values of 64.4 and 21.1 μM, respectively. The most active synthetic inhibitors, 2e and 2g, were still ca. 19-fold and 7-fold, respectively, less active towards HepG2 and Huh7 compared to sorafenib (1). However, the preliminary results suggested that the triazole-containing sorafenib structure had the potential to be further developed for the improvement of anti-HepG2 and Huh7 activities. The substitution at the *o*- or *p*-position on the phenoxy part with a suitable functional group was the key factor for the successful activity improvement.

C3_006_PF: DESIGN AND SYNTHESIS OF OFF/ON FLUORESCENT pH SENSOR BASED ON RHODAMINE 6G

Siriphong Somprasong, Torsak Luanphaisarnnont*
Department of Chemistry and Center of Excellence for Innovation in Chemistry (PERCH-CIC), Faculty of Science, Mahidol University, Bangkok 10400, Thailand
*e-mail: torsak.lua@mahidol.ac.th

Abstract: Development of pH sensors is important for many applications. Fluorescent probes have been among the most useful tools to monitor the pH. This research investigated the off/on fluorescent pH sensor based on structural modification of rhodamine 6G. Probe 1 was designed and synthesized. Its photophysical properties and its ability as a pH sensor were also investigated.

C3_007_PF: XANTHONES FROM THE ROOTS OF *Cratoxylum cochinchinense*

Peeravat Natrsanga, Santi Tip-pyang*
Center of Excellence in Natural Products Chemistry, Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand
*e-mail: Santi.Ti@chula.ac.th

Abstract: Six known xanthones namely cratoxylumxanthone A (1), 9-hydroxycalabaxanthone (2), macluraxanthone (3), 10-*O*-methylmacluraxanthone (4), 6-deoxyjacareubin (5), and β-mangostin (6) were isolated from the roots of *Cratoxylum cochinchinense* (Lour.) Blume. Their structures were characterized by spectroscopic methods as well as comparison with those reported in the literature. Their cytotoxicity was evaluated against (KB, Hela S-3, HT-29, MCF-7 and Hep G2 cell lines). Compounds 2 and 3 showed significant cytotoxicity towards both KB and Hela S-3 cells with the respective IC_{50} values of 7.39 and 6.07 µM (for 2) and 1.60, 1.85 µM (for 3). Moreover, 2 exhibited good cytotoxicity against HT-29 cells with IC_{50} value of 8.11 µM, whereas 3 showed a potent cytotoxicity against MCF-7 cells with IC_{50} value of 1.18 µM.

C3_008_PF: DEVELOPMENT OF AN ASYMMETRIC DIELS–ALDER REACTION OF *O*-NAPHTHOQUINONES

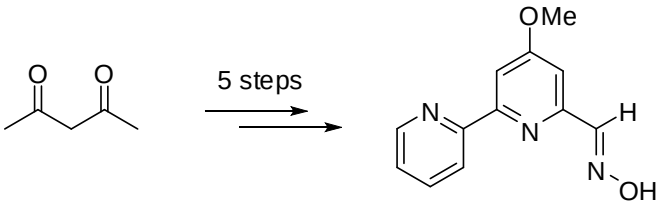
Watcharapon Prasitwatcharakorn, Torsak Luanphisarnnont*
Department of Chemistry and Center of Excellence for Innovation in Chemistry (PERCH-CIC), Faculty of Science, Mahidol University, 272 Rama VI Road, Ratchathewi, Bangkok, 10400, Thailand
*e-mail: torsak.lua@mahidol.ac.th

Abstract: Complex chiral carbocycles are important structural motifs in organic chemistry because they can be found in many biologically active and useful natural products and synthetic compounds. One powerful method to synthesize such carbocycles is an asymmetric Diels–Alder reaction which can rapidly assemble the complex carbocycles in high yield and regioselectivity. This work focuses on the development of a catalytic asymmetric Diels–Alder reaction of *o*-quinones using substituted prolinols as chiral catalysts. These chiral catalysts can catalyze the reaction with moderate efficiency, giving the desired complex chiral carbocycle products in moderate yield, excellent regioselectivity, and moderate enantioselectivity.

C3_009_PA: TOTAL SYNTHESIS OF CAERULOMYCIN A

Jesada Maneewong, Natthiya Saehlim, Rungnapha Saeeng*
Department of Chemistry and Centre of Excellence for Innovation in Chemistry
Faculty of Science, Burapha University, Saensook, Chonburi 20131, Thailand
*e-mail: rungnaph@buu.ac.th

Abstract: Caerulomycin A, a natural product isolated from the fermentation broth of *Streptomyces caeruleus*, is a bipyridine molecule with antibiotic properties and was recently found to exhibit cytotoxic activities. Caerulomycin A showed potent cytotoxicity against the HL-60 and A549 cell lines, with IC_{50} values of 0.71 and 0.26 µM, respectively. In this work, we synthesized caerulomycin A from pentane-2,4-dione via five steps reactions with intramolecular aldol condensation as a key step. Caerulomycin A was obtained in a moderate yield for further study of anticancer activity.



Caerulomycin A

C3_010_OF: KINETIC STUDY OF CONJUGATE ADDITION OF AMINES INTO ALKYNOIC ESTER

Peerawat Saejong[1], Panchika Prangkio[2], Torsak Luanphaisannont[1,3,*]
[1]Department of Chemistry, Faculty of Science, Mahidol University
[2]Department of Chemistry, Faculty of Science, Chiang Mai University
[3]Center of Excellence for Innovation in Chemistry (PERCH-CIC), Faculty of Science, Mahidol University
*e-mail: torsak.lua@mahidol.ac.th

Abstract: Unsaturated hydrocarbon functional groups are important in organic chemistry. One important reaction of these functional groups is the conjugate addition. The reaction is among the most important reactions in organic and biological chemistry as it is a basis of many synthesis applications and biological processes. Although the kinetic reactivity of alkenes and allenes in a conjugate addition has been investigated, the study of alkynes is still limited. This research investigated the kinetic behavior of alkynoic ester in a conjugate addition in comparison with alkenes and allenes. The rate of the conjugate addition of amine into alkynoic ester is faster than that of allenic and alkenic ester.

C3_011_PF: STUDY THE EXTRACTION OF *Stephania venosa* (BLUME) SPRENY. TUBERS

Warabhorn Boonyarat*, Chiraphat Phromthong
Department of Chemistry, Faculty of Science and Technology, Muban Chombueng Rajabhat University, Ratchaburi, Thailand
*e-mail: wara.boon.ell@gmail.com

Abstract: *Stephania venosa* (Blume) Spreng. is an important herb to treat to various diseases. This importance of treating is therefore study of the significant substances in the plant has be extracted by ethanol and methanol solvents. The Mayer's reagent was tested the alkaloids. The separation and purification of the substance were used Thin layer chromatography (TLC) and column chromatography. We found that the extraction solutions were yellow color of precipitate when tested with the reagent. The retention factor (R_f) range of alkaloids was between 0.22-0.25 cm. The purification of the extraction solutions which, it was shown only one line on TLC plate and the R_f was about 0.24 cm. Therefore, the substances were extracted from *Stephania venosa* (Blume) Spreng. that was the alkaloid group. The advantage of extraction methods is that found the substance in plant and used to treat the diseases.

C3_012_PA: SYNTHESIS OF LITHOCHOLIC ACID HYDRAZONE DERIVATIVES AND THEIR *IN VITRO* CYTOTOXIC ACTIVITY

Patchanee Charoenying[1,*], Nawasit Chotsaeng[1,2]
[1]Department of Chemistry, Faculty of Science, King Mongkut's Institute of Technology Ladkrabang, Ladkrabang, Bangkok 10520, Thailand
[2]Integrated Applied Chemistry Research Unit, Faculty of Science, King Mongkut's Institute of Technology Ladkrabang, Ladkrabang, Bangkok 10520, Thailand
*e-mail: patchanee.ch@kmitl.ac.th

Abstract: Lithocholic acid derivatives (4a)-(4e) were synthesized and investigated for cytotoxic activity. Using lithocholic acid (1) as a starting material, hydrazone derivatives were synthesized through modification of the carboxyl carbon C-24. As shown in Scheme 1, the synthesis of (4a)-(4e) was achieved from ethyl lithocholate (2). The hydrazone moiety was introduced *via* coupling of lithocholic acid hydrazide (3) with a suitably functionalized aldehyde utilizing acetic acid as a catalyst. The cytotoxicity of the synthesized hydrazones was tested by MTT assay *in vitro* against four human cancer cell lines; HT29 (human colon adenocarcinoma cell line), MCF7 (human breast carcinoma cell line), HepG2 (human hepatocellular carcinoma cell line) and KB (human oral epidermal carcinoma cell line). The results found that hydrazones (4a) and (4c) exhibited a significant activity against the KB cancer cell line with IC_{50} values of 1.03 and 1.68 μmol/mL, respectively.

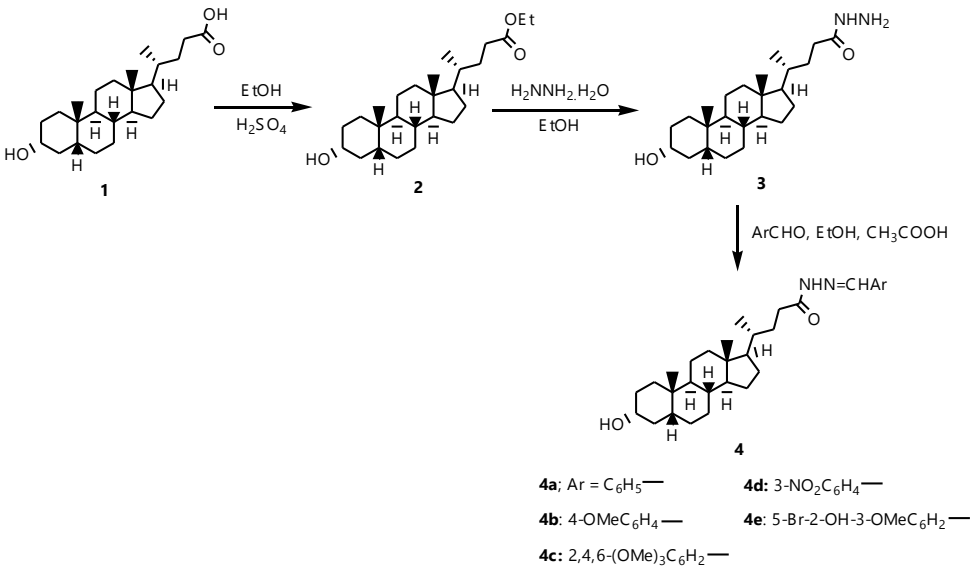


Figure 1 Synthesis of hydrazones (4a)-(4e)

C3_013_OA: DESIGN, SYNTHESIS AND STRUCTURE-PROPERTIES STUDIES OF CATIONIC STYRYL DYES FOR DNA SENSING APPLICATIONS

Kotchakorn Supabowornsathit, Tirayut Vilaivan*
Organic Synthesis Research Unit, Department of Chemistry, Faculty of Science, Chulalongkorn University, Phayathai Road, Patumwan, Bangkok 10330, Thailand
*e-mail: vtirayut@chula.ac.th

Abstract: Fluorescence dyes that can selectively bind and light up in the presence of DNA have found widespread applications as visualization tools in molecular biology. However, the choices of commercially available dyes are limited, and there are issues such as high cost, toxicity and poor selectivity among different types of DNA structures and sequences. Styryl dyes, conjugated organic molecules which consist of an electron-rich aromatic ring system connecting to an electron-deficient heteroaromatic ring system via one or more conjugated double bonds, have recently emerged as an attractive candidate as biological staining agents due to their superior and tunable optical properties as well as low toxicity compared to conventional intercalating dyes. In this study, novel cationic styryl dyes were designed with the aim to improve the binding efficiency with DNA targets which contain negatively-charged phosphate backbone. Optical properties of the newly synthesized dyes, both in the absence and presence of various sequence and structural types of DNA targets, were investigated to determine structural-properties relationships. The preliminary data revealed that core structures of the dyes play a significant role in determining the fluorescence properties and responsiveness of the dyes towards different DNA sequences and structures. For example, preferential fluorescence enhancement for AT-rich over CG-rich DNA duplexes was achieved for dyes with alkoxy as the electron donating substituent, whereas much less selectivity was observed with dialkylamino substituent. In addition, significant bathochromic shift in the UV absorption in addition to the fluorescence enhancement of some dyes were observed in the presence of DNA targets. These changes in optical properties are selective for DNA over other biological molecules such as bovine serum albumin (BSA) protein. A preliminary investigation of the mechanism of the absorption and fluorescence change will also be discussed. Hence, the novel cationic styryl dyes could serve as new tools for dual-mode DNA sensing with excellent tunable characteristics, selective for DNA detection and could be utilized for various biomedical applications.

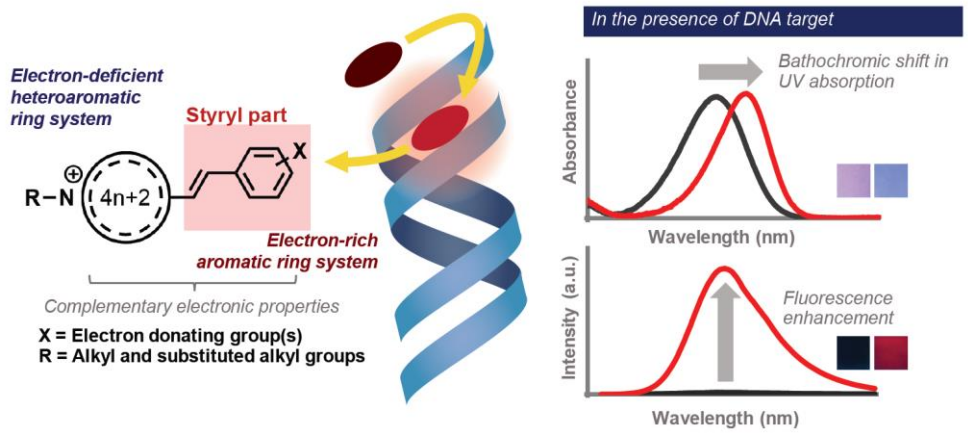


Figure 1. General structure of styryl dyes and their DNA sensing approaches

C3_014_PF: CHEMICAL CONSTITUENTS OF *Garcinia cowa* LEAVES

Piyaporn Phukhatmuen[1,3], Surat Laphookhieo[1,3], Rawiwan Charoensup[2,4], Wisanu Maneerat[1,3,4,*]
[1]School of Science, Mae Fah Luang University, Chiang Rai 57100, Thailand
[2]School of Integrative Medicine, Mae Fah Luang University, Chiang Rai 57100, Thailand
[3]Center of Chemical Innovation for Sustainability (CIS), Mae Fah Luang University, Chiang Rai 57100, Thailand
[4]Medicinal Plant Innovation Center, Mae Fah Luang University, Chiang Rai 57100, Thailand
*e-mail: wisanu.man@mfu.ac.th

Abstract: *Garcinia cowa* Roxb. *ex* DC. (Cha-Muang) has been used in folklore as an edible plant for culinary and therapeutic to treat fever, reduce phlegm, laxatives and improve blood circulation. The chemical investigation of the ethyl acetate leaf extract from *G. cowa* led to the isolation of six known compounds including friedelin (1), β-friedelinol (2), oleanane-12-ol (3), guttiferone I (4), 1,7-dihydroxyxanthone (5) and 1-hydroxy-7-methoxyxanthone (6). The structures of all isolated compounds were established by ^{1}H and ^{13}C NMR spectroscopic data. The structures of all isolated compounds were established by comparisons of their ^{1}H and ^{13}C NMR spectroscopic data with those reported in the literature.

C3_015_PA: A LABEL-FREE APPROACH FOR APTAMER-BASED FLUORESCENCE DETECTION OF MERCURY(II)

Duangkamol Tiarpattaradilok, Kotchakorn Supabowornsathit, Tirayut Vilaivan*
Organic Synthesis Research Unit, Department of Chemistry, Faculty of Science,
Chulalongkorn University, Phayathai Road, Patumwan, Bangkok 10330, Thailand
*e-mail: vtirayut@chula.ac.th

Abstract: Contamination of heavy metals in the environment is one of the most concerning health issues. Mercury is one of the most toxic heavy metal contaminants that requires strict control down to low ppb levels in water sources. Therefore very sensitive measurement method for accurate quantitative analysis of mercury that can be applied on-site is still in great demand. In this study, an aptamer-based fluorescence detection of mercury(II) ion has been developed. Most previously developed aptamer-based technologies for mercury sensing require covalent labeling of the aptamer with one or more dyes, which is complicated and expensive. Few label-free approaches have been developed so far, and some improvements are still required for practical use. In this work, novel styryl dyes – a class of fluorescence dyes consisting of and electron-deficient heteroaromatic ring system and electron-rich aromatic ring system linking together by conjugated double bond(s) which can change fluorescent properties upon binding to DNA with different structures – were evaluated as a potential fluorescence indicator for differentiating between the free aptamer (similar to the single-stranded DNA) and the aptamer bound to the mercury ion (similar to the double-stranded DNA) by the change in their fluorescence. Screening of dyes, aptamers and buffers were performed to find the optimal condition for Hg^{2+} detection by image analysis of photographs taken under UV light. Dyes that show good responsiveness were selected for further evaluation of Hg^{2+} detection performances. The calibration curve between Hg^{2+} concentration and fluorescence signal from spectrophotometer showed a linear correlation over the Hg^{2+} concentration range of 0-1.5 µM Hg^{2+} and a limit of detection (LOD) of 36.5 nM (75 ppb) was obtained. Moreover, screening with various metal ions confirmed that this method selectively responded to only Hg^{2+} and was therefore considered showing high specificity. In summary, a novel mercury detection system has been successfully developed, yet it still requires further optimization to improve the LOD.

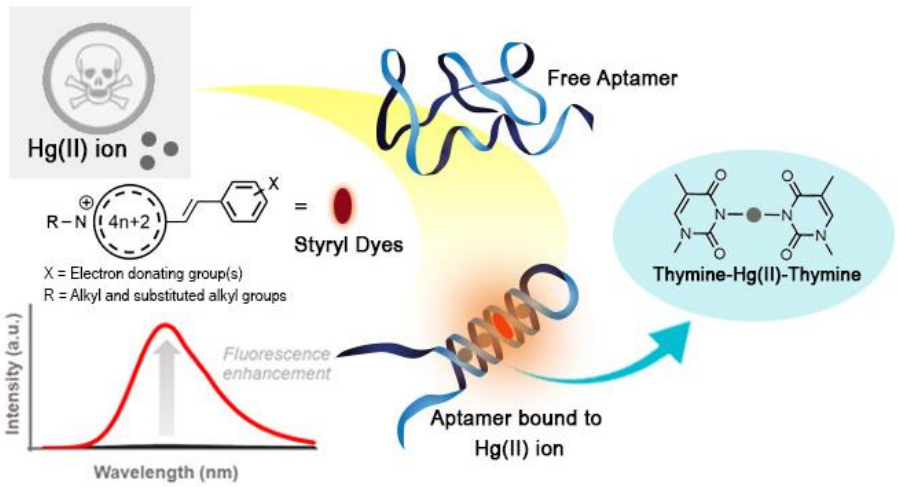


Figure 1. General concept of this work

C3_016_PF: CHEMICAL SYNTHESIS OF GLYCOSYL DITHIOCARBAMATE USING LACTOSE ISOLATED FROM WHEY AS PRECURSOR

Pranpariya Ponpakdee[1], Panuwat Padungros[2,*]
[1]Program in Petrochemistry and Polymer Science, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand
[2]Organic Synthesis Research Unit, Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand
*e-mail: panuwat.p@chula.ac.th

Abstract: Glycosyl dithiocarbamates (glycosyl DTCs) are efficient monomers in oligosaccharide synthesis. Several syntheses of glycosyl DTCs have been previously reported. The conventional methods; however, required multistep syntheses which involved strictly controlled anhydrous conditions. In this work, 2-chloro-1,3-dimethylimidazolinium chloride (DMC) was investigated as a dehydrative agent for condensation between lactol (1-hydroxy glycoside) and sodium *N*,*N*-diethyldithiocarbamate (NaDTC; $Na^{+-}SC(S)NEt_2$). The lactol 1 derived from protected galactose was first examined as a model substrate. After several optimizations, galactosyl DTC 2 was afforded in good yields *via* direct anomeric activation with DMC. The galactosyl DTC 2 was further utilized as a glycosyl donor for chemical glycosylation. Coupling between galactosyl DTC 2 and glycosyl acceptor 3 using $Cu(OTf)_2$ as an Lewis acid activator provided the corresponding disaccharide 4 in 61% yield with moderate selectivity. Next, lactose (5) was isolated from liquid whey which kindly donated by cheese factory of the Royal Chitralada project, Bangkok. Isolation of lactose was developed and obtained solid lactose in 39 grams from liquid whey 1 liter, the recovery was 3.9% (w/v). The DMC-mediated activation was then carried out to yield lactosyl DTC 6 intermediate in good yield. Ongoing work focuses on the application of lactosyl DTC 6 as glycosyl donor for the synthesis of prebiotic galacto-oligosaccharide (GOS).

C3_017_PA: FLAVONES FROM THE TWIG EXTRACT OF *Pongamia pinnata*

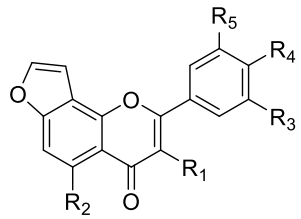
Jirativat Nanthachan[1,*], Pornphimon Meesakul[1], Wisanu Maneerat[1], Luksamee Vittaya[2], Surat Laphookhieo[1]

[1]Center of Chemical Innovation for Sustainability (CIS) and School of Science, Mae Fah Luang University, Chiang Rai 57100, Thailand

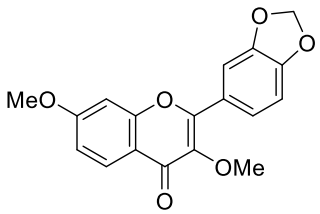
[2]Faculty of Science and Fisheries Technology, Rajamangala University of Technology Srivijaya, Trang 92150, Thailand

*e-mail: 6031102002@lamduan.mfu.ac.th

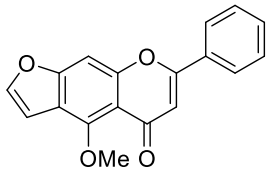
Abstract: The phytochemical investigation of the twig extract of *Pongamia pinnata* led to the isolation and identification of seven flavones (1–7): karanjin (1), pongapinnol (2), 3'-methoxypongapin (3), *O*-methylpongaglabol (4), demethoxykanugin (5), pinnatin (6), and karanjachromene (7). Their structures were elucidated by 1D- and 2D-NMR spectroscopic data and comparisons of their NMR data with those reported in the literatures.



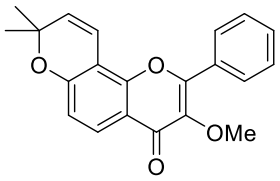
	R_1	R_2	R_3	R_4	R_5
1	OMe	H	H	H	H
2	OMe	H	OH	H	OH
3	OMe	H	OMe	$-CH_2-O-CH_2-$	
4	H	OMe	H	H	H



5



6



7

C3_018_PF: POTENT VASORELAXANT CAGED POLYPRENYLATED XANTHONES FROM THE RESIN OF *Garcinia hanburyi*

Rungnapa Noina[1], Ratchanaporn Chokchaisiri[2], Chainarong Tocharus[3], Luckika Panthiya[3], Waraluck Chaichompoo[1], Apichart Suksamrarn[1,*]

[1]Department of Chemistry and Center of Excellence for Innovation in Chemistry, Faculty of Science, Ramkhamhaeng University, Bangkok 10240, Thailand

[2]Department of Chemistry, School of Science, University of Phayao, Phayao 56000, Thailand

[3]Department of Anatomy, Faculty of Medicine, Chiang Mai University, Chiang Mai 50200, Thailand

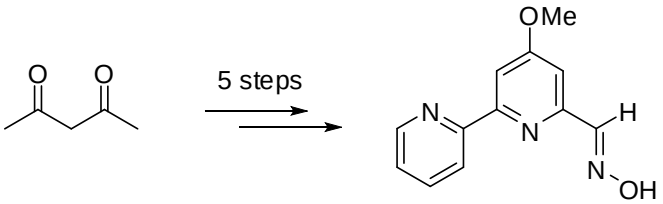
*e-mail : s_apichart@ru.ac.th

Abstract: *Garcinia hanburyi* (Clusiaceae) known in Thai as "Rong thong", is locally used as traditional medicine for the treatment of internal drastic purgative and externally infected wounds, chronic dermatitis, hemorrhoids, and bedsore. The chemical investigation of the hexane extract of the resin from this plant species resulted in the isolation of three known caged polyprenylated xanthones: gambogin (1), desoxymorellin (2) and desoxygambogenin (3). The structures of these compounds were elucidated using chemical and spectroscopic techniques. All of them showed vasorelaxant activity in rat isolated thoracic aorta. Compound 2 exhibited the most highly potent activity, with EC_{50} of 1.983×10^{-7} M.

C3_019_PA: TOTAL SYNTHESIS OF CAERULOMYCIN A

Jesada Maneewong, Natthiya Saehlim, Rungnapha Saeeng*
Department of Chemistry and Centre of Excellence for Innovation in Chemistry
Faculty of Science, Burapha University, Saensook, Chonburi 20131, Thailand
*e-mail: rungnaph@buu.ac.th

Abstract: Caerulomycin A, a natural product isolated from the fermentation broth of *Streptomyces caeruleus*, is a bipyridine molecule with antibiotic properties and was recently found to exhibit cytotoxic activities. Caerulomycin A showed potent cytotoxicity against the HL-60 and A549 cell lines, with IC_{50} values of 0.71 and 0.26 µM, respectively. In this work, we synthesized caerulomycin A from pentane-2,4-dione via five steps reactions with intramolecular aldol condensation as a key step. Caerulomycin A was obtained in a moderate yield for further study of anticancer activity.

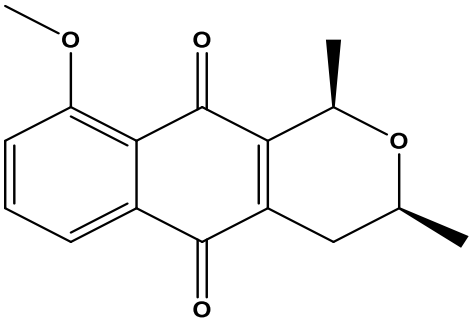


Caerulomycin A

C3_020_PA: (+)-ELEUTHERIN: A POTENTIAL ANTI-CARIES AGENT FROM THE RHIZOMES OF *Eleutherine bulbosa* (Mill.) Urb

Ritbey Ruga[1,2,3,*], Warinthorn Chavasiri[3,*]
[1]Department of Chemistry, Faculty of Mathematics and Natural Sciences, Mulawarman University, Samarinda 75123, Indonesia
[2]Research Center for Medicines and Cosmetic from Tropical Rainforest Resources, Mulawarman University, Samarinda 75119, Indonesia
[3]Center of Excellence in Natural Products Chemistry, Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 13330, Thailand
*e-mail: nona.ritbey@gmail.com, warinthorn.c@chula.ac.th

Abstract: *Eleutherine bulbosa* has been used by local people in East Kalimantan as a folk medicine for treatment of various diseases. The phytochemical investigation from the rhizomes of *E. bulbosa* was carried out with the aim to search for anti-caries agent. Eleutherin and other seven compounds were successfully isolated from the dichloromethane extract and conducted their antibacterial activities against *Streptococcus sobrinus* KCCM 11898 and *Streptococcus mutans* ATCC 25175 by diffusion method. The MIC values of the compounds were determined by dilution method. The structures of all isolated compounds were elucidated by ^{1}H and ^{13}C NMR data as well comparison of their data with those reported in previous literatures. Eleutherin is the most active compound against both bacteria with MIC values of 7.8 and 3.9 µM against *S. sobrinus* and *S. mutans*, respectively. It was also more active than chloramphenicol as standard toward both bacteria with equal MIC value of 15.6 µM.

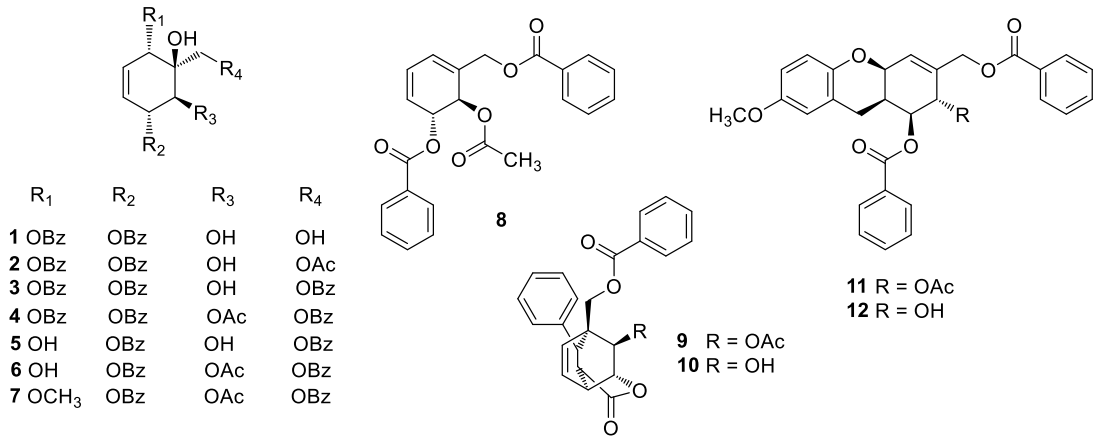


(+)-ELEUTHERIN

C3_021_PA: POLYOXYGENATED CYCLOHEXANE DERIVATIVES FROM THE STEMS OF *Uvaria curtisii*

Abdulwahab Salae*, Urairat Phrommee, Napatsawan Khwanchuen, Unruethai Phupornprasert, Uma Prawat
Laboratory of Natural Products Chemistry, Faculty of Science and Technology, Phuket Rajabhat University, Muang, Phuket 83000, Thailand
*e-mail: wahab_a@pkru.ac.th

Abstract: Phytochemical study on the Southern Thailand endemic Annonaceae plant *Uvaria curtisii* King led to the isolation of twelve known polyoxygenated cyclohexane derivatives, identified as uvaribonol A (1), uvarigranol E (2), ferrudiol (3), 2-*O*-acetyl-6-*O*-benzoylzeylenol (4), zeylenol (5), uvarigranol B (6), 2-*O*-acetyl-6-*O*-methylzeylenol (7), 1,6-deoxytingtanoxide (8), zeylena acetate (9), zeylena (10), cherrevenol B (11) and cherrevenol A (12). Their structures were determined through extensive spectroscopic analyses including 1D and 2D NMR as well as comparison with the literature data. The relative stereochemistry was established by using NOESY information. Although, the polyoxygenated compounds have commonly found from the genus *Uvaria*, this is the first report of these compounds from *U. curtisii*.



	R_1	R_2	R_3	R_4
1	OBz	OBz	OH	OH
2	OBz	OBz	OH	OAc
3	OBz	OBz	OH	OBz
4	OBz	OBz	OAc	OBz
5	OH	OBz	OH	OBz
6	OH	OBz	OAc	OBz
7	OCH_3	OBz	OAc	OBz

Figure 1. Structures of compounds 1-12.

SESSION C4:
PHYSICAL &
THEORETICAL CHEMISTRY

C4_001_OA: EXCITED-STATE TORSIONAL ROTATION OF THIOFLAVIN T BINDING TO VARIANT HUMAN TELOMERIC G-QUADRUPLEX DNA: A QM/MM STUDY

Wutthinan Thongyod[1,2], Chittanon Buranachai[1,2], Teparksorn Pengpan[1], Chutintorn Punwong[1,*]
[1]Department of Physics, Faculty of Science, Prince of Songkla University, Hat Yai, Songkhla 90112, Thailand
[2]Center of Excellence for Trace Analysis and Biosensor, Prince of Songkla University, Hat Yai, Songkhla 90112, Thailand
*e-mail: chutintorn@gmail.com

Abstract: Thioflavin T (ThT) and variant human telomeric G-quadruplex DNA (CTA-GQ) have been used to develop an effective optical sensor for cisplatin detection based on the fluorescence characteristic of ThT in different environments. ThT fluorescence is very strong when binding to the CTA-GQ. However, if cisplatin is added into the system, the CTA-GQ will be destroyed to be the single-stranded DNA (ssDNA) and ThT dissociates because of low binding stability of ThT/ssDNA. Fluorescence of completely solvated ThT is very low due to the excited-state torsional rotation of the central C-C single bond of ThT. Nevertheless, the details of the ThT/CTA-GQ system at molecular level are not completely understood. Here, molecular simulations with a combined quantum mechanical/molecular mechanical (QM/MM) method are performed to investigate the excited-state rotation and fluorescence behavior of ThT when binding to the CTA-GQ. We find that the excited-state rotation is not observed in some binding configurations. This implies the fluorescence enhancement of ThT in the complex. The rotation depends on a restriction of ThT movement by the DNA in each binding configuration. Finally, a better understanding achieved from this QM/MM study is expected to obtain useful information for designing more effective ThT/GQ-based sensors.

C4_002_PA: THERMAL RESPONSE OF LIPOPROTEIN NANODISCS BY COARSE-GRAINED MOLECULAR DYNAMICS SIMULATIONS

Warin Rangubpit[1], Ras B. Pandey[2], Pornthep Sompornpisut[1,*]
[1]Center of Excellent in Computational Chemistry, Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand
[2]Department of Physics and Astronomy, University of Southern Mississippi, Hattiesburg, MS 39406, USA
*e-mail: Pornthep.S@chula.ac.th

Abstract: Nanodiscs, a modified high-density lipoprotein (HDL) consisting of a phospholipid bilayer encircled by membrane scaffold proteins, has been increasing used as an encapsulating agent for structural study of membrane proteins. They have been successfully used in structure determination of several membrane proteins using various spectroscopic techniques, especially cryo-electron microscopy (cryo-EM). It has been reported the change in the morphology of nanodiscs upon changing the temperature, for instance, the deformation from the initial discoidal nanodisc into oblate shape. It should be noted that for observation in cryo-EM, biological samples are preserved at cryogenic temperature, and therefore could affect the nanodisc structure. Understanding the structural stability of the nanodiscs due to change in temperature is crucial. In this study, we present the effect of temperature to nanodisc structure by coarse-grained molecular dynamics (CG-MD) simulations. MD simulations were conducted for five different temperatures ranging from 200 to 400K with Martini force fields for CG-protein and lipid. Microsecond CG-MD simulations revealed structure and dynamic responses upon a variation of simulation temperature. As temperature rises, large-scale motions and changes in solvation property of the nanodiscs are reported.

Keywords: Nanodisc, Coarse-grained model, Membrane scaffolds protein

C4_003_OF: ENHANCING SENSITIVITY AND SELECTIVITY OF SURFACE-ENHANCED RAMAN SCATTERING DETECTION BY CHEMOMETRIC METHOD

Nontawat Sricharoen[1,2], Prompong Pienpinijtham[2], Sanong Ekgasit[2], Kanet Wongravee[1,2,*]
[1]Center of Excellence on Petrochemical and Materials Technology, Chulalongkorn University, Bangkok 10330, Thailand.
[2]Sensor Research Unit, Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand.
*e-mail: kanet.w@chula.ac.th

Abstract: Surface-Enhanced Raman Scattering (SERS) spectroscopy is a rapid and ultrasensitive technique for detecting the vibrational patterns of functional groups of molecules using nanoparticles as substrate. To acquire the analyte signal, the analyte should be immobilized and interacted on the surface of nanoparticles. To differentiate the signal of the analyte, signal patterns of capping agent and analyte must be different, otherwise, SERS signals of both capping agent and analyte will be overlapped and difficult for any further analysis. In the study, the chemometric methods were used to deconvolute the signals in SERS spectra. Multivariate curve resolution-alternative least square (MCR-ALS) was performed to extract the pure spectrum of the capping agent and the analyte from the overlapped signals. In the case, the efficiency of our developed algorithm was tested with the simulated spectra generated by two Gaussian peaks, representing the analyte and capping agent signal, respectively. These two peaks were generated using different condition involving the ratio of concentration between the analyte and the capping agent, noise levels, and resolutions in order to indicate the limitation of the developed method. The results show that, the pure analyte signals were successfully obtained with the R^2 values are higher than 0.99 and the prediction error is <1% and < 5% for calibration samples and validation samples, respectively. The developed program has the potential features to monitor and quantify an analyte in the practical SERS detection.

C4_004_PF: MOLECULAR DOCKING STUDIES OF DONEPEZIL-COUMARIN HYBRID AS NOVEL MULTI TARGET hAChE AND hMAO-B INHIBITORS

Charinee Thonthong, Siritron Samosorn, Pornthip Boonsri*
Department of Chemistry, Faculty of Science, Srinakharinwirot University, Bangkok 10110, Thailand
*e-mail: pornthipb@g.swu.ac.th

Abstract: Designing multitarget-directed-ligands (MTDLs) with simultaneous inhibition of human acetylcholinesterase (hAChE) and human monoamine oxidase type B (hMAO-B) has been targeted as the new potential therapeutic for treatment of Alzheimer's disease (AD). In the present work, a new series of donepezil-coumarin hybrid was designed based on molecular docking to serve as multitarget hAChE and hMAO-B Inhibitors. The hybrids showed no significant difference in binding energies to the hAChE and hMAO-B. Furthermore, the substituent effect on benzene ring for compound A and phenylbenzeneamine ring for compound B, whose design was based on pharmacophores of donepezil, was explored to improve the binding affinity. The results showed that most of compounds obtained similar mode of binding to hAChE and hMAO-B when compared to the reference ligand. Among them, the meta-nitrile substituted group (B8) was identified as the most potent inhibitor to hAChE and hMAO-B with the binding energy values at -12.29 and -12.22 kcal/mol, respectively. More importantly, B8 formed the hydrophobic interactions and strong hydrogen bonding to key residues in the peripheral anionic site (PAS) and catalytic active site (CAS) of the hAChE and have important formed hydrophobic entrance cavity toward the FAD of the hMAO-B. Therefore, we were expected that these novel donepezil-coumarin hybrids could be proposed as the potential multitarget inhibitors for AD therapy.

C4_005_PF: LASER-INDUCED BREAKDOWN SPECTROSCOPY STUDY OF RED-COLORED ANCIENT GLASS BEADS FROM KHLONG THOM ARCHAEOLOGICAL SITE

Krit Won-in[1,*], Jirapant Dutchaneephet[2], Pisutti Dararutana[3]
[1]Department of Earth Science, Faculty of Science, Kasetsart University, Bangkok 10900, Thailand
[2]Institute of Physical Education Phetchabun, Muang District, Phetchabun 67000, Thailand
[3]Retired Army Officer, Royal Thai Army, Bangkok 10900, Thailand
*e-mail: kritwonin@gmail.com

Abstract: This work is the first time in Thailand that a bench-top laser-induced breakdown spectroscopy (LIBS) has been used for examining ancient glass bead samples found at the Khlong Thom archaeological site, Krabi Province in southern Thailand. These samples dated to about the 4th Century AD. The results showed theirs elemental composition which were corresponded with those from X-ray fluorescence spectroscopy such as scanning electron microscope coupled with energy dispersive X-ray spectroscopy (SEM-EDS) and particle-induced X-ray emission spectroscopy (PIXE). It was found that the samples were classified as high magnesia glass and low-magnesia high potash glass which contained same glass chemicals as those from the Roman period. It can be concluded that it was the long distance or exchange connections in the maritime. It is demonstrated that the LIBS is one of potential technique for quick characterization of historical objects.

C4_006_PA: THE USE OF A SOLVENT MIXTURE TO STUDY THE INFLUENCE OF DIELECTRIC PROPERTIES ON PHOTOINDUCED ELECTRON TRANSFER REACTIONS

Patcharanan Choto[1,2,*], Juthathip Phumaenam[1,2], Thitipone Suwunwong[1,2], Kenneth Rasmussen[3], Guenter Grampp[4]

[1]Center of Chemical Innovation for Sustainability (CIS), Mae Fah Luang University, Tasud, Muang, Chiang Rai 57100, Thailand

[2]School of Science, Mae Fah Luang University, Tasud, Muang, Chiang Rai 57100, Thailand

[3]ESA Materials and Electrical Components Laboratory, European Space Research and Technology Centre, Keplerlaan 1, 2201-AZ Noordwijk, The Netherlands

[4]Institute of physical and theoretical chemistry, Graz University of technology, Graz 8010, Austria

*e-mail:patcharanan.cho@mfu.ac.th

Abstract: The dielectric properties of the solvent can influence the outer sphere reorganization energy of photoinduced electron transfer (PET) reactions. Precise knowledge of such phenomena is, therefore, important for the interpretation of their kinetics. The developed tertiary solvent mixtures, composed of different ratio of propyl acetate (PA), butyronitrile (BN) and diethyl phthalate (DEP) were used as an alternative medium to investigate the influence of dielectric properties on the quenching of well-known excited singlet pyrene by indole. These tertiary mixtures can vary a wide range of dielectric constants, in which the other properties can be kept constant. Quenching rate constants (k_q) of the reactions in tertiary mixtures xPA: xBN: xDEP and the pure solvents, acetonitrile and ethanol, were measured at room temperature by fluorescence spectroscopy. The rate constants (k_{et}) and solvent dynamic effects of the electron transfer reactions were evaluated in the framework of Marcus theory. The result shows that the solvent dependence behavior of the reactions in tertiary mixtures is consistent with the reactions in the pure solvents. This confirms that these solvent mixtures can be used as an alternative medium to clarify the influence of solvent on electron transfer reactions.

SESSION D:
POLYMER & MATERIALS SCIENCE_NANOTECHNOLOGY

D_001_PF: ZINC OXIDE DOPED WITH COPPER(II) OXIDE SUPPORTED ON CELLULOSE FLAKES FOR DEGRADATION OF METHYLENE BLUE

Saowapa Chotisuwan*, A-aesoh Luebaesa, Jareerat Roumcharoen
Department of Science, Faculty of Science and Technology, Prince of Songkla University, Pattani 94000, Thailand
*e-mail: saowapa.c@psu.ac.th

Abstract: Zinc oxide (1-5 wt %) photocatalysts doped with 1 wt % CuO supported on cellulose flakes (CFs) were prepared for degradation of methylene blue dye. Isolated cellulose fibers from oil palm trunk were dissolved in strong alkaline solution with 0.5 wt % ZnO as additive agent at -10 °C. Then CFs were formed by dropping cellulose solution into coagulation bath of 2 M HCl solution. The photocatalysts supported on CFs were prepared by precipitation to contain 1, 3 and 5 wt % ZnO and 1 wt % CuO. The photocatalysts were characterized by Fourier transform infrared spectroscopy (FT-IR), X-ray diffraction (XRD), and stereoscopic microscopy. It was observed that the particle sizes of CFs were 0.5-3.5 mm. The catalytic performance of the photocatalysts was performed by degradation of methylene blue dye solution. The 5 mg catalysts were dispersed in 50 mL of 1 x 10^{-5} M methylene blue solution at room temperature and irradiated with 20 W daylight lamp for 1 hour. It was found that the degradation efficiency of methylene blue catalyzed by 1 wt% ZnO-1 wt% CuO/CFs gave the optimum value at 68.4±1.5 %.

D_002_OF: MODIFICATION OF PECTIN BY 3-(DIMITHYLAMINO) PROPYLAMINE

Nootcharee Kunkit[1], Thanapon Deekaikam[1], Kiattikhun Manokruang[1,2,*]

[1]Department of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

[2]Materials Science Research Center, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

*e-mail: kiattikhun.m@cmu.ac.th

Abstract: Pectin is an anionic and biocompatible polysaccharide that can respond to pH changes. Pectin, thus, is a member of a pH-responsive polymer family. It has been well known that gelation of pectin occurs at acidic pH values and this acidic pH of gelation limits the use of such biomaterials. So, this research aimed to raise the gelation pH of pectin by modifying its chemical structure using 3-(dimethylamino) propylamine. The chemical structure of pectin was modified by the reaction between carboxylic acids of pectin and the primary amine groups of 3-(dimethylamino) propylamine (DMAPA). The carboxylic acid groups on pectin moieties were activated by the use of EDC/NHS coupling so that the amine groups from DMAPA can then react at the active sites, at which the amide formation was a result. The modified pectin copolymers with different DMAPA compositions (pec-*g*-DMAPA0.5, pec-*g*-DMAPA1.0 and pec-*g*-DMAPA1.5) were characterized and successfully confirmed by proton nuclear magnetic resonance spectroscopy (^{1}H-NMR). The grafting percentage values of pec-*g*-DMAPA0.5, pec-*g*-DMAPA1.0 and pec-*g*-DMAPA1.5, as calculated from the ^{1}H- NMR integral bands, were 38%, 42% and 52%, respectively. The grafting percentage obviously depended on DMAPA feeding composition which suggested that the values were increased by increasing DMAPA feeding composition. Also, the pH of the copolymer solutions was increased by increasing DMAPA composition in the pectin backbone.

D_003_PA: GEMOLOGICAL CHARACTERISTICS OF OYSTER COPPER TURQUOISE CLAIMED TO BE FROM UNITED STATES OF AMERICA

Apichet Boonsoong[1,*], Natdanai Moondong, Phisit Limtrakun
Department of Geological Sciences, Faculty of Science, Chiang Mai University, Chiang Mai, Thailand
*e-mail: Siamsapphire@hotmail.com

Abstract: The studied samples were sold as 'Oyster Copper Turquoise' are kind of treated turquoises. They are new type of composite turquoise that consist of genuine turquoise that are blue to greenish blue in colors, oyster that are white to orange together with some yellow brass gold color metal matrix (figure 1). The 10 polished samples were studied for their gemological and chemical properties. The samples were fashioned as cabochons weighing 13.31 to 23.31 ct. and were divided into three groups each on show bodycolor of turquoise more than oyster, turquoise as well as oyster and oyster more than turquoise. Their specific gravity was in the range of 2.70 to 2.82. They were inert under short wave ultraviolet light but under long wave ultraviolet light displayed a bright patchy white to blue in turquoise, the oyster displayed a strong white to orange and matrix were mainly inert. Petrographic studied showed that they are composed of turquoise pieces and aragonite structures of oyster but matrix is opaque. SEM image showed surfaced of turquoise areas which were pieces of granular. Oyster showed columnar and platelet habits and matrix showed granular habit. EDS provided the constituents were oxygen, aluminum, phosphorus, copper and/or iron in turquoise, in oyster were calcium, carbon, oxygen and in matrix were copper, zinc, oxygen and/or calcium, silicon, aluminum. XRD revealed that the mineral compositions of samples include turquoise, aragonite, calcite and copper. FTIR of turquoise powder displayed absorption features at approximately 1740 cm^{-1}. Matrix powder displayed consistent absorption features in the 1740, 2860, 2925 and 2956 cm^{-1} these were reportedly associated with polymers. However, no peak was detected the opticon or other resins. These composites consist of small fragment of turquoise and oyster together with a colorless polymer in gold-color matrix. Furthermore, matrix samples contain interstitial areas formed of colorless polymer containing fragments of brass.

Figure 1. Oyster Copper Turquoise samples.

D_004_PA: APPLICATION OF EXTENDING SHELF LIFE OF FRESH EGG USING CARBOXYMETHYL CELLULOSE /$CACO_3$ MODIFIED BY PALMITIC ACID AND STEARIC ACID AS AN ACTIVE PACKAGING

Witthawat Piampowdee[1,*], Niparat Sritharet[2], Chiravoot Pechyen[1]

[1]Department of Materials and Textile Technology, Faculty of Science and Technology, Thammasat University, Thailand

[2]Department of Agricultural Technology, Faculty of Science and Technology, Thammasat University, Thailand

*e-mail: witthawatpowdee@hotmail.com

Abstract: The productive of various coatings based carboxymethyl cellules (CMC) / $CaCO_3$ (modified with 1 3 5 % w/v of palmitic acid and stearic acid) solution on interior properties of fresh egg were analyzed during storage at 30°C for 2 weeks. Coating had significant effect an albumen pH, Yolk Index (YI), Haugh unit (HU) and Fourier Transform Infrared spectroscopy (FTIR). All batches of fresh eggs (Grade AA at day one) were uncoated and coated. Uncoated eggs had higher albumen pH 9.13 and lower YI (21.23), HU (77.40) between storage. In the group of coated eggs, CMC/$CaCO_3$ -Palmitic acid and CMC/$CaCO_3$-Stearic acid coated eggs had the highest YI (35.69 to 43.38 and 33.30 to 43.98) and HU (71.38 to 85.90 and 75.41 to 85.90) after storage. The crystalline structure at all coatings was characterized using XRD. The incorporation at modified $CaCO_3$ with palmitic acid and stearic acid result in % crystallinity increase indicated that modified $CaCO_3$ as a nucleating agent. Its nucleating of agent help improve the balance physical and barrier properties. This study highlights the promising use of CMC/$CaCO_3$-Palmitic Acid and CMC/CaCO3-Stearic Acid coatings to both enhance the shelf life of fresh eggs.

D_005_PA: A FLOWER SHAPE-GREEN SYNTHESIS AND CHARACTERIZATION OF SILVER NANOPARTICLES (AgNPs) WITH DIFFERENT STARCH AS A REDUCING AGENT FOR BIODIAGNOSIS APPLICATION

Khanittha Ponsanti[1,]*, Chiravoot Pechyen[1], Benchamaporn Tangnorawich[2], Nipaporn Ngernyuang[3]

[1]Department of Materials Technology and Textile, Faculty of Science and Technology, Thammasat University

[2]Department of Physical, Faculty of Science and Technology, Thammasat University

[3]Chulabhom International College of Medicine, Thammasat University

*e-mail: fai.ponfanpi@gmail.com.

Abstract: In this work we study the effect of different starch as a reducing agent (corn, cassava, and sago) on to synthesis of silver (AgNPs) nanoparticles by reduction of silver nitrate (AgNO3). Green and simple synthesis strategies have gained tremendous popularity for the production of anisotropically-shaped noble metallic nanoparticles. The absorption peak at 430 nm (λmax), measured using a UV-Vis spectrophotometer indicates the existence of AgNPs, this reaction was favored by the increase of temperature with optimal results at 40 °C. The obtained powders silver nanoparticles that were synthesized from different starches with a transmission electron microscope and particle size analyzer techniques it was found that silver nanoparticles that synthesized with corn starch was shaped into a flower structure with a clustering and dispersing and the particle size distribution of silver nanoparticles were found approximately 48 nm. Silver nanoparticles synthesized with cassava starch and sago starch forming a large flower which the particle size distribution of silver nanoparticles were found a in 108.1 and 114.5 nm. Synthesis of AgNPs was only obtained using starch as reducing agent, the use of solutions of starch allow low pH of the solutions creates thermodynamic instabilities for the AgNPs synthesis, due to low repulsive force for colloid stability. In addition, the effects of silver nanoparticles synthesis with different starches were analyzed the by X-ray diffraction analysis that obtained in the 2θ position at 38.07° 44.4° 64.38° and 77.7° corresponding to (111) (200) (220) and (311) planes of the Face-Centred Cubic (FCC) crystal structure which was a characteristic of silver nanoparticles. The extremely strong properties of AgNPs flower structure has been successfully applied to the detection of cancer cells. The unique flower structure with high-sensitivity properties are also expected to find use in many other fields such as biolabel, bioassay, biodiagnosis, and even clinical diagnosis and therapy.

D_006_PA: PRODUCTION AND CHARACTERIZATION OF PRINTED SCREEN ELECTRODES MODIFIED WITH GRAPHENE/ZNO NANOCOMPOSITE FOR GOUT

Nion Taikerd[1,*], Chiravoot Pechyen[1], Patcharee Pratumpong[2]
[1]Department of Materials Technology and Textile, Faculty of Science and Technology, Thammasat University.
[2]Department of Physical, Faculty of Science and Technology, Thammasat University.
*e-mail: nion.tk@gmail.com

Abstract: Graphene-Zinc oxide (G/ZnO) nanocomposites were prepared by *in situ* sol-gel synthesis. This method is convenient, low cost and high purity composite. The G/ZnO were characterized by transmission electron microscopy (TEM), revealing that ZnO adhered to the Graphene surface. After annealing G/ZnO at a suitable temperature (500°C) they were given a good crystallinity of ZnO, characterized by the XRD pattern. The crystalline nature was used to make microelectrodes, which exhibited strong electrocatalytic activity towards the oxidation of uric acid (UA). The combination of Graphene and ZnO significantly increased the electron transfer at the electrode surface, microelectrode portability, increased selectivity and sensitivity for uric (UA). The optimum potential of G/ZnO working electrode to determinate UA was 0.4 Volts. The biosensor was developed for the detection of UA with respect to the above properties. The linear range for UA 50-200 µM working electrode in 0.5M PBS (pH = 7.4). The G/ZnO working electrode can detect the concentration of UA in the human's urine, and normal pH conditions (5.5-6.5). These findings suggest that a portable test center for clinical diagnosis may be possible in Thailand.

D_007_PF: EFFECTS OF LOW DOSE OF GOLD NANOPARTICLES ON PERICYTES BIOLOGY

Sasikarn Looprasertkul[1], Amornpun Sereemaspun[1,3], Depicha Jindatip[1,2,*]

[1]Department of Anatomy, Faculty of Medicine, Chulalongkorn University and King Chulalongkorn Memorial Hospital, Bangkok, Thailand

[2]Department of Anatomy, Division of Histology and Cell Biology, Jichi Medical University School of Medicine, Tochigi, Japan

[3]Nanobiomedicine Laboratory, Department of Anatomy, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand

*e-mail: depicha.j@chula.ac.th

Abstract: Pericytes are located on the capillary wall and play an important role in maintaining the vascular system in physiological and pathological conditions. Several studies showed that gold nanoparticles (AuNPs) could inhibit endothelial cells proliferation, migration, invasion and tube formation. However, it should be noted that there was no report on the effect of AuNPs on pericytes. Therefore, the aim of this study was to investigate the alteration of pericyte properties after AuNPs treatment. Human pericytes from the placenta (hPC-PL) were treated with 10 ppm concentration of 20 nm-AuNPs and then observed morphology by light microscopy. Cell migration is evaluated by transwell migration assay. In addition, mRNA expression of the *Ki67* and *PDGFR-β* on pericytes were investigated by reverse transcription quantitative PCR (RT-qPCR). The results showed that 20 nm-AuNPs at 10 ppm significantly reduced cell migration, suppressed cell proliferation, and downregulated *PDGFR-β* mRNA expression of treated pericytes compared with control. Further experiments are required to study the effects of various sizes and doses of AuNPs on the pericytes including endothelial-pericyte tube formation.

D_008_PA: PROCEEDING ON EXTRACTION OF CELLULOSE-PAPER FROM BREWERS' SPENT GRAIN BY CHEMICAL TREATMENT

Jakrada Attarataya[1,*], Sunaree Choknud[2]

[1]Synchrotron Light Research Institute (Public organization) 111 University Avenue, Muang District, Nakhon Ratchasima, Thailand 30000

[2]Suranaree University of Technology 111 University Avenue, Muang District, Nakhon Ratchasima, Thailand 30000

*e-mail: jakrada@slri.or.th

Abstract: According to the growth in popularity of beer worldwide, brewery industry in Thailand has produced about 2 billion liters in 2017 that it would be roughly 400 million kilograms of by-products. Therefore, concern on large amount of by-products and wastes generated by the brewing industry has been addressed and the main component of this waste is spent grains (BSG) from the fermentation process up to 85% of the total. According to Mussatto et al. 2013 and 2014, the production of spent grain is estimated of approximately 3.9 x 10^{10} kilograms worldwide every year. The spent grain is consisted by the husks of barley malt grain mainly which is rich in cellulose, hemicellulose and lignin as fibers. Besides that, there are also found a fair amount of protein and a variety of minerals elements. Because of the main component as fibers, they are considered to become a subject in order to waste management for this industry. In this study, we aimed to modify the raw materials from BSG by chemical treatment in order to gain bio-polymer containing mainly cellulose using sulfuric acid, soda, and peroxide-bleaching treatments, respectively. We succeeded extracting unwanted components leaving only white fibers as a bio-paper product and analyzed components qualitatively using techniques such as Fourier-transform infrared spectroscopy (FTIR) to identify organic compounds such as carbohydrates, proteins, and lipids. Moreover, scanning electron microscopy (SEM) was also used to reveal images of fibers at a level of micrometers in comparison of products from each step of chemical procedures.

D_009_PA: ANTI-BACTERIAL AND FUNGI ACTIVITY OF NATURAL RUBBER BASED TITANIUM AND ZINC OXIDE NANOCOMPOSITES

Siriwat radabutra[1,*], Rujiraporn sakura[2]

[1]Department of Chemistry and Center of Excellence for Innovation in Chemistry (PERCH-CIC), Faculty of Science, Ubon Ratchathani University, Warinchamrap, Ubon Ratchathani 34190, Thailand

[2]Faculty of science, Laboratory of Advanced Polymer and Rubber Materials (APRM), Ubon Ratchathani University, Ubon Ratchathani 34190, Thailand

*e-mail: siriwatubu@gmail.com

Abstract: The anti-bacterial and fungi activity is necessary properties for rubber mat production. The researcher therefore has an idea to add substances that can inhibit fungi and bacteria into natural rubber, namely zinc oxide and titanium oxide nanoparticle to improve fungi and bacterial activity of natural rubber. These nanoparticle were added into rubber formulation which composed of natural rubber (NR), Calcium carbonate, and Sulfur curative system. After that they were mixed together in the internal mixer before compression molding. Antibacterial activity and mechanical properties of vulcanizate rubber were characterized following Thai Industrial Standards Institute (TISI) (TIS 2377-2559). The mechanical properties such as tensile strength, hardness, compression set and etc. passed the standard. In addition, the anti-fungi and bacterial properties by adding zincoxide and titanium dioxide nanoparticles into NR formulation can inhibit to *Aspergillus niger*, gram-positive bacteria such as *Stephylococcus aureus* and gram-negative bacteria such as *Escherichia coli*. It can be concluded that rubber formulas can be used to produce non-slip rubber sheets in bathrooms that can inhibit mold and bacteria.

Keywords: Natural Rubber, Anti-fungi, Anti-bacteria, Non-slip rubber floor mats

D_010_PA: THE EFFECT OF ANODIZATION DURATION ON MORPHOLOGY AND ELECTRICAL PROPERTIES OF TiO_2 NANOTUBE ARRAYS

Somwan Chumphongphan[1], Kornkanok Nukard[2], Prachak Inkaew[3]
[1]Center of Innovative Materials for Sustainability, School of Science, Mae Fah Luang University, Chiangrai, 57100
[2]School of Science, Mae Fah Luang University, Chiangrai, 57100
[3]Center of Chemical Innovation for Sustainability, School of Science, Mae Fah Luang University, Chiangrai, 57100
*e-mail: somwan@mfu.ac.th

Abstract: TiO_2 nanotube arrays (NTAs) were synthesized by anodization method. The as-prepared TiO_2 NTAs were annealed at 450 °C for 3 h, 2 °C/min to transform amorphous TiO_2 to anatase phase. The TiO_2 NTAs distribute uniformly over surface of Ti plate. The average inner diameters of synthesized TiO_2 NTAs are approximately 65, 80 and 90 nm for the anodization duration of 1, 2 and 3 h, respectively. Some cracks on the surface of TiO_2 NTAs can be observed after the anodization process for 3 h. The impedance of TiO_2 NTAs at room temperature was not significant difference for those three conditions.

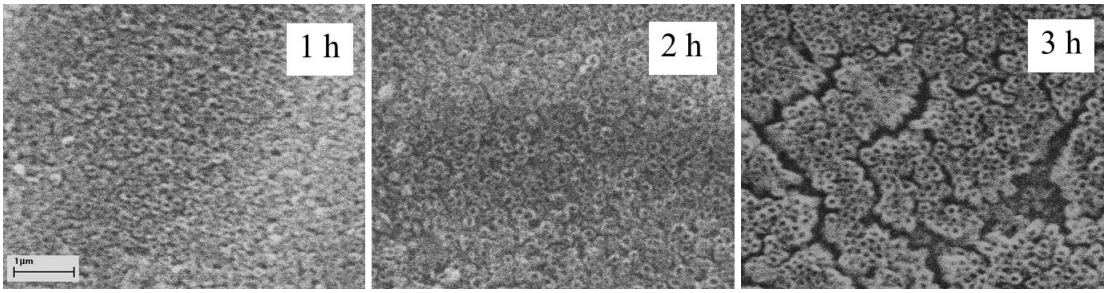


Figure 1. The SEM images of TiO_2 nanotube arrays prepared by anodization process at 1, 2 and 3 h.

D_011_PA: EFFECT OF ANNEALING TEMPERATURE OF TITANIUM DIOXIDE FILMS PREPARED BY ELECTRO SPARK DEPOSITION TECHNIQUE

Gitchanaphon Sriwichai, Suparut Narksitipan*
Program in Materials Science, Faculty of Science, Maejo University, Chiang Mai 50290, Thailand
*e-mail: snarksitipan@gmail.com

Abstract: Electro spark deposition technique is a technology that uses electrical energy stored in a capacitor to initialize an electrical spark between the cathode and the anode. The high temperature generated by the electrical spark leads to partial melting of substrate and mixing of it with the material of the electrode. Between the two electric sparks, the amount of the molten metal solidifies to form the surface layer. In this research, titanium dioxide (TiO_2) films prepared by electro spark deposition technique. Titanium (Ti) nanoparticle transferred from the depositing of tiatnium pure electrode to coat on the glass substrate. Then, they are annealed at various temperature of 200-400°C for 2 hours. Finally, TiO_2 films are characterized with chemical composition and microstructure by EDS and SEM, respectively. Optical properties of those films are analyzed by UV-VIS spectrophotometer. It was found that the EDS results showed elements of titanium (Ti) and oxygen (O), which are composition of TiO_2 films. SEM image revealed the nanoparticles of TiO_2 are agglomerated throughout on the surface and like angular shape, as showed in figure 1. The optical transmission (%) in the ultraviolet light range was between 70 and 80%. Optical transmission (%) increased with increasing annealed temperature.

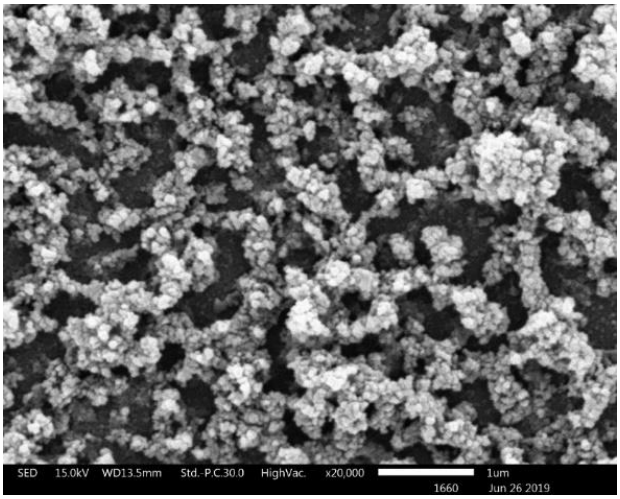


Figure 1. TiO_2 films prepared by electro spark deposition technique and annealed at temperature 400°C and for 2 hours.

D_012_OA: ENHANCED DIELECTRIC CONSTANT OF BARIUM TITANATE–EPOXY COMOSITES THROUGH A 3D CERAMIC NETWORK STRUCTURE

Gasidit Panomsuwan[1,*], Hathaikarn Manuspiya[2]
[1]Department of Materials Engineering, Faculty of Engineering, Kasetsart University, Bangkok, Thailand
[2]The Petroleum and Petrochemical College, Chulalongkorn University, Bangkok, Thailand
*e-mail: fenggdp@ku.ac.th, gasidit.p@ku.th

Abstract: Ceramic–polymer composites have been considered as a promising material for high-energy density capacitors because of their combination of high dielectric constant of ceramic and high dielectric breakdown strength of polymer. However, the ceramic loading of >50 vol% is required to enhance dielectric constant of composites. Therefore, development of ceramic–polymer composites with high dielectric constant at low ceramic loading (<30 vol%) is very challenging. In this work, we have fabricated a unique $BaTiO_3$ (BTO)–epoxy composite in which BTO ceramic phase has a skeleton 3D network structure in an epoxy matrix. 3D-BTO ceramics were prepared by coating cellulose sponge with BTO slurry and then sintered at 1200 °C. The cellulose sponge template was decomposed during sintering, resulting in the formation of 3D porous network of BTO. The epoxy solution was pour into 3D-BTO network, forming a unique composite system. By varying the number of coating from 3 to 18 times, BTO content in composites ranged between 3 and 20 vol%. Scanning electron microscopy (SEM) images showed that the BTO grains were connected to each other and good interface between BTO and epoxy was observed. The sintered 3D-BTO ceramics exhibited a tetragonal structure as confirmed by X-ray diffraction (XRD). The dielectric properties of 3D-BTO–epoxy composites were measured at room temperature in the frequency range of 10^2–10^7 Hz. It was found that the dielectric constant increased with increasing BTO content from 3.2 for pure epoxy and 34 for BTO content of 20 vol% at 10^6 Hz. This value is much higher than that of composite prepared by conventional mixing of BTO powders with epoxy at same BTO content. Enhanced dielectric constant of 3D-BTO–epoxy composite is due to an increase in polarization induced by a continuous phase of 3D-BTO network along the direction of applied electric field. A slight decrease in dielectric constant was found as the frequency increased, indicating frequency-independent behavior of composites. We conclude that the design of ceramic arrangement with 3D porous network plays a vital role in enhancing dielectric constant of composites at relatively low BTO content. This result in this work can be further developed to a ceramic–polymer composite with high energy density for energy storage application.

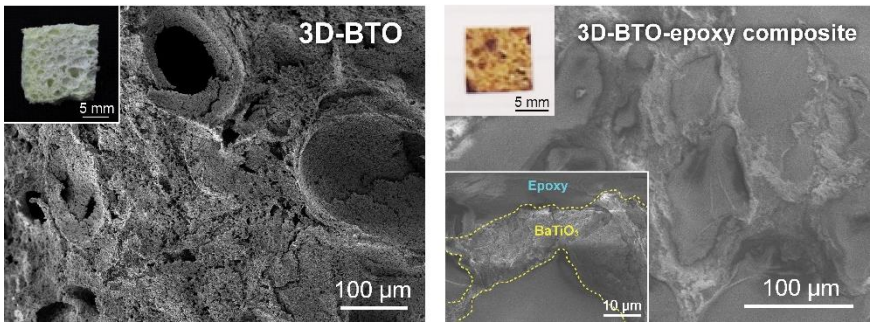


Figure 1. SEM images of 3D-BTO and 3D-BTO–epoxy composite.

D_013_PA: A FACILE SYNTHESIS OF SELF-CATALYTIC PVP/PVA/CA HYDROGEL USING HYDROGENCARBONATE AS A GELLING AGENT

Supachai Thongsuksaengcharoen, Siritron Samosorn, Kriangsak Songsrirote*

Department of Chemistry, Faculty of Science, Srinakharinwirot University, Sukhumvit 23, Wattana, Bangkok 10110, Thailand

*e-mail: kriangsaks@g.swu.ac.th

Abstract: A simple and economic method for PVA/PVP/CA hydrogel preparation using microwave-assisted irradiation is presented. The different ratios of staring components and also microwave irradiation parameters were studied to obtain hydrogel with high levels of gel fraction and a degree of swelling suitable for the application of wound dressings. The optimum conditions for hydrogel synthesis was 6:6:3 %(w/v) of PVA/PVP/CA under 120 °C for 3 minutes of microwave irradiation. The ionic liquid-like structure of PVP-CA possibly play an important role in terms of the crosslinking process. In addition, $NaHCO_3$ applied to the synthesized hydrogel also showed a significant effect in enhancing gel formation. The mechanism for three-dimensional network formation based on esterification and hydrogen-bonding interaction was also proposed in this work.

D_014_OA: SUPERHYDROPHOBIC GOLD FILM EMBEDDED ON PDMS AS AN POTENTIAL SUBSTRATE FOR MAGNETOWETTING

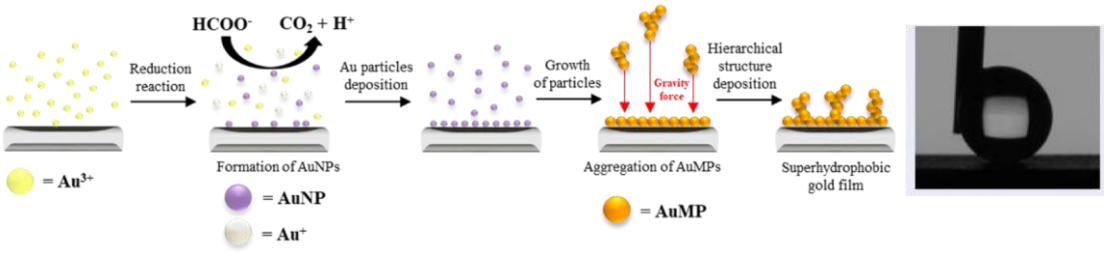
Siriwan Boonmeewiriya[1], Supeera Nootchanat[2], Attasith Parnsubsakul[2], Sanong Ekgasit[2,3], Kanet Wongravee[2,3,*]

[1]Program in Petrochemistry and Polymer Science, Faculty of Science. Chulalongkorn University, Pathumwan, Bangkok 10330, Thailand

[2]Sensor Research Unit, Department of Chemistry, Faculty of Science, Chulalongkorn University, Pathumwan, Bangkok 10330, Thailand

[3]Research Network NANOTEC-CU on Advanced Structural and Functional Nanomaterials, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

Abstract: Simple method to fabricate superhydrophobic surface was discovered by reduction reaction between chloroauric acid ($HAuCl_4$) and sodium formate (HCOONa) and deposition process of synthesized gold particles at room temperature on polydimethylsiloxane (PDMS) substrate without surface modification. To obtain superhydrophobicity on surface, ratio of reactants and deposition time of gold growth solution (AuGS) were carefully controlled. Wettability of fabricated gold film was examined by water contact angle (WCA) and contact angle hysteresis measurement. Morphology and deposition mechanism were confirmed by scanning electron microscope (SEM), X-ray diffactometer (XRD) and infrared spectrophotometer (IR). Superhydrophobicity obtained on the PDMS surface after the deposition time about 2 hr with WCA more than 160° and it could be up to 164.41° with a contact angle hysteresis of about 1.93°. The structure of gold film contained with 2 layers of different structure and second layer could have made the surface have a roughness which caused non-wetting property. Special characteristic of surface would be suitable for use its in microfluidic system with easily magnetic driving the solution.



D_015_PF: SYNTHESIS OF HIGH MOLECULAR WEIGHT POLY(*ε*-CAPROLACTONE) USING TITANIUM(IV) *n*-BUTOXIDE AS EFFECTIVE INITIATOR

Wanich Limwanich[1,*], Winita Punyodom[2,3], Puttinan Meepowpan[2,3]

[1]Faculty of Sciences and Agricultural Technology, Rajamangala University of Technology Lanna, Chiang Mai 50300, Thailand

[2]Polymer Research Laboratory, Department of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

[3]Center of Excellence in Materials Science and Technology, Chiang Mai University, Chiang Mai 50200, Thailand

*e-mail: wanich.lim@gmail.com

Abstract: In this work, high molecular weight poly(*ε*-caprolactone) (PCL) was synthesized from the ring-opening polymerization (ROP) of *ε*-caprolactone (*ε*-CL) initiated by titanium(IV) *n*-butoxide ($Ti(O\,nBu)_4$). The polymerizations of *ε*-CL with different concentrations of $Ti(O\,nBu)_4$ initiator (0.025 – 0.200 mol%) were carried out under bulk condition (solvent free process) at 150 °C for 24 h. The molecular weights of the synthesized PCL were determined from the conventional gel permeation chromatography (GPC) technique. From bulk polymerization, $Ti(O\,nBu)_4$ could control the polymerization of *ε*-CL and molecular weight of PCL. The physical appearances of the purified PCL were varied from white powder to white fiber. The number average molecular weights (M_n) of the synthesized PCL were in the range of 2.01×10^4 - 4.62×10^4 g/mol with molecular weight distribution (MWD) of 1.80 - 1.93. Furthermore, the values of %yield for the synthesized PCLs were in the range of 90 - 93%. The polymerization mechanism of *ε*-CL with $Ti(O\,nBu)_4$ was proposed through the coordination-insertion mechanism. The condition used in this work could effectively improve the molecular weight of PCL obtained from the ROP of *ε*-CL with $Ti(O\,nBu)_4$ reported in literature.

D_016_PA: SYNTHESIS OF GOLD NANOPARTICLES USING NATURAL TANNIN AND THEIR CATALYTIC ACTIVITY IN CONGO RED REDUCTION

Penwisa Pisitsak*, Kwandee Chamchoy, Vararanda Chinprateep, Wiphawan Khobthong
Department of Materials and Textile Technology, Faculty of Science and Technology, Thammasat University, Pathum Thani 12121, Thailand
*e-mail: penwisa_p@yahoo.com

Abstract: This work demonstrated the synthesis of gold nanoparticles (GNP) from chloroauric acid and natural tannin extracted from *Xylocarpus Granatum* bark in an acidic aqueous media at room temperature. The tannin-rich extract successfully acted as a reducing agent and capping agent, producing GNPs within a few minutes. The formation of GNPs was confirmed by the change of solution color from yellow to red. The nanoparticle diameter range of 10-20 nm with various shapes, including small spherical colloid gold particles and non-spherical gold crystals, were obtained. GNPs were used for catalytic degradation of Congo red (an azo dye), with $NaBH_4$ as a reducing agent. In the absence of GNPs, decolorization of the dye was minimal even after 24 h. It was concluded that GNPs were required to significantly degrade Congo red in water within a reasonable time frame. The efficiency of the degradation process was improved considerably when increasing the amount of GNPs or $NaBH_4$ in the system. Only 5% of the dye remained in the solution after 24-h treatment.

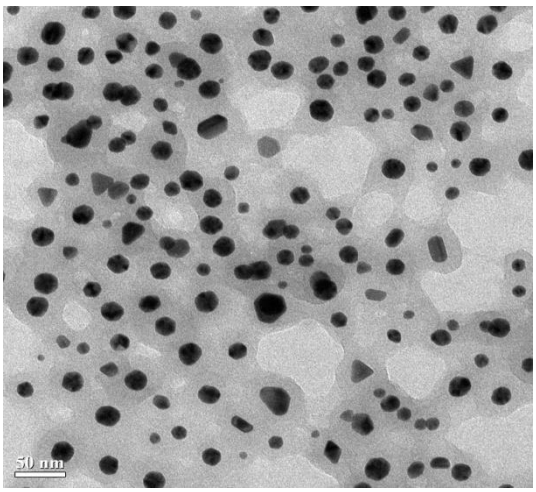


Figure 1. TEM images of gold nanoparticles synthesized using chloroauric acid and natural tannin extracted from *Xylocarpus Granatum* bark

D_017_PA: PREPARATION AND PHYSICAL PROPERTIES OF (1-x)$Bi_{0.5}(Na_{0.80}K_{0.20})_{0.5}TiO_3$-$xCa_3Co_4O_9$ CERAMICS

Pimpilai Wannasut[1], Anucha Watcharapasorn[1,2,*]
[1]Department of Physics and Materials Science, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand
[2]Center of Excellence in Materials Science and Technology, Materials Science Research Center, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand
*e-mail: anucha@stanfordalumni.org

Abstract: This work investigation on the preparation, phase, physical properties and microstructure of (1-x)$Bi_{0.5}(Na_{0.80}K_{0.20})_{0.5}TiO_3$-$xCa_3Co_4O_9$ or (1-x)BNKT-xCCO where x = 0, 0.10, 0.20, 0.30, 0.40 and 0.50 weigh fraction. The sintering condition between 950-1150 °C for. The suitable sintering condition is 1100 °C for 2 h. After this temperature the ceramics showed melting. The highest density of 4.53 g/cm^3 with linear shrinkage ~19.73%. The XRD pattern of all sample indicated that single phase without impurity detected. The microstructure of CCO doped BNKT showed irregular grain shape.

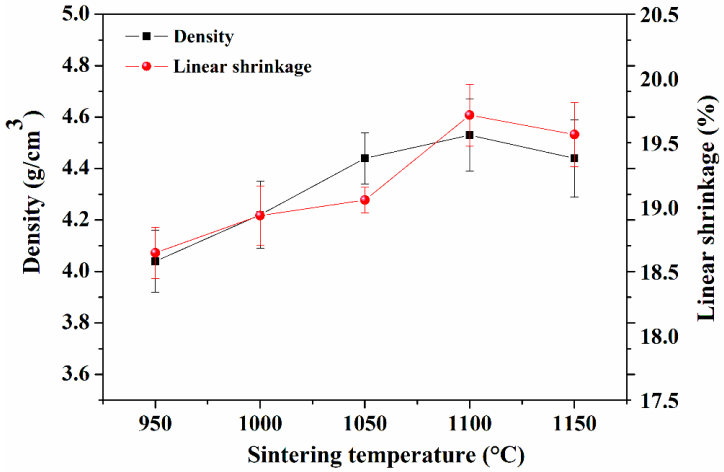


Figure 1. Plot of density and linear shrinkage of (1-x)BNKT-xCCO ceramics.

D_018_PA: MORPHOLOGY CHARACTERIZATION OF CROSSLINKED- CHITOSAN/POLY (ETHLYENE OXIDE) ELECTROSPUN NANOFIBERS CONTAINING Cu-BTC

Thitirat Inprasit*, Ariya Patompotipatarasuk, Sarocha Muangsook
Department of Materials and Textile Technology, Faculty of Science and Technology, Thammasat University, Pathum Thani 12121, Thailand
*e-mail: thi_inp@tu.ac.th

Abstract: To maintain the fibrous morphology of materials in wet condition had been focused and was characterized by FESEM. The chitosan/poly(ethylene oxide) nanofibers were produced by electrospinning technique with condition at a flow rate of 10 µL/min, working distance of 13.5 cm, and voltage of 25 kV. The effect of CS/PEO ratio on fiber forming was pronounced at 3:7 which provided the smooth surface and bead-free nanofibers. The crosslinking with 1.25, 2.5, 3.75, and 5%(w/w) of citric acid was also studied to improve water resistance. The fibrous morphology was found at 2.5% (w/w) of citric acid and followed by heat treatment at 140°C for 10 min. It exhibited the insoluble nanofibers with less swelling after immersed in water for 24 hr. Cu-BTC which is porous material was applied onto crosslinked-CS/PEO electrospun nanofibers to enhance dye adsorption property. However, the deposition of Cu-BTC on fiber surface was unsuccessful because the pH during deposition process was not suitable.

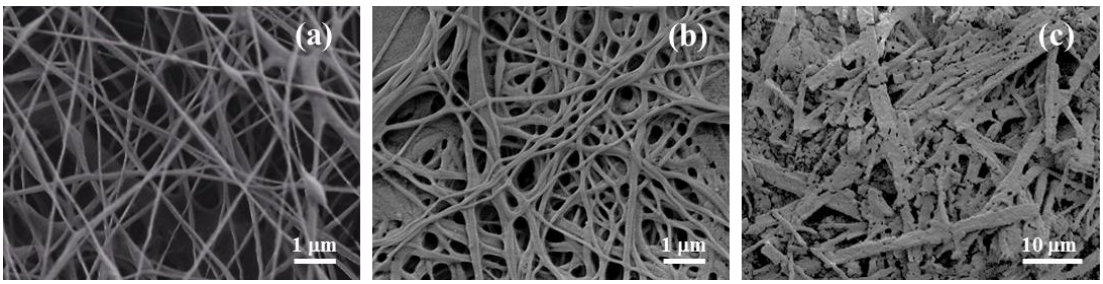


Figure 1. SEM images of the crosslinked-CS/PEO electrospun nanofibers (a) before immersion in water, (b) after immersion in water for 24 h, and (c) after Cu-BTC loading

D_019_PF: PORTABLE ELECTROCHEMICAL SENSOR FOR FENITROTHION ANALYSIS

Kanyanat Dee-ying, Chaiya Prasittichai*
Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok 10900, Thailand
*e-mail: fscicyp@ku.ac.th or chaiya.pr@ku.th

Abstract: Fenitrothion (FEN) is extensively employed for crop protection from insects. The small amount of FEN has shown to inhibit the activity of acetyl cholinesterase activity causing neurotoxic effect. We report here a novel approach for electrochemical detection of FEN by surface modified halloysite nanotubes (HNTs) electrode. HNTs were surface modified with 3-trihydroxysilyl-1-propanesulfonic acid, mixed with carbon paste and form the electrode. Under the optimal conditions, a linear range from 5-30 ug/L of FEN and detection limit of 0.5 ppm (S/N =3) were obtained from the modified electrode. The modified material was also screen-printed on the flexible materials to form portable electrochemical FEN detector. The results presented here offer an alternative approach for FEN analysis that could be beneficial for several food and agricultural industries.

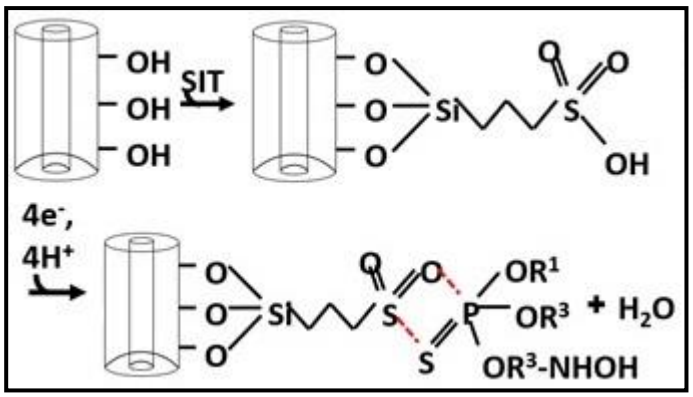


Figure 1. Schematic diagram of SIT modified HNTs for FEN detection

D_020_PA: EFFECT OF TiO_2 AND ZnO IN IN-SITU UV-CROSSLINKING OF ELECTROSPUN PVA NANOFIBER

Jarinphorn Pukkao, Pisutsaran Chitichotpanya, Penwisa Pisitsak, Thitirat Inprasit*
Department of Materials and Textile Technology, Faculty of Science and Technology, Thammasat University, Pathum Thani 12120, Thailand
*e-mail: thi_inp@tu.ac.th

Abstract: Titanium dioxide (TiO_2) and zinc oxide (ZnO) are widely used as photocatalysts. As they have the energy gaps of 3.2 eV and 3.37 eV, respectively, TiO_2 and ZnO are capable of absorbing UV light and initiating chemical reactions. The aim of this research was to crosslink polyvinyl alcohol (PVA) via UV radiation during electrospinning and investigate the effects of TiO_2 and ZnO on the crosslinking properties of the electrospun PVA nanofibers. The electrospinning parameters were as follows: flow rate 10 µl/min, voltage 25 kV, needle-collector distance 15 cm, and UV radiation 6 and 25 W. XRD and SEM were used to study the structure and particle size of TiO_2 and ZnO. The chemical structure and chemical composition of the crosslinked PVA nanofibers were investigated using FTIR and SEM-EDX. The morphology of the nanofibers was observed using FE-SEM. The degree of swelling was measured using a gravimetric method. Citric acid, a traditional crosslinker, was also used to crosslink PVA nanofibers and its effectiveness was evaluated in comparison with the TiO_2 and ZnO photocatalysts. An increase in the amount of TiO_2, ZnO, and citric acid led to an increase in the fiber diameter and more effective crosslinking reactions. TiO_2, having a smaller mean particle size, was more efficiently dispersed in the PVA matrix than the larger ZnO particles. Crosslinking of PVA nanofibers resulted in a lower degree of swelling, improved water solubility, and better dimensional stability after 48 h immersion in water.

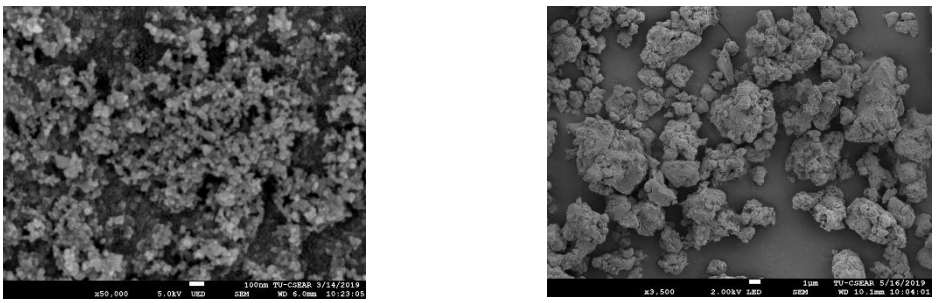


Figure 1. The SEM images of TiO_2 particle (left) and ZnO particle (right)

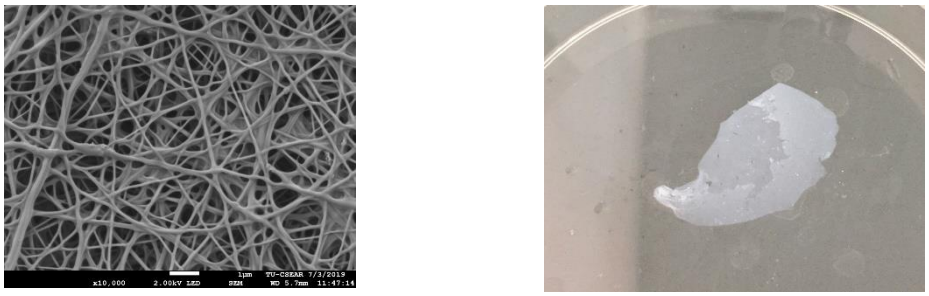


Figure 2. The SEM image of
crosslinked-PVA nanofibers before 48 h immersion in water (left) and
the photographic image of the same sample taken after 48 h immersion in water (right)

D_021_PA: AN APPROACH FOR USING ELECTROCHEMICAL IMPEDANCE SPECTROSCOPY FOR TESTING THE COATING ABILITY OF NON-INTENDED BPA LACQUER ON CAN SURFACE

Natapol Suetrong, Chaiya Prasittichai*
Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok 10900, Thailand
*e-mail: fscicyp@ku.ac.th or chaiya.pr@ku.th

Abstract: Newly developed organic coatings have been recently introduced to the packaged food industries. This implementation requires rapid and reliable measurement to probe the performance of these organic coatings in actual storage environment. Here, we report the use of electrochemical impedance spectroscopy (EIS) for determining the storage lifetime of several organic coatings used in the packaged food industries. We found that EIS could offer a quicker and comparatively more reliable than traditional measurement. We also describe the effects of glass transition temperature, curing time and curing temperatures on the storage lifetime. In addition, the effects of certain chemicals in food on organic coatings performances are described. We believe that the results we presented here could be tremendously beneficial for packaged food industries for designing types of appropriate organic coatings.

D_022_PA: FLEXURAL STENGTH OF *Bambusa nutans* BAMBOO

Ramita Khamprasit[1], Weerawat Dangpong[1], Darunee Wattanasiriwech[2], Suthee Wattanasiriwech[2,*]
[1]Materials Engineering Program, School of Science, Mae Fah Luang University, Thailand
[2]Materials Innovation Program, School of Science, Mae Fah Luang University, Thailand
*e-mail: suthee@mfu.ac.th

Abstract: *Bambusa nutans* (Phai Bong in Thai) is one of the most popular types of bamboo widely used in Thailand for making woven products. Different layers of the culm have been used differently by bamboo weaving artisans. The outer layer is normally used in making sturdy and large products such as chicken coops, whereas the inner layer is used for making small and more delicate products like baskets. In order to clarify the reasons behind such practice, the strips prepared from outer and inner layers of green *Bambusa nutans* culm (Figure 1) were subjected to flexural test. The properties of strips with and without nodal fraction were also compared. The test results indicated that the average flexural strength of the outer layer was approximately 230 MPa while that of the inner layer was only 82 MPa. The greater strength of the outer layer was correlated with higher density of vascular bundle observed in the outer layer. With the presence of nodal fraction, the bamboo strips exhibited greater flexural strength by approximately 30-50% but became more brittle, making it less favorable for weaving.

Figure 1 Specimen preparation for flexural test

D_023_PA: MECHANICAL PROPERTY MODIFICATION OF BAMBOO STRIPS

Priya Chinnarat[1], Waraporn Khueanwises[1], Natthkrista Kaewkan[1], Suthee Wattanasiriwech[2,*]
[1]Materials Engineering Program, School of Science, Mae Fah Luang University, Thailand
[2]Materials Innovation Program, School of Science, Mae Fah Luang University, Thailand
*e-mail: suthee@mfu.ac.th

Abstract: The use of bamboo strips for tying or weaving has long been a part of Thai culture. The preparation process involves selection of the right type of bamboo, splitting culms into very thin and uniform strips, sun drying to prevent molding. Prior to using, dry strips are softened and toughened by soaking in water for a certain period of time. However, despite its simplicity, the details of preparation can be different from one community to another and no good practice has yet been developed. In this work, the change in mechanical properties of bamboo strips after soaking in water for a different period of time has been investigated. The bamboo strips for testing were prepared from two most popular types of bamboo used in tying and weaving: (i) *Gigantochloa hossesuii* (Phai Bongkai) and (ii) *Gigantochloa nigrociliata* (Phai Lailo). From tensile test results, it was found that after soaking in water for a short period the elastic moduli of *Phai Bongkai* was reduced approximately by three folds: from 13.6 to 4.5 GPa but its flexural strength as well as the elastic elongation were increased by three and six folds, respectively. Phai Lailo also exhibited similar changes in mechanical properties after soaking. The remarkable improvement in mechanical properties of the soaked bamboo strips was confirmed by a twist-test which indicated that the durability of the bamboo strips against the degree of twisting was 50% increased after soaking for 30 min and reached the maximum point with 100% improvement after 10 h.

D_024_OA: ENHANCED PHOTOCATALYTIC EFFICIENCY USING NATURAL LAC-DYE MODIFIED TITANIUM DIOXIDE PHOTOCATALYST

Cheewita Suwanchawalit[1]*, Jariyaporn Sangkaworn[1], Kritapas Laohhasurayotin[2]
[1]Department of Chemistry, Faculty of Science, Silpakorn University, Sanam Chandra Palace Campus, Nakornpathom 73000, Thailand
[2]Hybrid Nanostructure and Nanocomposites Laboratory (HNN), National Nanotechnology Center (NANOTEC), 111 Thailand Science Park, Phahonyothin Road, Khlong Nueng, Khlong Luang, Pathum Thani 12120, Thailand
*e-mail: suwanchawalit_c@su.ac.th

Abstract: Natural Lac dye-modified titanium dioxide (Lac-TiO_2) was prepared by impregnation method. We have studied the effect of Lac dye's concentrations on the microstructure, optical property and photocatalytic efficiency. The physical properties of the products were studied by several techniques including X-ray powder diffraction (XRD), scanning electron microscopy (SEM), fourier-transformed infrared spectroscopy (FT-IR), and diffuse reflectance UV-Vis spectroscopy (DRS). XRD pattern of Lac-TiO_2 showed that the phase was anatase. SEM images revealed that Lac-TiO_2 nanoparticles had uniform spherical shape. The FT-IR spectra showed the characteristic bands of TiO_2 and natural lac dye. DRS results revealed that the Lac-TiO_2 showed red shift into visible region. The photocatalytic degradation of the methylene blue under visible light revealed that Lac-TiO_2 samples provided higher photocatalytic efficiency than pure TiO_2. The measurement of generated hydroxyl radical during photocatalytic process was also studied. Furthermore, the photocatalytic mechanism of Lac-TiO_2 photocatalyst was proposed in the work.

D_025_PA: EFFECT OF pH ON THE PREPARATION OF INDIGO CARMINE DYE/CA-AL LAYERED DOUBLE HYDROXIDE COMPOSITES

Nattarika Pacharoen[1], Narit Triamnak[2], Cheewita Suwanchawalit[1], Soontorn Suvokhiaw[1,*]
[1]Department of Chemistry, Faculty of Science, Silpakorn University, Nakhon Pathom 73000, Thailand
[2]Department of Materials Science and Engineering, Faculty of Engineering and Industrial Technology, Silpakorn University, Sanam Chandra Palace Campus, Nakhon Pathom 73000, Thailand
*e-mail: s_suntornsc@hotmail.com

Abstract: The indigo carmine dye/Ca-Al layered double hydroxide composites were prepared via co-precipitate method. The Ca-Al layered double hydroxide (Ca-Al LDH) was also prepared in the same manner in order to compare. The pH of solution during syntheses were varied from 10 to 13. The as-synthesized samples were characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM), diffuse reflectance UV/Vis spectrophotometry (DRS) and Fourier-transform infrared spectroscopy (FT-IR). The results revealed that all samples contained both indigo carmine dye and Ca-Al LDH. The presence of indigo carmine dye during co-precipitation of Ca-Al LDH resulted in disordered stacking of LDH layers. The SEM images show the plate-like particle for all samples. The thickness of plate increased with the increasing of the pH of solution. The sample which was synthesized at pH 10 exhibited smaller particle size than the samples which were synthesized at pH 11, 12, and 13. However, they show the same deep blue color. They could be an alternative lake pigment applying for screening paint.

D_026_PA: 3D-PRINTED GRAPHENE/POLY(LACTIC ACID) NANOCOMPOSITES

Aphiwat Pongwisuthiruchte*, Pranut Potiyaraj
Department of Materials Science, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand
*e-mail: apw.pongwisuthiruchte@gmail.com

Abstract: The purpose of this research is to investigate the effects of graphene as an additive on the properties of polylactic acid (PLA) specimens formed by the 3D-printing technique. The processing parameters, i.e. the printing direction, the raster angle, and the infill percentage of the 3D-printed specimen, the mechanical properties, the thermal properties, the melt flow index, the electrical properties and the morphology of the 3D-printed specimens were considered. Initially, graphene oxide was synthesized from graphite by the chemical oxidation method. Graphene was obtained by the reduction of graphene oxide via using L-ascorbic acid as a reducing agent. To obtain the masterbatch, the prepared graphene was mixed with PLA via coagulation technique. Then, melt-mixed the masterbatch with PLA in a twin-screw extruder to acquire composite filaments for 3D-printing and rolling-up with a self-made rolling machine. Finally, composite filaments were using to print testing specimens. The results indicated that when the amount of graphene increased, the tensile properties and the impact strength of the 3D-printed specimens were lower. The flexural strength increased by the addition of graphene at 2 phr, then decreased with a higher amount due to an aggregation of graphene particles, which were observed by the scanning electron microscope. The graphene/PLA composites possess a higher melt flow index and thermal degradation temperatures as well as enhanced antistatic properties. Moreover, the raster angle at +45°/-45° and 0°/+90° at 100% infill horizontal printed specimen shown the high elongation at break and impact strength, and the high tensile strength and flexural strength, respectively.

D_027_PA: PREPARATION OF NITROGEN-DOPED GRAPHENE BY SIMPLIFIED REFLUX METHOD FOR SUPERCAPACITOR MATERIALS

Wesarach Samoechip*, Prasit Pattananuwat, Pranut Potiyaraj
Department of Materials Science, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand
*e-mail: wesarach.smch@gmail.com

Abstract: Supercapacitor is a type of energy storage devices which has attracted interests from its high power density and fast charging time. Graphene and its derivatives can be a candidate as a raw material for this application because of its high surface area. This report investigated the potential of nitrogen-doped graphene (NG) which prepared by the simplified reflux method from graphene oxide to be nitrogen-graphene oxide (NGO) at 97°C for 12 hours. It was found that melamine can be a nitrogen source dopant successfully, confirmed by the primary amine group in the wavenumber of region 1536 and 1439 cm^{-1} in the FTIR spectrum. For supercapacitor application study, ascorbic acid was used as a reducing agent at 1 and 2 folds of NG. The highest specific capacitance of 333.38 F/g at 10 mV/sec is obtained from NG which synthesized from 1 fold of reducing agent, compared with 2 fold of reducing agent and non-nitrogen functional group. Incorporation of nitrogen functional groups from melamine in graphene structure play the important roles to improve the electrochemical performance. This investigation evidently demonstrated nitrogen-doped graphene is the potential candidate materials for supercapacitor application.

D_028_OF: NATURAL RUBBER FILM MODIFIED BY METHYLTRICHLOROSILANE FOR CREATING SUPERHYDROPHOBIC SURFACE

Patchararujee Ngamdee[1,2], Napida Hinchiranan[1,2,*]

[1]Department of Chemical Technology, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

[2]Center of Excellence of Petrochemical and Materials Technology, Chulalongkorn University, Bangkok 10330, Thailand

*e-mail: patchararujee.n@ku.th, napida.h@chula.ac.th

Abstract: The natural rubber (NR) film with superhydrophobic surface was successfully prepared via hydroxylation of NR to induce the -OH groups, which were the active sites for reacting with methyltrichlorosilane (MTCS), a non-fluorinated water repellent agent. The chemical structure of vulcanized NR (VNR), hydroxylated VNR (OH-VNR) and modified VNR (MTCS-VNR) was determined by using attenuated total reflectance Fourier transform infrared spectroscopy (ATR-FTIR). The results indicated that the OH-VNR prepared by immersing the VNR film in 75% sulfuric acid for 1 h showed the greatest amount of -OH groups in the NR structure. The water contact angles of modified OH-VNR with MTCS was gradually increased to 155° (2 wt% MTCS), which exhibited strong repellence to water as a superhydrophobic NR, while the VNR and modified VNR with similar MTCS content had water contact angles of 99.0° and 116° respectively. The results demonstrated that the -OH functional groups were the effective active sites for MTCS modification leading the superhydrophobic properties.

D_029_PA: NANOCOMPOSITE FIBER FROM POLY (BUTYLENE SUCCINATE) REINFORCED WITH GRAPHENE NANOPARTICLE

Nutthapong Poompiew*, Pranut Potiyaraj
Department of Materials Science, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand
*e-mail address: poompiew.n@gmail.com

Abstract: Graphene has attracted some attention from researchers in recent years due to its unique physical properties and morphology. This research successfully controlled the dispersion of graphene in poly(butylene succinate) or PBS matrix by the two-step process. The graphene/PBS masterbatch was firstly prepared by the solution mixing method in order to coat polymer around the surface of graphene to prevent graphene from restacking. The graphene/PBS fibers were then subsequently prepared by mixing the masterbatch with PBS at various ratios by the melt spinning method. The effects of graphene on mechanical, thermal, electrical and morphological properties of the prepared nanocomposite fibers were investigated. The results indicated that, the nanocomposite with 0.3 phr of graphene whoed the enhanced tensile strength up to 14.5%. Moreover, the elongation at break increased as the amount of graphen increased. This was probably due to the well dispersion of graphene in biopolymer matrix that resulting in easier slippage of polymer chains while receiving tension force. This behavior was also evidenced by the scanning electron micrograph of the fibers. The results also showed well dispersion of few layers of graphen in matrix of fibers in machine direction. The glass transition temperature (T_g) and the crystalline melting temperatures (T_m) were not affected by the addition of rGO. The electrical resistance gradually decreased with the increasing amount of graphene in the nanocomposite fibers.In this electrical conductivity range, the nanocomposite fibers can be used for applications which anti-static property is required.

D_030_PA: RAPID VIBRO-MILLING APPROACH TO NOVEL MICROWAVE DIELECTRIC NICKEL DINIOBATE NANOMATERIALS

Orawan Khamman*, Supon Ananta
Department of Physics and Materials Science, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand
*e-mail: orawankhamman@yahoo.com

Abstract: Owning to the exponential growth of microwave communication and satellite development systems, a quest for novel potential dielectric materials with better properties is challenging. In this work, nickel diniobate ($Ni_4Nb_2O_9$) nanapowders have been synthesised via rapid vibro-milling technique. The formation of the $Ni_4Nb_2O_9$ phase was characterized by DTA and XRD techniques. Morphology and particle size have been determined via a combination of SEM and laser diffraction techniques. It was found that the smallest particle size of 100 nm was achieved at 35 h of milling time and calcined at 1250 °C for 0.5 h with heating/cooling rates of 20 °C/min. More importantly, the resulting $Ni_4Nb_2O_9$ powders have a particle size depending on vibro-milling times.

D_031_PA: EFFECT OF AGING HEAT TREATMENT ON CORROSION RESISTANCE OF SINTERED 17-4PH STAINLESS STEEL IN ARTIFICIAL SALIVA

Manutchaya Wongkaewmoon[1], Onthida Kosasang[1,2,*]
[1]School of Science, Mae Fah Luang University, Chiang Rai 57100, Thailand
[2]Center of Innovative Materials for Sustainability (iMatS), School of Science, Mae Fah Luang University, Chiang Rai 57100, Thailand
*e-mail: onthida.kos@mfu.ac.th

Abstract: The effect of aging temperature on corrosion behavior of 17-4PH stainless steel in artificial saliva were investigated. The 17-4PH Stainless steel fabricated by metal injection molding process (MIM) were subjected to solution annealing at 1040°C and followed by aging at 400°C for 1 hour., 480°C for 1 hour, and 620°C for 4 hours. The corrosion behavior was measured using potentiodynamic polarization measurement. The surface morphology after corrosion test was observed using scanning electron microscope (SEM). The correlation between aging temperature and corrosion behavior will be reported.

D_032_OA: PREPARATION OF HETEROGENEOUS CATALYSTS OF PLATINUM@MESOPOROUS CARBON *VIA* SELF-ASSEMBLY METHOD FOR FURFURAL HYDROGENATION REACTION

Piyamit Toumsri[1], Sureeporn Saknaphawuth[2,3], Joongjai Panpranot[2,3], Laemthong Chuenchom[1,*]

[1]Department of Chemistry, Faculty of Science, Prince of Songkla University, Songkhla 90112, Thailand

[2]Department of Chemical Engineering, Faculty of Engineering, Chulalongkorn University, Bangkok 10330, Thailand

[3]Center of Excellence on Catalysis and Catalytic Reaction Engineering, Faculty of Engineering, Chulalongkorn University, Bangkok 10330, Thailand

*e-mail: laemthong.c@psu.ac.th

Abstract: Furfuryl alcohol (FFA) is the chemical synthesized from furfural (FFR) by hydrogenation reaction. There are the raw materials widely used in industrial to synthesis tetrahydrofurfuryl alcohol, resin, fiber, and chemical intermediate in the production of perfume and vitamin. The hydrogenation reaction of furfural to furfuryl alcohol require the catalyst. The catalyst that widely used in FFR hydrogenation reaction is Platinum (Pt), which is an effective catalyst in the partial hydrogenation reaction of FFR to FFA. In general, the platinum catalyst deposited on supporting materials such as carbon materials, Titanium dioxide, etc. However, the preparation process of the platinum catalyst at supporting materials had complexity and taken a long time. In this work, Pt^0@mesoporous carbon catalysts (Pt-MC) can be prepared *via* a facile self-assembly method using a block copolymer as a pore template for catalyzed the hydrogenation reaction of FFR to FFA. The Pt-MC catalyst contained ~ 3 wt% Pt^0 and exhibited an average pore size of 3.4 nm. The catalytic study shows that water is the best solvent for the catalysis of this reaction with the high conversion and selectivity percentage of 24.3% and 100%, respectively. This project shows a facile and cost-effective preparation of Pt-MC catalysts with satisfying catalytic properties in furfural hydrogenation.

Keywords: catalyst, mesoporous carbon, platinum, hydrogenation reaction, furfural

D_033_PF: NOVEL AND FACILE FABRICATION OF MAGNETICALLY MESOPOROUS CARBON MONOLITHS FOR REMOVAL OF TERACYCLINE

Parichart Onsri[1], Decha Dechtrirat[2,3], Laemthong Chuenchom[1,*]
[1]Department of Chemistry, Faculty of Science, Prince of Songkla University, Songkhla 90112, Thailand
[2]Department of Materials Science, Faculty of Science, Kasetsart University, Bangkok 10900, Thailand
[3]Specialized Center of Rubber and Polymer Materials for Agriculture and Industry (RPM), Faculty of Science, Kasetsart University, Bangkok, 10900, Thailand
*e-mail: laemthong.c@psu.ac.th

Abstract: Tetracycline (TC), a pharmaceutical antibiotic macromolecule, has been used in suppressing the growth of bacteria in both of humans and animals. The increase use of TC in many fields has spread its contamination to water effluents and then leads to environmental problems. Therefore, the high-efficiency removal of TC from aqueous solution has already become a crucial concern. This work exhibited the novel and facile synthesis of magnetically mesoporous carbon monoliths as an adsorbent for the removal of TC. The materials have been prepared based on carbonization of sodium alginate monolithic sponges in combination with iron ions. The obtained materials were characterized using a Scanning Electron Microscope (SEM) and the porosity was analyzed by N_2 sorption isotherm. A BET specific surface area of a selected sample has been found to be as high as 191.60 m^2/g with large mesopore volume as 76.44%. Interestingly, its porosity is found to be suitable to adsorb large TC molecules. The adsorption capacity of the monolith towards TC was 28.45 mg/g at 24 h. The result of kinetic studies favorably fitted with pseudo-second-order model which reached the equilibrium within 5 h. Furthermore, the materials also exhibited the magnetic properties, enabling the its facile removal from the solution with an external magnet.

Keywords: magnetic, porous carbon, monoliths, adsorption, tetracycline

D_034_OA: PHOTOLUMINESCENCE AND X-RAY PHOTOELECTRON SPECTROSCOPIC STUDY OF MILLED ZINC OXIDE MATERIAL PREPARED BY HIGH ENERGY BALL MILLING TECHNIQUE

Wanichaya Mekprasart[1], Balaji Rao Ravuri[2], Wisanu Pecharapa[1,*]
[1]College of Nanotechnology, King Mongkut's Institute of Technology Ladkrabang, Bangkok 10520, Thailand
[2]Gandhi Institute of Technology and Management (DEEMED TO BE UNIVERSITY), Hyderabad, Telangana 502329, India
*e-mail: kpewisan@gmail.com

Abstract: Luminescence properties that are correlated to near band edge emission and defect-related emission of milled zinc oxide (ZnO) powder prepared by high energy ball milling technique are investigated. Commercial ZnO powder (particle size of 500 nm) was chosen as starting material in milling process to produce ultrafine ZnO powder. The milling process was carried out at different speeds; 0, 200, 400 and 600 rpm for 10 min. After milling at high speed, change in color of milled ZnO powder was clearly observed that could be due to the defects in ZnO structure induced by mechanical strain during milling process. Surface morphology of milled ZnO powder was monitored by field-emission scanning electron microscopy (FESEM). Element component and surface chemical states of the samples were analyzed by X-ray photoelectron spectroscopy (XPS). Optical property of milled samples was investigated by diffuse reflectance UV-Vis spectrometer. Meanwhile, room-temperature photoluminescence spectroscopy of the milled samples was performed. The milled ZnO particle size was distinctly decreased to ca. 200 nm affirmed by FESEM images in Figure 1. PL spectra of milled ZnO sample showed two prominent emission bands; UV and visible region. Visible emission intensity increased with increasing milling speed that would be attributed to greater intrinsic point defects and surface defects caused by high mechanical strain during milling process. This phenomenon is originated from the deep defect levels of oxygen vacancies accompanying XPS results.

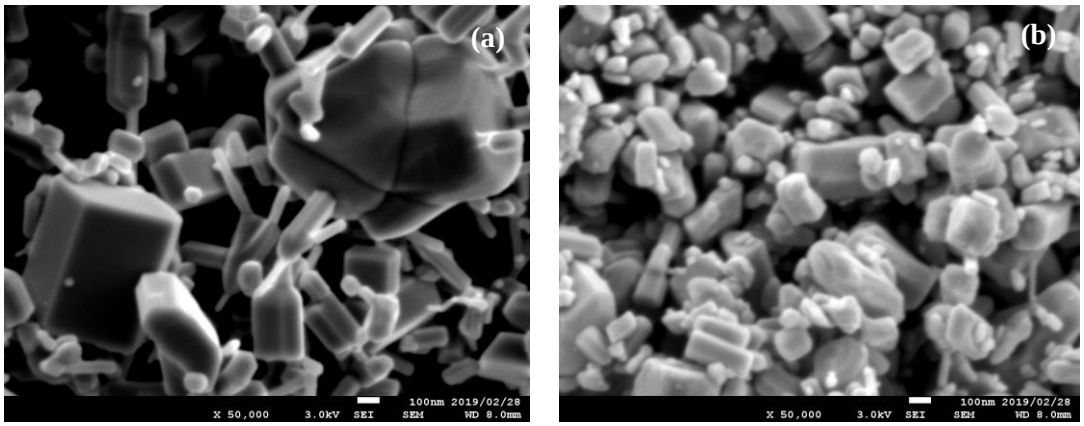


Figure 1. FESEM images of (a) as-prepared commercial ZnO powder and (b) milled ZnO powder at 600 rpm

D_035_PA: EFFECTS OF TiO_2 CONTENT AND HEAT TREATMENT TEMPERATURE ON CRYSTALLIZATION KINETICS AND MECHANICAL PROPERTIES OF Na_2O-CaO-P_2O_5 BIOACTIVE GLASS-CERAMICS

Pratthana Intawin[1], Tawee Tunkasiri[2], Sukum Eitssayeam[1], Kamonpan Pengpat[1,*]
[1]Department of Physics and Materials Science, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand
[2]Science and Technology Research Institute, Chiang Mai University, Chiang Mai 50200, Thailand
*e-mail: kamonpan.p@cmu.ac.th

Abstract: This study deals with the effects of TiO_2 content and heat treatment temperature on the thermal and mechanical properties of Na_2O-CaO-P_2O_5 glasses and glass-ceramics. The effects of TiO_2 on glass transition and crystallization temperature were analyzed via differential thermal analyzer (DTA). In addition, microstructure and micromechanical properties of TiO_2 added Na_2O-CaO-P_2O_5 glass-ceramics were also investigated by X-ray diffraction (XRD), scanning electron microscopy (SEM) and microhardness measurements. From the DTA results, crystallization kinetics were studied by using Ozawa and Kissinger equations. Activation energies and Avrami parameters were also calculated in this study. The crystallization peak temperature (T_p) and activation energy (E)were found to increase with the increase in TiO_2 content. The major crystalline phases were sodium titanium phosphate and calcium phosphate along with rutile as the minor crystalline phases presented as unmelted particles in the glass samples. Mechanical properties were obtained from the microhardness measurements for all samples. It was found that the added TiO_2 content caused positive effect while heat treatment temperature had negative effect on Vickers hardness, Knoop hardness and Young's modulus.

D_036_PA: INVESTIGATION OF MICROSTRUCTURE AND MECHANICAL PROPERTIES IN THE INJECTION MOLDING OF LITHIUM DISILICATE GLASS-CERAMIC USING PEG-BASED BINDER FOR DENTAL MATERIAL APPLICATION

Arnon Kraipok[1,2], Surapong Panyata[1,2], Pratthana Intawin[2], Patamas Bintachitt[3], Sukum Eitssayeam[2], Tawee Tunkasiri[2], Kamonpan Pengpat[2,*]

[1]Graduate School, Chiang Mai University, Chiang Mai 50200, Thailand

[2]Department of Physics and Materials, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

[3]Department of Physics, Faculty of Science, Srinakharinwirot University, Bangkok 10110, Thailand

*e-mail: kamonpan.p@cmu.ac.th

Abstract: Lithium disilicate glass-ceramics are extensively employed in restorative dentistry because of their superior aesthetic properties and their hardness being similar to that of natural teeth. The aim of this investigation was to study the microstructure and mechanical properties in the low-pressure injection molding of lithium disilicate glass-ceramics using PEG-based binder for dental material application. As the concentration of glass powder was increased from 45 to 60 vol%. The binder system based on polyethylene glycol (PEG), steric acid and polyvinyl butyryl (PVB) were mixed with glass powder. After that the samples were sintered at 800 °C for 2 h. The microstructure and mechanical properties of the samples were characterized by the scanning electron microscopy (SEM) and Vickers hardness testing. The SEM result showed that the porosity increased with decreasing glass powder content. The mechanical properties with the highest density value and the highest value of Vickers hardness were 2.25 g/cm^3 and 6.66 GPa, respectively.

D_037_OF: ENHANCING HYDROPHOBICITY OF PVDF HOLLOW FIBER MEMBRANE BY PLASMA INDUCED AND GRAFTED WITH CHLOROALKYLSILANES

Hanh Le Thi My[1,2,3], Rattachat Mongkolnavin[4], Roongkan Nuisin[5], Sermpong Sairiam[2,3,5,*]

[1]International Postgraduate Program in Hazardous Substance and Environmental Management, Chulalongkorn University, Bangkok 10330, Thailand

[2]Center of Excellence for Environmental and Hazardous Waste Management, Chulalongkorn University, Bangkok 10330, Thailand

[3]Research Program of Industrial Waste Management-Policies and Practices, Center of Excellence for Environmental and Hazardous Waste Management, Chulalongkorn University, Bangkok 10330, Thailand

[4]Department of Physics, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

[5]Department of Environmental Science, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

*e-mail: sermpong.s@chula.ac.th

Abstract: PVDF hollow fiber membranes were modified by plasma activation with different plasma gases (i.e., Ar and O_2) followed by direct grafting with two different chloroalkylsilanes (methyltrichlorosilane (MTCS) and trimethylchlorosilane (TMCS)) at varies of grafting times to enhance the hydrophobicity. The results showed that membrane activated by oxygen plasma gas gave better results compared to which activated by argon plasma gas. In particular, after activated by plasma gases at applied voltage of 8 kV then followed by grafted with 0.02M MTCS for 2h, the water contact angle (WCA) of the modified membrane were increased from 70.5° (original) to 108.1° and 119.4° by Ar and O_2 plasma activation, respectively. Besides, MTCS poses more effect on membrane hydrophobicity enhancement than TMCS. In which, hydrophobic particles were found on membrane surface by SEM using MTCS modification, while the membranes surface grafted by TMCS did not change. The silicon (Si) and oxygen (O) contents on the surface of modified membrane increased compared to the original and activated membranes. The presence of Si on the membrane surface of membranes by EDS proved that PVDF membranes were successfully modified by MTCS. The surface modification under O_2 plasma activation at applied voltage of 8 kV followed by grafting with 0.02M MTCS for 4h showed higher water contact angle.

D_038_PA: STUDY CRYSTALLIZATION BEHAVIOR AND KINETICS OF CALCIUM MAGNESIUM SILICATE GLASS-CERAMIC DOPED WITH Dy_2O_3

Wipada Senanon[1,2], Sukum Eitssayeam[1], Tawee Tunkasiri[1], Kamonpan Pengpat[1,*]
[1]Department of Physics and Materials Science, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand
[2]Graduate School, Chiang Mai University, Chiang Mai 50200, Thailand
*e-mail: kamonpan.p@cmu.ac.th

Abstract: $CaCO_3$-MgO-SiO_2-Al_2O_3-ZnO based glass system doped with Dy_2O_3 were prepared by conventional melt-quenching method. The crystallization behavior and kinetics were studied by using differential thermal analysis at various heating rates of 5, 10, 15, 20 °C/min. The activation energy (E_A) of crystallization and avrami parameter (n) were determined under non-isothermal conditions using by different equations such as Kissinger, Ozawa and Matusita-Sakka equations. The optical properties were also analyzed by UV-Vis spectroscopy and fluorescence spectroscopy techniques. The crystallization mechanism were studied with connected activation energy which indicated the changing of crystallization behavior in matrix glass. It was found that the activation energy and avrami parameter were dependent on crystallization fraction (x). The results shown that the crystallization mechanism in this glass system is between two-dimensional and three-dimensional crystal growth. The emission spectra exhibited a strong blue and yellow wish green luminescence composed of 481 and 573 nm under 348 nm excitation.

D_039_PA: MICROSTRUCTURE AND MECHANICAL PROPERTIES OF YTTRIA-STABILIZED ZIRCONIA CERAMICS WITH A PEG-BASED BINDER FOR LOW-PRESSURE INJECTION MOLDING

Manlika Kamnoy[1], Suchittra Inthong[2], Uraiwan Intatha[3], Kamonpan Pengpat[1], Sukum Eittsayeam[1,*]

[1]Department of Physics and Materials Science, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

[2]Faculty of Agricultural Science and Technology, Rajamangala University of Technology Lanna Phitsanulok, Phitsanulok, 65000, Thailand

[3]School of Science, Mae Fah Luang University, Chiang Rai 57100, Thailand

*e-mail: sukum99@gmail.com

Abstract: In this work, the microstructure and mechanical properties of Yttria-stabilized zirconia (YSZ) with a PEG-based binder were investigated. The amounts of polyethylene glycol (PEG), steric Acid and polyvinyl butyryl (PVB) were mixed with YSZ powder (25 to 35 vol%). Debinding was performed in two steps: water leaching to remove the PEG and thermal pyrolysis to remove residual binders. After that the green parts were sintered at 1580°C for 2h. The microstructure of sample were characterized by the scanning electron microscopy (SEM). Moreover, the mechanical properties was investigated by Vickers hardness testing. The results indicated that the samples showed density and porosity in the range of 5.35 - 5.27 g/cm^3 and 4.13-8.48 %, respectively. The highest values of Vickers hardness was 9.59 GPa.

D_040_PA: LOW-PRESSURE INJECTION MOLDING OF ALUMINA CERAMICS USING A PEG-BASED BINDER FOR MEDICAL MATERIALS APPLICATION

Lalita Srimoon[1], Suchittra Inthong[2], Uraiwan Intatha[3], Sukum Eittsayeam[1,*]
[1]Department of Physics and Materials Science, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand
[2]Faculty of Agricultural Science and Technology, Rajamangala University of Technology Lanna Phitsanulok, Phitsanulok 65000, Thailand
[3]School of Science, Mae Fah Luang University, Chiang Rai 57100, Thailand
*e-mail: sukum99@gmail.com

Abstract: This study was conducted to find out the effects of Al_2O_3 content on the microstructure and mechanical properties for low-pressure injection molding. As the concentration of Al_2O_3 was increased from 50 to 54 vol%. The binder system based on polyethylene glycol (PEG), steric Acid and polyvinyl butyryl (PVB) were mixed with Al_2O_3 powder. Debinding was performed in two steps: water leaching to remove the PEG and thermal pyrolysis to remove residual binders. The green parts after debinding were sintered at 1580 C for 2h. The microstructure and mechanical properties were investigated. The SEM result showed that the porosity increased with increasing Al_2O_3 content from 50 to 54 vol%. The mechanical properties with the highest density value of 3.64 g/cm^3 and high Vickers hardness values in the range of 9.50 - 9.59 GPa.

D_041_PA: THE OPTICAL PROPERTIES OF Bi_2GeO_5 GLASS AND GLASS DOPE WITH ERBIUM ION

Surapong Panyata, Arnon Kraipok, Pratthana Intawin, Sukum Eitssayeam, Tawee Tunkasiri, Kamonpan Pengpat*
Department of Physics and Materials, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand
*e-mail: kamonpan.p@cmu.ac.th

Abstract: The Glass of the compositions Bi_2GeO_5 and $58.4BiO_{1.5}$-$23.4GeO_2$-$18.2BO_{1.5}$-$0.15ErO_{1.5}$ have been prepared by pouring molten materials onto liquid-nitrogen cooled copper plates. X-ray diffraction measurements (XRD) on the resulting glasses have been performed. The morphologies of the obtained glass were investigated by Scanning electron microscopy (SEM). Moreover, optical absorption and transmission spectra in the visible and near-infrared range recorded at room temperature on the samples obtained using UV-Vis-NIR spectrophotometer. The effect of Er_2O_3-doping on phase, microstructure and optical properties were estimated.

D_042_PA: SOLID STATE SYNTHESIS OF CORDIERITE-MULLITE SYSTEM

Ramita Khamprasit[1], Suthee Wattanasiriwech[2], Darunee Wattanasiriwech[2,*]
[1]Materials Engineering Program, School of Science, Mae Fah Luang University, Thailand
[2]Materials Innovation Program, School of Science, Mae Fah Luang University, Thailand
*e-mail: darunee@mfu.ac.th

Abstract: In this paper, an attempt to synthesize designed cordierite-mullite phase using a solid state reaction method was reported. Alumina, quartz, magnesia and talc were used as starting materials for the synthesis. Talc was added for two purposes; to assist the reaction progress and to be the Mg source. The raw materials were mixed and fired at 1350 °C for 2 h or 1400 °C for 2 to 4 h. The resulting phase compositions were analysed using the Reference Intensity Ratio (RIR) semi-quantitative analysis technique. The highest amount of cordierite phase up to 96% was obtained at the firing scheme of 1400°C for 4 h in the C100-M0 composition. Mullite could not be formed at the selected scheme without the present of talc in the starting mixture, and no pure mullite was observed in the selected firing regimes. This highest amount of mullite phase achieved from this method was 74% but co-existed with cordierite and other phases.

D_043_PA: MOISTURE ADSORPTION CAPACITY OF BAMBOO CHARCOAL

Pawarit Chumpon[1], Worawit Choomak[1], Punsab Chaisurat[1], Suthee Wattanasiriwech[2,*]
[1]Materials Engineering Program, School of Science, Mae Fah Luang University, Thailand
[2]Materials Innovation Program, School of Science, Mae Fah Luang University, Thailand
*e-mail: suthee@mfu.ac.th

Abstract: Bamboo charcoal is a well known natural chemical and toxin adsorbent. Its unique adsorption ability arises from the highly porous structure allowing the specific molecules to be adsorped on its very high surface area (300-700 m^2/g). In building application, bamboo charcoal can also be used as moisture adsorbent for indoor humidity regulation. Such property can be obtained not only by proper control of firing but also by choosing the right type of bamboo. In this work, the humidity adsorption capacity of bamboo charcoal samples prepared from two bamboo species, *Dendrocalamus strictus* (Phai Saeng) and *Thyrsostachys siamensis Gamble* (Phai Ruak), was determined. The culm of the former type is hollow while that of the latter is nearly solid (Figure 1). Both specimens were fired in an electric kiln at 600°C with a constant heating and cooling rate of 2°C/min under a nitrogen atmosphere prior to moisture adsorption test for up to 8 days. The result shows that under 99% RH atmosphere, both bamboo charcoal specimens continuously adsorp moisture and at the end of the test period, the adsorption reached as high as 220% and 115% for the specimen of Phai Sang and Phai Ruak, respectively. Despite its higher moisture adsorption capacity, Phai Sang has only 15% yield of charcoal after firing, while that from Phai Ruak was double at 31%, making them both equally viable candidates for such application.

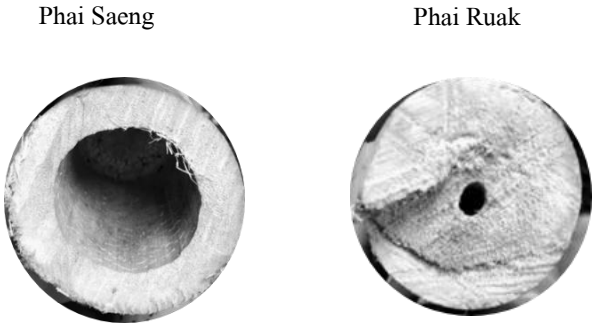


Figure 1 Cross-section images of the bamboos showing very different culm thickness.

D_044_PF: PREPARATION AND CHARACTERIZATION OF KAFFIR LIME OIL MACROCAPSULES

Aungsana Prajaksangsiri[1,*], Pattara Thiraphibundet[2]
[1]Petrochemistry and Polymer Science, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand
[2]Nanotec-CU Center of Excellence on Food and Agriculture, Department of Chemistry, Faculty of Science, Chulalongkorn University and, Bangkok 10330, Thailand
*e-mail: a.m._chain@hotmail.com

Abstract: Macrocapsules with the size of 3-4 mm were prepared by coaxial glass-tube apparatus. The shell-forming solution made from alginate, gellan gum and TEMPO-oxidized bacterial cellulose (TOBC). The core solution was kaffir lime oil (KLO). The various amount of TOBC with the degree of oxidation 0.1 was studied as the reinforcement agent for KLO capsule shell. Increase the amount of TOBC led to enhance the viscosity of shell-forming solution. The higher viscosity of solution caused the lower capsules formation efficiency percentage (%CFE) but gave larger size and higher weight of KLO capsules. Interestingly, the shell surface of KLO capsule with 0.2% of TOBC content was smoother and lesser shrinkage than other content. Moreover, addition of TOBC in the shell-forming solution showed the improvement of the compression strength of KLO capsules.

D_045_PA: EFFECT OF HYDROQUINONE AND METHYL METHACRYLATE MONOMER ON ACRYLIC DENTURE BASE RESIN

Pornchiwin Banjong[1], Natthawika Sankham[1], Watchara Duangnga[1], Uraiwan Intatha[1,2], Nattakan Soykeabkaew[1,2], Sitthi Duangphet[1,2,*]
[1]School of Science, Mae Fah Luang University, Chiang Rai 57100, Thailand
[2]Center of Innovative Materials for Sustainability (iMatS), Mae Fah Luang University, Chiang Rai 57100, Thailand
*e-mail: sitthi.dua@mfu.ac.th

Abstract: The purpose of this project is to modify the denture base resin for artificial teeth materials. Generally, resin for denture base will harden with in few minutes but the working period of artificial teeth shaping is about 30 minutes. Adding methyl methacrylate (MMA) monomer to dilute accelerator and adding hydroquinone (HQ) as inhibitor are considered in order to extend the solidifying time of denture base resin. The ratios of denture base resin/MMA in this study were 3:1, 2:2 and 1:3 v/v and the concentration of HQ was varied from 0.01-0.05 wt%. The results indicated that both HQ and MMA prolonged solidification time of denture base resin and HQ was more effective on increasing working time than MMA. However, the introduction of HQ and MMA decreased mechanical properties of the resin including flexural strength, flexural modulus and hardness.

D_046_PA: FABRICATION OF SUPERHYDROPHOBIC IN 17-4PH STAINLESS STEEL BY ANODIZATION PROCESS

Suttita Rattanawong[1], Onthida Kosasang[1,2,*]
[1]School of Science, Mae Fah Luang University, Chiang Rai 57100. Thailand
[2]Center of Innovative Materials for Sustainability (iMatS), School of Science, Mae Fah Luang University, Chiang Rai 57100, Thailand
*e-mail: onthida.kos@mfu.ac.th

Abstract: Superhydrophobic surface is well known in self-cleaning application and anticorrosive property. This surface is a high specific area surface that shows low wettability of water with contact angels exceeding 150°. In this work, superhydrophobic surface on 17-4 PH stainless steel used in orthodontic bracket was prepared by anodizing process. The effect of anodizing parameters (i.e. electrolyte, anodizing voltage and time) were investigated to create micro-nano surface roughness. The hydrophobicity, microstructure and roughness surface were observed using contact angle measurement, scanning electron microscope (SEM) and atomic force microscopes (AFM), respectively. The correlation between anodizing parameters and contact angle, microstructure and surface roughness will be reported.

D_047_PA: PREPARATION OF QUARTZ AND CRISTOBALITE FROM RICE HUSK ASH DERIVED FROM BIOMASS POWER PLANT

Weerachon phoohinkong[1,*], Udomsak Kitthawee[1], Wisanu Pecharapa[2]
[1]Faculty of Science and Technology, Suan Dusit University, Bangkok, 10700, Thailand
[2]College of Nanotechnology, King Mongkut's Institute of Technology Ladkrabang, Ladkrabang, Bangkok 10520, Thailand
*e-mail: p_veerachon@hotmail.com

Abstract: Quartz and cristobalite are the important material of the high pressure/temperature phase of silica, SiO_2, in a wide range of industrial and emerging technology. SiO_2 is one of the most abundant metal oxides in Earth's crust, planetary and lunar rocks in different form and quality. In typical highly pure silica was obtained from agricultural rice husk waste or rice husk ask waste from the biomass power plant by using alkaline extraction. In this work, we use the obtained carbon waste after alkaline extraction of silica from power plant rice husk ash to prepare of quartz and cristobalite by calcined in the range of 700-1100 ℃. The obtained samples were characterized using Fourier-transform infrared spectroscopy (FT-IR), Raman spectroscopy, X-ray diffraction patterns (XRD), scanning electron microscope (SEM), and X-ray photoelectron spectroscopy (XPS). The results from the characteristic diffract peaks, Si*2p* binding energy and absorption of Si-O-Si symmetric stretching confirmed that the obtained submicron fine powders sample co-existence of quartz, α- and β-cristobalite polymorphs formation occur even in low-temperature at 700 ℃ by showing the main crystal composition of quartz at 700-800 ℃ and the main phase transform to cristobalite at 900-1100 ℃.

Figure 1. Photograph of obtained powders sample calcined at 700, 800, 900 and 1,100 ℃

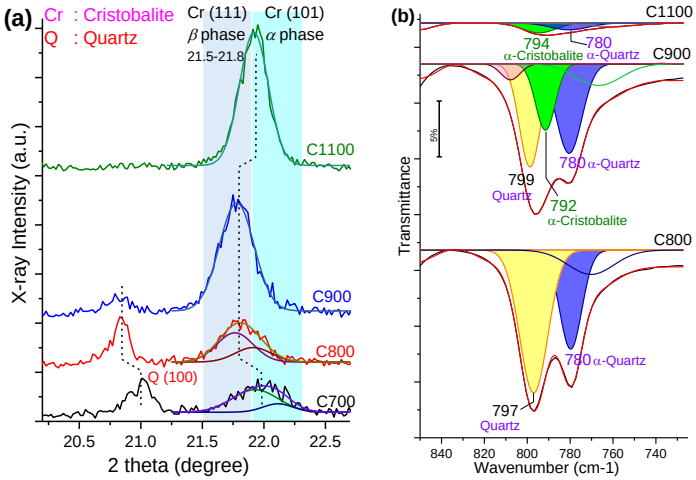


Figure 2. X-ray diffraction patterns of obtained powders sample in the region of quartz(100) β-cristobalite(111) α-cristobalite(101) (a) and FTIR spectra in the region of Si-O-Si symmetric stretching characteristic of silica polymorphs (b)

D_048_0A: PREPARATION AND PROPERTIES OF CASSAVA STARCH/MODIFIED SUGAR CANE LEAVE FIBER COMPOSITE

Lalisa Bunmechimma[1], Thanawadee Leejarkpai[2], Sa-Ad Riyajan[1,*]
[1]Department of Chemistry , Faculty of Science and Technology , Thammasat University, , Klong Nung District, Klong Luang, Phatum Thani 12120
[2] National and Materials Technology center (MTEC), Klong Nung District, Klong Luang, Phatum Thani 12120
*e-mail: Lalisa_b@sci.tu.ac.th

Abstract: This research aims to formulate biomaterial composite from cassava starch (CS) and modified natural fiber from sugarcane leaves (MCSF) that are agricultural waste and also reduce the environmental problems. The effect of MCSF on the physical properties of biocomposite, was studied. Cassava starch biocomposite films were prepared by solution-casting technique which includes 0-50 wt% of MSCF. Results showed that the MCSF was a good dispersion in CS matric due to good compatibility in biopolymer. After the addition of the MCSF, the moisture absorption and porosity was increased as a function of the MCSF. The CS/MCSF composite showed the good hydrophilic. In addition, the CS/MCSF composite are able to degrade well in natural soil.

D_049_PF: INFLUENCE OF Sb DOPANT ON PHYSICAL, OPTICAL AND ELECTRICAL PROPERTIES OF CO-PRECIPITATED ZnO POWDERS

Somtop Santibenchakul[1,*], Sutada Banchuen[2], Krisana Chongsri[2], Wuttichai Srinonate[3], Wisanu Pecharapa[3]

[1]Department of Science and Mathematics, Faculty of Science and Technology, Rajamangala University of Technology Tawan-ok, Chonburi 20110, Thailand

[2]Department of Applied Physics, Faculty of Science and Technology, Rajabhat Rajanagarindra University, Chachoengsao 24000, Thailand

[3]College of Nanotechnology, King Mongkut's Institute of Technology Ladkrabang, Bangkok 10520, Thailand

*e-mail: knotchem@hotmail.com

Abstract: ZnO-based nanostructured materials has recently become one of the most useful nanomaterials being utilized in various practical applications including gas sensors, biosensors, photovoltaic and advanced optoelectronics devices because of their good and exceptional mechanical, optical and electrical properties that can be modified to meet the practical requirement for specific application. In general, undoped ZnO is n-type semiconductive material with wide band gap of 3.3 eV. However, it has been reported that p-type ZnO can be achieved by doping technique with either metal or non-metal elements such as Ag, Sb P and N. The effort for making good p-type ZnO is still in focus. In this work, the a facile synthesis of Sb-doped ZnO nanopowders by co-precipitation process was conducted employing zinc nitrate and antimony chloride as starting precursors for Zn and Sb source, respectively. After precipitation, the intermediate powders with different Sb-doping concentrations (0-10%) were calcined at different temperatures of 300-700°C for crystallization. Their crystallinity and morphological property were performed by X-ray diffraction (XRD) and scanning electron microscopy (SEM) when their optical properties was examined by diffuse reflection spectroscopy and photoluminescence spectroscopy. The electrical properties of the samples in pellet form were carried out by Hall measurement. The XRD results exhibited higher crystallinity and greater particle size with increasing calcination temperature but the deterioration in its crystallinity was observed as the doping content increased. The corresponding lattice parameter and the micro-strain were evaluated. Regarding optical and electrical results, it is indicated that Sb dopant plays significant role on relevant optical and electrical properties including optical band gap, optical absorption and electrical conductivity.

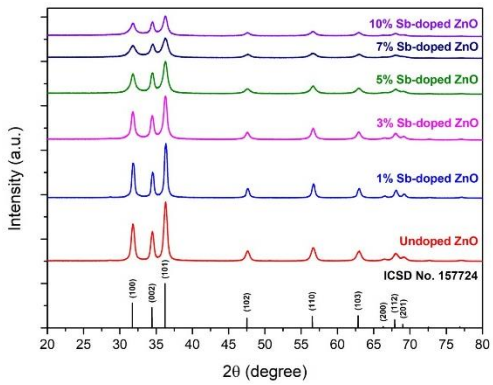


Figure 1. XRD patterns of Sb-doped ZnO nanopowders with different Sb doping contents

D_050_PA: EFFECT OF ANIMAL OIL ON PHYSICAL AND MECHANICAL PROPERTIES OF POROUS ALUMINO-SILICEOUS MATERIALS

Narumon Lertcumfu[1], Kannikar Kaewapai[2,3], Pharatree Jaita[2,4], Ratabongkot Sanjoom[5], Pruchya Malasri[2], Gobwute Rujijanagul[2,4,6,7,*], Tawee Tunkasiri[2,5]

[1]Department of gemological sciences, Faculty of Gemological Sciences and Applied Arts, Rambhai Barni Rajabhat University, Chanthaburi 22000, Thailand

[2]Department of Physics and Materials Science, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

[3]Graduate School, Chiang Mai University, Chiang Mai 50200, Thailand

[4]Science and Technology Research Institute, Chiang Mai University, Chiang Mai 50200, Thailand

[5]Department of Applied Science and Biotechnology, Faculty of Agro-Industrial Technology, Rajamangala University of Technology Tawan-ok Chantaburi Campus, Chantaburi 22210 Thailand

[6]Materials Science Research Center, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

[7]Research Center in Physics and Astronomy, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

*e-mail: rujijanagul@yahoo.com

Abstract: Porous alumino-siliceous (PAS) materials are pozzolanic materials containing reactive silica and alumina. PAS materials are attractive for use in a wide variety of construction and adsorption materials. The PAS materials were synthesized by a geopolymerization method with a reaction between aluminosilicate powders (ceramic waste and metakaolin) and an alkaline solution, H_2O_2 as a foaming agent and an animal oil as a surfactant. Different amounts of animal oil (2.5 – 15 wt%) were added to the samples. PAS materials with open pores and high porosity were successfully fabricated with pork lard as a surfactant. The compressive strength trend was related to total porosity. The relationship between compressive strength and porosity was found to consist with a model. The results suggest that this material can be used as a foam material.

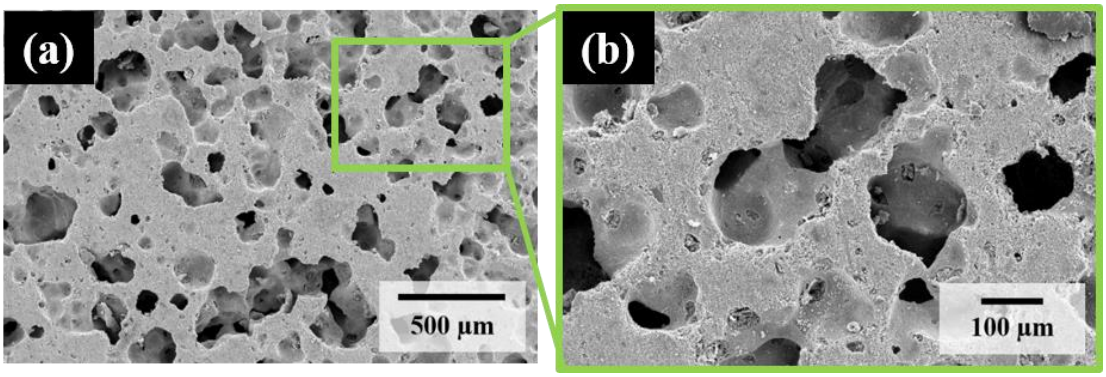


Figure 1. SEM micrographs for PAS-2.5 wt% pork lard samples.

D_051_PA: ELECTRICAL PROPERTIES OF BISMUTH FERRITE DOPED ON STRONTIUM IRON NIOBATE LEAD-FREE CERAMICS

Ratabongkot Sanjoom[1,*], Pharatree Jaita[2], Narumon Lertcumfu[3], Tawee Tunkasiri[2]

[1]Department of Applied Science and Biotechnology, Faculty of Agro-Industrial Technology, Rajamangala University of Technology Tawan-ok Chantaburi Campus, Chantaburi 22210 Thailand

[2]Department of Physics and Materials Science, Faculty of Sciences, Chiang Mai University, Chiang Mai 50200, Thailand

[3]Department of gemological sciences, Faculty of Gemological Sciences and Applied Arts, Rambhai Barni Rajabhat University, Chanthaburi 22000, Thailand

*e-mail: kachaporn.sanjoom@gmail.com

Abstract: Effects of bismuth ferrite, $BiFeO_3$ (BFO) on the properties of strontium iron niobate, $Sr(Fe_{0.5}Nb_{0.5})O_3$ (SFN) ceramics were investigated. The ceramics were synthesized by solid-state reaction technique. X-ray diffraction analysis revealed that all ceramics exhibited a single perovskite structure with an orthorhombic symmetry. Examination of the dielectric spectra indicated that all ceramics presented high dielectric constants which were frequency-dependent. The x = 0.05 ceramic showed a very high dielectric constant (ε_r > 40,680 at 1 kHz). By using a complex impedance analysis technique, bulk grain, grain boundary, and electrode responses were found to affect the dielectric behavior which could be related to the Maxwell-Wagner polarization mechanism. Furthermore, ferroelectric behavior was also found to improve for a higher amount of BFO content.

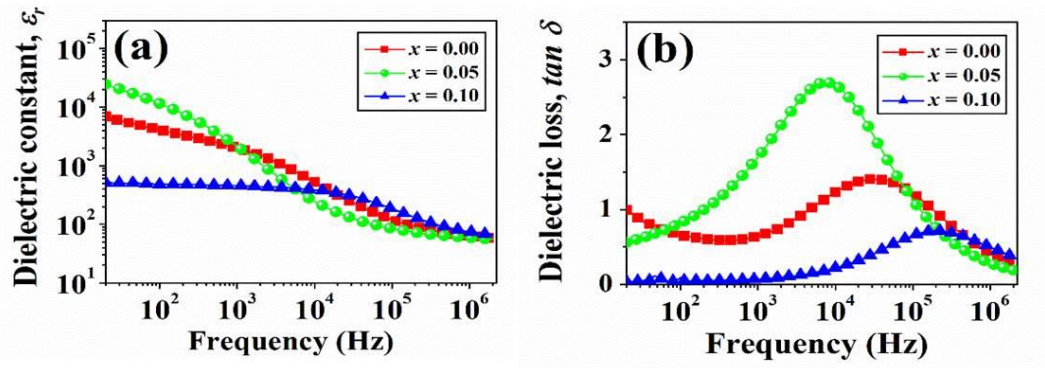


Figure 1. Frequency dependence of (a) dielectric constant (ε_r) and (b) dielectric loss ($tan\ \delta$) of the (1-x)SFN-xBFO ceramics.

D_052_PA: MECHANICAL, ELECTRICAL, AND MAGNETIC PROPERTIES OF BISMUTH SODIUM POTASSIUM TITANATE-BASED CERAMICS MODIFIED BY BARIUM IRON TANTALATE

Pharatree Jaita[1,2], Ratabongkot Sanjoom[3], Narumon Lertcumfu[1], Pruchya Malasri[1], Gobwute Rujijangul[1,2,4,5,*], Tawee Tunkasiri[1,4]

[1]Department of Physics and Materials Science, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

[2]Science and Technology Research Institute, Chiang Mai University, Chiang Mai 50200, Thailand

[3]Department of Applied Science and Biotechnology, Faculty of Agro-Industrial Technology, Rajamangala University of Technology Tawan-ok Chantaburi Campus, Chantaburi 22210, Thailand

[4]Materials Science Research Center, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

[5]Research Center in Physics and Astronomy, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

*e-mail: rujijanagul@yahoo.com

Abstract: In this research, the effects of barium iron tantalate additive on the mechanical and electrical properties of bismuth sodium potassium titanate ceramics modified by barium strontium titanate were investigated. The studied ceramics were fabricated via a solid-state mixed oxide method and sintered at the temperature of 1125 °C for 2 h dwell time in order to obtain dense ceramics. The XRD and Raman data revealed the coexisting rhombohedral and tetragonal phases for all samples. The density increased with increasing the additive content, which resulted in the improvements of mechanical and dielectric properties. The maximum dielectric (ε_r = 1799) and mechanical properties (H_V = 6.30 GPa, H_K = 5.30 GPa, E = 97 GPa and K_{IC} = 1.95 MPa.m$^{1/2}$) properties were observed. The leakage current density (J) increased with increasing amount of the additive at high electric fields of 30 kV/cm while the resistivity (ρ) was also found to decrease with the additive. The magnetocapacitance (-MC%) value also increased with increasing of the additive. The obtained results suggested that the additive not only enhanced the mechanical but also improve electrical properties of the studied samples.

D_053_PA: EFFECT OF SINTERING TEMPERATURE ON MECHANICAL AND ELECTRICAL PROPERTIES OF LEAD ZIRCONATE TITANATE MODIFIED BY BLNT CERAMICS

Pharatree Jaita[1], Parkpoom Jarupoom[2,*]
[1]Department of Physics and Materials Science, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand
[2]Department of Industrial Engineering, Faculty of Engineering, Rajamangala University of Technology Lanna, Chiang Mai 50300, Thailand
*e-mail: noteparkpoom@gmail.com

Abstract: The effects of sintering condition on physical, microstructure and dielectric properties of the PZT-3BLNT ceramics were investigated. The samples were prepared by a conventional mixed oxide method and sintered at the temperatures ranging from 1050 °C to 1200 °C under normal atmosphere for 2 h. X-ray diffraction indicated that the mixed rhombohedral-tetragonal phases were observed at lower sintering temperature of 1050 °C, while the tetragonal phase became dominant at higher sintering temperature (1200 °C). The optimum sintering temperature for preparation of high-density PZT-3BLNT ceramic was found to be 1200 °C. Linear shrinkage and average grain size tended to increase with increasing the sintering temperature. The effect of annealing conditions on mechanical and dielectric properties of the PZT-3BLNT ceramic sintered at 1200 °C were also studied in this work. It was found that the maximum room temperature dielectric constant (ε_r) of 1313 and Vickers hardness (*HV*) of 4.38 GPa were achieved for the sample annealed at 950 °C for 8 h dwell time and this value was ~ 18 - 20 % higher than the unannealed sample. This result was also well correlated with the maximum relative density observed for this annealing condition.

D_054_OF: SYNTHESIS AND STRUCTURAL PROPERTIES OF METAL DOPED Li NIKEL-RICH NMC POWDER MATERIALS FOR HIGH SPECIFIC CAPACITY

Jaruwan Kanthachan[1,2], Uraiwan Intatha[3], Sukum Eitssayeam[2,*]
[1]Graduate School, Chiang Mai University, Chiang Mai 50200, Thailand
[2]Department of Physics and Materials, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand
[3]Materials for Energy and Environment Research Group, School of Science, MaeFahLuang University, Chiang Rai 57100, Thailand
*e-mail: sukum99@yahoo.com

Abstract: Lithium nickel manganese cobalt oxide(NMC) is positive electrodes in lithium-ion batteries. The $LiNi_{0.75}Mn_{0.15}Co_{0.10}O_2$ shows the highest specific capacity, with the potential range of 215 $mAhg^{-1}$. The fine NMC powder size was successfully synthesized by co-precipitation method. Addition of $Sn_3(PO_4)_2$ has distinct influence on the crystal structure of the materials. Study, different steps synthesis to mix with lithium hydroxide monohydrate. After doping with an appropriate amount tin phosphate, the electrochemical performance of $LiNi_{0.75-x}Mn_{0.15-x}Co_{0.10-x}(Sn_3(PO_4)_2)_xO_2$ or $Li_{1-y}(NiMnCo)_1(Sn_3(PO_4)_2)_yO_2$ cathode materials is significantly enhanced. The phase formation and structure were studied by X-ray Powder Diffraction (XRD). The morphological change is also investigated by field-emission scanning electron microscope (FE-SEM).

D_055_PA: MOLDED SHEETS FROM COFFEE HUSK AND REUSED PAPER: EFFECT OF COFFEE HUSK PARTICLE SIZE

Anudthida Maphon[1], Phattharasaya Rattanawongkun[1], Nutchanad Kunfong[1], Supattra Klayya[1], Sitthi Duangphet[1], Sirirung Wongsakul[2], Nattaya Tawichai[1], Uraiwan Intatha[1], Nattakan Soykeabkaew[1,*]

[1]Center of Innovative Materials for Sustainability (iMatS), School of Science, Mae Fah Luang University, 333 M 1, Muang, Chiang Rai 57100, Thailand

[2]School of Agro-Industry, Mae Fah Luang University, 333 M 1, Muang, Chiang Rai 57100, Thailand

*e-mail: nattakan@mfu.ac.th

Abstract: Coffee husk (CH) is one of major wastes in the coffee-roasting industry. This study aims to produce paper sheets from CH by blending with reused paper (RP) pulp. To prepare the blended sheets, firstly, CH was ground and sieved into 3 particle sizes, i.e., >1.0 mm (large), 0.5-1.0 mm (medium), and <0.5 mm (small). Then, CH particles were blended into 2wt% RP pulp slurry in the ratio of 20/80 by mass of CH/RP. Next, the blended sheets were formed by a using a compression molding technique at temperature of 130 °C under pressure of 0.6 MPa for 5 minutes. It was found that the grammage of the obtained paper sheets was approximately 300 g/m^2. The tensile properties of sheets including tensile index, tensile strength, elongation at break and Young's modulus were evaluated. The results clearly showed that the particle size of CH affected to the tensile properties of the RP based sheet. Only, the blended paper sheets with addition of the medium size CH particles could preserve the tensile strength of the RP based sheet. On the other hand, the sheets filled with the small or large size CH particles showed a decrease in all tensile properties. In this case, it was possible that CH particles might interrupt the RP fiber-fiber network and bonding, hence, weakening these blended CH/RP molded sheets.

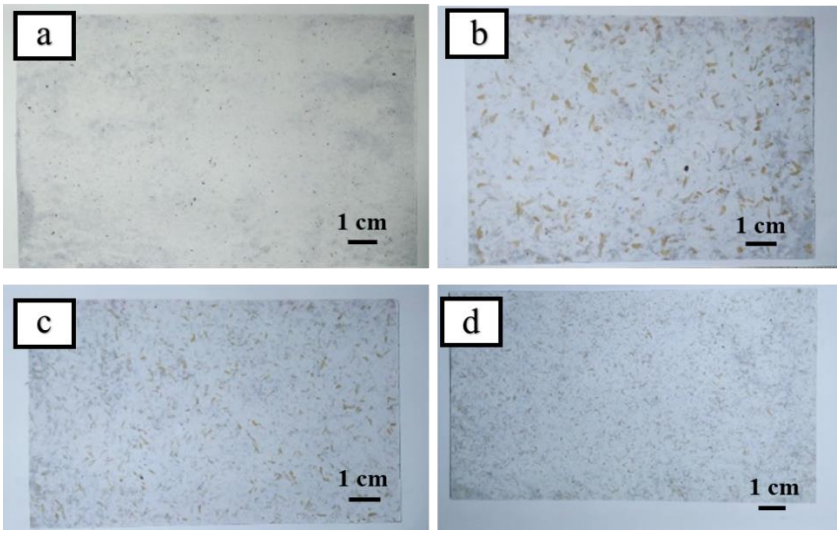


Figure 1. Photos of the molded sheets from: (a) reused paper and reused paper blended with coffee husk of particle size (b) >1.0 mm, (c) 0.5-1.0 mm, and (d) <0.5 mm.

D_056_OA: EFFECT OF SHORT PULPING TIME ON SODA PULPING PROCESS OF BANANA STEM AND PINEAPPLE LEAF

Bussayapat Phanyot, Phattharasaya Rattanawongkun, Nutchanad Kunfong, Supattra Klayya, Sitthi Duangphet, Nattaya Tawichai, Uraiwan Intatha, Nattakan Soykeabkaew*
Center of Innovative Materials for Sustainability (iMatS), School of Science, Mae Fah Luang University, 333 M 1, Muang, Chiang Rai 57100, Thailand
*e-mail: nattakan@mfu.ac.th

Abstract: Agricultural residues such as banana stem (B) and pineapple leaf (P) are the abundant, low-cost, and effective sources for cellulose fiber or pulp and paper production. The pulp yield is one of the keys to be concerned and essentially depends on the pulping time. To save energy and cost of the pulping process, the aim of this study was to prepare the pulps from B and P using a soda pulping process with shorter times (i.e. 5-20 minutes) than usual. The pulp yields were evaluated and morphology of the obtained fibers was observed. It was found that the total yield of B and P pulps were approximately 32-38%. The highest screened yield of B pulp was 22.6% obtained with 20 minutes pulping time. For the P pulp, when increasing pulping time from 5 to 10 minutes, the screened yield was not visibly increased. Only 17.1-18.4% of the screened P pulp were obtained. From SEM images, the removal of non-cellulose substances and fiber defibrillation were confirmed. It can conclude that the preparation of B and P pulps using shorter pulping times is possible and potentially reduce the energy consumption when compared to previous researches.

Figure 1. The appearance of the banana stem pulp (left; B Pulp) and pineapple leaf pulp (right; P pulp).

D_057_OA: EFFECTS OF PROCESSING STEP AND FIBER VOLUME FRACTION ON RICE STRAW/UNSATURATED POLYESTER BIOCOMPOSITES

Thanatorn Thanyapanich[1], Sakaowduen Preampree[1], Anyaporn Boonmahittsud[2], Uraiwan Intatha[1], Nattaya Tawichai[1], Nattakan Soykeabkaew[1,*]

[1]Center of Innovative Materials for Sustainability (iMatS), School of Science, Mae Fah Luang University, 333 M 1, Muang, Chiang Rai 57100, Thailand

[2]Department of Materials Science, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

*e-mail: nattakan@mfu.ac.th

Abstract: In the past two decades, there has been a huge renewed interest in using natural fibers as reinforcements in composite materials due to growing concerns in the environment and sustainability. Rice straw is one of the agricultural wastes that has a good prospective to be also used as a reinforcing agent owing to its abundance in Thailand. In this work, rice straw was used to reinforce in unsaturated polyester (UP) resin and the biocomposites were prepared by using a compression molding technique. Firstly, the effect of different processing steps: i) non-sealed and ii) sealed mold with an aluminum foil during the forming and curing of biocomposites on their structures and mechanical properties was investigated. It was shown that the sealed mold resulted in the higher gel content percentage or crosslinking degree as well as an increase in the flexural properties of the biocomposites. This was supposedly due to the sealed mold could protect the UP system from inhibitors such as oxygen molecule during the curing reaction. Moreover, it could largely reduce loss of volatile reactants such as monomers from the resin system. Secondly, the effect of fiber volume fraction (V_f) on the biocomposite performance was also studied. The results showed that the biocomposites with V_f of 0.3 exhibited the highest strength and modulus values (29.2 ± 3.3 MPa and 2.3 ± 0.1 GPa, respectively). The SEM photos indicated a good wettability between rice straw fibers and UP resin in this biocomposite structure.

Figure 1. Photos of the non-sealed (left) and sealed molds (right).

D_058_OA: EFFECT OF POST-CURING ON RICE STRAW/UNSATURATED POLYESTER BIOCOMPOSITES

Thanaphut Boonpetch[1], Sakaowduen Preampree[1], Anyaporn Boonmahittsud[2], Uraiwan Intatha[1], Nattaya Tawichai[1], Nattakan Soykeabkaew[1,*]

[1]Center of Innovative Materials for Sustainability (iMatS), School of Science, Mae Fah Luang University, 333 M 1, Muang, Chiang Rai 57100, Thailand

[2]Department of Materials Science, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

*e-mail: nattakan@mfu.ac.th

Abstract: At present, the demand for bio-based materials in various applications is raising due to the addressed problems in the environment and earth sustainability. Rice straw/unsaturated polyester (UP) biocomposites have been continually reported for their good properties and potentials in many uses. The mechanical properties of UP resins strongly depend on the degree of crosslinking occurred during a curing process. Still, a complete crosslinked or cured network is hardly and rarely achieved at low temperatures. To enhance the composite properties, a post-curing at high temperatures is often required. In this work, rice straw/UP biocomposites were prepared by using a compression molding technique under pressure of 149.2 psi at 80°C for 8 minutes. Later, the biocomposites were post-cured at 80°C for 12 or 24 hours and the gel content (%) was determined to evaluate the degree of curing in each sample. In comparison with the control (non post-cured) sample, however, it was found that the gel contents of the post-cured samples were not increased (around 87%). In contrast to this results, the flexural and impact properties of the post-cured biocomposites were improved as compared to the control sample. With no rice straw addition, the neat resin was shown to be almost completely cured expressing the gel content as high as 97%. This suggested that rice straw fiber possibly hindered further cross-linked reaction in the UP resin system, hence, the lower gel contents were obtained in the biocomposite systems.

Figure 1. The appearance of the prepared biocomposites.

D_059_OA: COMPARISON OF MOLDED PULPS FROM RICE STRAW, PINEAPPLE LEAF AND BANANA STEM PULPS

Thawan Chotimarnon, Phattharasaya Rattanawongkun, Nutchanad Kunfong, Supattra Klayya, Sitthi Duangphet, Nattaya Tawichai, Uraiwan Intatha, Nattakan Soykeabkaew*
Center of Innovative Materials for Sustainability (iMatS), School of Science, Mae Fah Luang University, 333 M 1, Muang, Chiang Rai 57100, Thailand
*e-mail: nattakan@mfu.ac.th

Abstract: Molded pulp is an eco-friendly packaging product popularly chosen nowadays. It is mostly used to replace plastic containers such as polypropylene (PP), polystyrene (PS) and polyethylene (PE). Besides, the non-wood pulps from agricultural crops and residues have been increasingly studied as alternative materials in the pulp production. Therefore, this study aims to investigate the possibility of utilizing rice straw (R), pineapple leaf (P) and banana stem (B) as raw materials to prepare pulps by using a soda-anthraquinone (Soda-AQ) pulping process. The pulping was carried out with 4-7% sodium hydroxide (NaOH) solution and 0.1% AQ, a liquid-solid ratio of 10:1, and pulping time of 15-30 minutes at 98 ± 2 °C. Next, the obtained pulps were sieved into unscreened and screened portions and then the molded sheets were formed using compression molding technique under pressure of 0.6 MPa at 130°C for 5 minutes. The molded sheets from both unscreened and screened R pulps showed the highest tensile strength and tensile index (62 MPa and 63.28 Nm/g, respectively) when compared to the sheets from P and B pulps. From SEM images, the cross-section of the R pulp sheets revealed less voids between fiber layers and, hence, better fiber-packing and bonding. Based on their mechanical properties compared to commercial molded pulp products, it suggested that these agricultural residues and their pulps can be considered as promising alternative sources for pulp and molded pulp production.

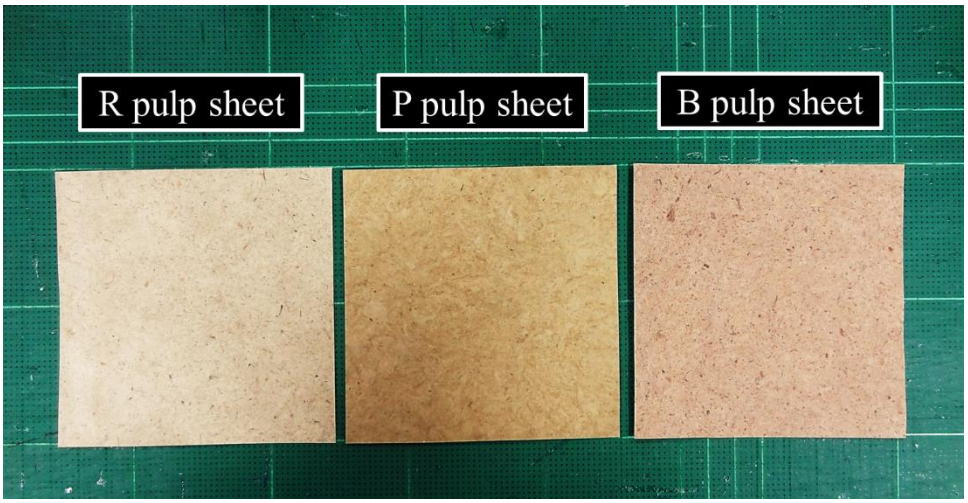


Figure 1. Molded pulp sheets from rice straw (R), pineapple leaf (P) and banana stem (B) pulps.

D_060_PA: INVESTIGATION OF THE PHASE FORMATION AND MECHANICAL PROPERTIES OF LI-SILICA GLASS-CERAMICS SYSTEM

Wanrada Suwannakran[1], Anon Noochanong[1], Arnon Kraipok[2], Sukum Eitsayeam[2], Wilaiwan Leenakul[1,*]

[1]Faculty of Science and Technology, Rajamangala University of Technology Phra Nakhon, Bangkok 10800, Thailand

[2]Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

*e-mail: wilaiwan.l@rmutp.ac.th

Abstract: Lithium disilicate based glass ceramics are one of the most promising dental restoration materials that has been developed for clinical applications due to their good bioactivity and mechanical properties. The aim of this study was to analyze the nucleation and phase formation to form lithium disilicate glass-ceramics synthesized from SiO_2-LiO_2 glass systems with adding CeO_2(0-0.15 wt%) by using conventional melting techniques. These glass systems were obtained by the melting of commercial reagents at temperatures of 1450°C. The effects of various heat treatment temperature conditions and CeO_2 on microstructure, phase formation and mechanical properties of samples were investigated. $Li_2Si_2O_5$ and Li_2SiO_3 phases were observed in all glass ceramic samples. The results showed that the intensity of $Li_2Si_2O_5$ is slightly increases with increasing of the volume of CeO_2. The optimum heat treatment temperature resulting in maximum mechanical values with samples adding 1.0 wt% CeO_2 which were heated at the first step at 600°C and second step heated at 800°C for 1 hr, with a high density of 2.50 g/cm^3 and the vicker microhardness value of 812 HV.

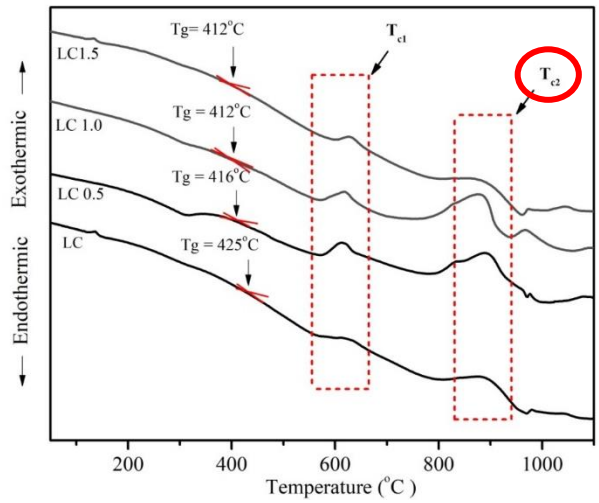


Figure 1. DTA Trace of Lithium disilicate with various CeO_2 condition

D_061_PA: PREPARATION AND PROPERTIES OF GLASS-CERAMICS FOR DENTAL RESTORATION

Wipada Senanon[1], Sukum Eitssayeam[1], Krit Sutjarittangtham[2,*]
[1]Department of Physics and Materials Science, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand
[2]Physics Program, Faculty of Science and Technology, Pibulsongkram Rajabhat University, Phitsanulok 65000, Thailand
*e-mail: krit783@gmail.com

Abstract: The dental glass-ceramic was prepared by mixing the starting metal oxide materials and melting at 1450 °C for 4 h. Then the molten glass was quenched rapidly into water at room temperature and ground to obtain glass frit powder. After that the powder pressed into a mold 10 mm in diameter. Finally, the samples were sintered at 930 °C in a vacuum electrical furnace. The crystal structure and microstructure were observed by using X-ray diffraction (XRD) and field emission scanning electron microscopy (FE-SEM). The hardness was investigated by Vickers hardness (HV) and Knoop hardness (HK) testing. The modulus of elasticity (E) and fracture toughness (K_{IC}) were calculated. Results indicated that the dental glass-ceramics had three phases as an amorphous phase of glass and a crystal phase of leucite and kalsilite. HV of dental ceramics were in the range of 4.18 – 6.25 GPa.

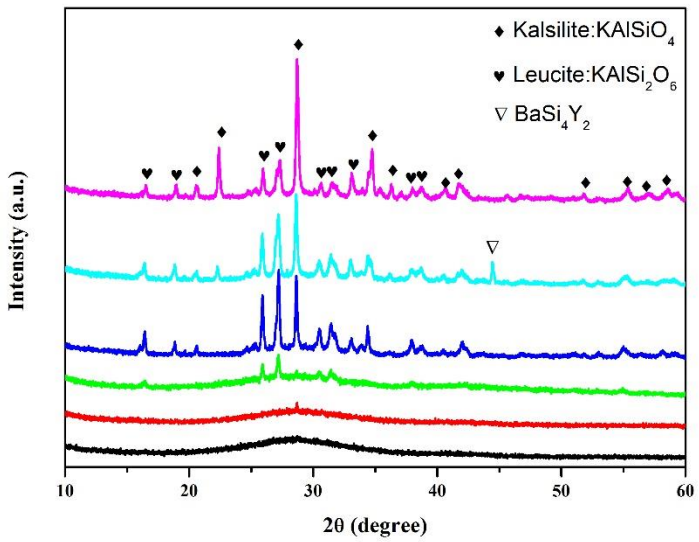


Figure 1. XRD pattern of dental glass-ceramics added Li_2O_3

D_062_PA: EFFECT OF $BaTiO_3$ NANO-PARTICLES ON DIELECTRIC AND FERROELECTRIC PROPERTIES OF $Ba_{0.85}Sr_{0.15}Ti_{0.90}Zr_{0.10}O_3$

Juthamas Thongduang,[1] Sukum Eitssayeam[2], Tawee Tunkasiri[2], Krit Sutjarittangtham[1,*]
[1]Physics Program, Faculty of Science and Technology, Pibulsongkram Rajabhat University, Phitsanulok 65000, Thailand
[2]Department of Physics and Materials Science, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand
*e-mail: krit783@gmail.com

Abstract: This research was synthetized the $Ba_{0.85}Sr_{0.15}Zr_{0.1}Ti_{0.9}O_3$ (BSZT) ceramics by seed-induced method and studied the effect of the $BaTiO_3$ (BT) nano-particles on dielectric and ferroelectric properties of BSZT ceramics. The BT nano-particles was synthesized by molten-salt method. BT nano-particles was added to the starting materials of BSZT, then ball-mill at 24 h and calcined at 1200 °C for 3 h and sintered at 1400 °C for 3 h. The crystal structure and microstructure were observed by x-ray diffraction (XRD) and scanning electron microscope (SEM). The ferroelectric properties was observed by hysteresis loop. The result indicated that XRD patterns confirm that the tetragonal phase structure. The sample with 4 mol% of BT nano-particles exhibited highest value of dielectric constant (ε_r) at maximum temperature of 17565 and Curie temperature increased with BT nano-particles. The grain size significantly increased with increasing concentration of BT nano-particles.

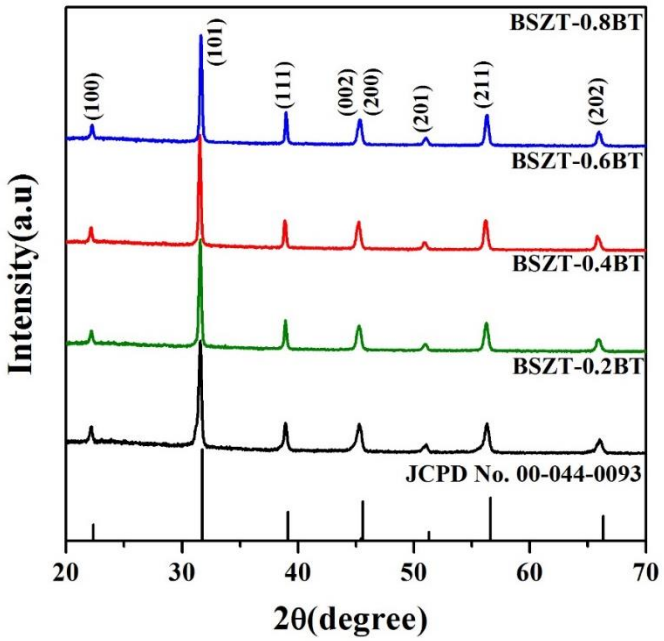


Figure 1. X-ray diffraction patterns of BSZT ceramic with varied the BT nano-particles concentration

D_063_OA: EFFECT OF SURFACE TREATMENTS ON MICRO-SHEAR BOND STRENGTH OF RESIN CEMENT TO A NEWLY DEVELOPED LITHIUM DISILICATE GLASS CERAMIC

Teerapong Mamanee[1,*], Kanokwan Yawichai[2], Siripong Sirimongkolwattana[1]
[1]Department of Restorative Dentistry and Periodontology, Faculty of Dentistry, Chiang Mai University, Chiang Mai 50200 Thailand
[2]Pua Crown Prince Hospital, Nan 55120 Thailand
*e-mail: teerapong.tm@gmail.com

Abstract: This study evaluated the effect of different surface treatments on the micro-shear strength of the bond between resin cement and a newly-developed lithium disilicate glass ceramic with and without thermocycling. Seventy-seven newly developed lithium disilicate glass ceramic plates were prepared. The embedded specimens were randomly divided into seven groups according to surface treatments: (1) no surface treatment (NS); (2) hydrofluoric acid (HF); (3) sandblasting (S); (4) silane coating (Si); (5) hydrofluoric acid and silane coating (HF+Si); (6) sandblasting and silane coating (S+Si); (7) Cojet™ and silane coating (Coj+Si). Resin cement rods were bonded to the treated ceramic surface. After 0 and 5,000 cycles of thermocycles, specimens were subjected to a micro-shear bond strength (μSBS) test at a cross-head speed of 1 mm/min. Data were analyzed using two-way ANOVA, followed by the Dunnett T3 multiple comparison test (p<0.05). For non-thermocycled groups, the mean μSBS of the HF+Si (25.38±1.03 MPa) and Si groups (24.65±1.43 MPa) were significantly higher than that of other groups. Moreover, thermocycling significantly decreased mean μSBS values in all groups (p<0.05). Silanization was the most effective surface treatment in terms of increasing bond strength between resin cement and a newly developed lithium disilicate glass ceramic.

SESSION E:
ENERGY_ENVIRONMENTAL & EARTH SCIENCE

E_001_PA: ADSORPTION OF SOME PLANT NUTRIENTS BY CHITOSAN-PECTIN FILM

Samley Sok[1], Witchaya Kanburom[1], Sitanan Nuengjumnong[1], Korakoj Pethasanayothin[2], Anawat Pinisakul[1,*]

[1]Department of Chemistry, Faculty of Science, King Mongkut's University of Technology Thonburi, Thailand

[2]Department of Industrial Chemistry, Faculty of Science and Technology, Bansomdejchaopraya Rajabhat University, Thailand

*e-mail: ianaakul@kmutt.ac.th

Abstract: This research studied adsorption capability of nutrients comprising of phosphate, magnesium, copper, zinc, manganese and iron using chitosan-pectin film in a ratio of 70:30 by weight as adsorbents. The main factors of adsorption have been observed such as contact time, adsorbent dosage and adsorption isotherm. The experiment was separated into 2 phases consisted of the formation of adsorbent and its characterization. Phase I, the produced chitosan-pectin adsorbent were yellowish when the ratios of chitosan and pectin was 70:30 by weight. The FTIR analysis of adsorbent exhibited the presence of amide groups of chitosan and carboxyl groups of pectin. The new peaks were found at 1621, 1337 and 641 cm^{-1}, corresponding to COO^-, –NH and OCN, respectively. Phase II, the contact time of phosphate adsorption was 120 minutes while the equilibrium time of magnesium, copper, zinc, manganese and iron were 60 minutes. The maximum adsorption capacity of phosphate, magnesium and iron were 70, 93.32 and 73.84% while using 1.2, 20, and 20 g/L of adsorbent, respectively. At 2 g/L of adsorbent dose could adsorb copper, zinc and manganese about 96.74, 97.14 and 98.96%, respectively. The adsorption isotherm of phosphate, magnesium and iron were explained by Freundlich model but adsorption of copper, zinc and manganese were described by Langmuir model.

E_002_PF: ARCHITECTURE ELEMENTS AND STRATIGRAPHY OF ANCIENT MUN RIVER, NAKHON RATCHASIMA, NORTHEASTERN THAILAND

Thunchanok Kawinate*, Montri Choowong, Kantapon Suraprasit
Morphology of Earth Surface and Advanced Geohazards in Southeast Asia (MESA) Research Unit, Department of Geology, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand
*e-mail: thunchanok-k@hotmail.com

Abstract: In order to understand the depositional mechanism of the meandering Mun river, the reconstruction of architecture elements coupled with detail stratigraphic correlation is essential. In this study, we recognized ten lithofacies that can be grouped into six architecture elements from meander belt of the Mun River, Nakhon Ratchasima province. Ten lithofacies include planar-cross-bedded gravel (Gp), matrix-supported gravel (Gmg), trough-cross-bedded sand (St), ripple cross-laminated sand (Sr), planar-cross-bedded sand (Sp), horizontally bedded sand (Sh), silt, mud (Fsm) mud, silt (Fr), massive mud, silt (Fm) and laminated sand, silt, mud (Fl). Six architecture elements were identified as sandy bedforms (SB), lateral accretion deposits (LA), levee deposits (LV), crevasse channel elements (CR), floodplain fines (FF) and abandoned channel (CH(FF)). All these facies and elements found within 13 m thick indicate the sedimentary process of the meandering river. Based on facies and architectures, the upper part shows fine-grained facies deposited mainly from suspension during a low flow regime and low energy. The lower part is mainly characterized by sand facies with medium to very coarse-grained and less commonly gravel facies at the base, It is interpreted to have deposited by high flow regime, rapid flow and high energy depositional mechanism.

E_003_OA: ELECTROCHEMICAL PERFORMANCE OF Cu-Mn-S/CARBON NANOTUBES COMPOSITE AS ELECTRODE MATERIAL FOR SUPERCAPACITORS

Siriwimol Noymak[1], Chatwarin Poochai[2], Adisorn Tuantranont[2], I Ming Tang[3], Weeraphat Pon-On[1,*]

[1]Department of Physics, Faculty of Science, Kasetsart University, Bangkok, Thailand.

[2]Graphene and Printed Electronics for Dual-Use Applications Research Division (GPERD), National Security and Dual-Use Technology Center, National Science and Technology Development Agency (NSTDA), 112 Thailand Science Park, Phahon Yothin Road, Klong Nueng, Klong Luang, Phathum Thani 12120, Thailand.

[3]Department of Materials Science, Faculty of Science, Kasertsart University Bangkok10900, Thailand.

*e-mail fsciwpp@ku.ac.th, Tel.:662 562 5555 ext. 3008-3011

Abstract: Seeking for suitable electrode materials are great challenges for developing high performance supercapacitors. Herein, hybrid composite of binary metal sulfides of copper-manganese-sulphide (Cu-Mn-S) with acid-treated carbon nanotubes (aCNT) (CMS@aCNTs) is regarded as a promising electrode material for supercapacitor. The hybrid composite of CMS@aCNT was synthesized using a facile hydrothermal and sulfuration process. The results show Cu-Mn-S nanoparticles are closely dispersed on aCNTs, suggesting the formation of a united composite. This composite exhibits a specific surface area of 70 m^2g^{-1} and an average pore diameter of 20.44 nm, which are provided numerous effective paths for electron transfer and ion diffusion, and thus promoted the faradaic reactions of the CMS@aCNTs electrode in the energy storage processes. For the electrochemical performance, CMS@aCNTs composite delivers the specific capacitance as high as 100 Fg^{-1} at 0.1 Ag^{-1} and sligthly lower of 96 Fg^{-1} at 0.25 Ag^{-1} in 3M KOH electrolyte and exhibited an energy density of 3.47 Wh kg^{-1} at a power density of 50 Wkg^{-1}. This finding proves that CMS@aCNTs composite can be considered as a promising candidate material applied to high-performance energy storage device.

E_004_PF: ACTIVITY OF $PtIrO_2$/C FOR REGENERATIVE PEM FUEL CELL

Ladawan Thupchai[1,2], Mali Hunsom[3], Kejvalee Pruksathorn[1,2,*]
[1]Department of Chemical Technology, Faculty of Science, Chulalongkorn University, Bangkok, Thailand
[2]Center of Excellence on Petrochemical and Materials Technology, Chulalongkorn University, Bangkok, Thailand
[3]Associate Fellow of Royal Society of Thailand, Bangkok, Thailand
*e-mail: kejvalee.p@chula.ac.th

Abstract:The $PtIrO_2$/C electrocatalysts for oxygen reduction reaction (ORR) and oxygen evolution reaction (OER) in regenerative PEM fuel cell were prepared by impregnation method at the ratio of Pt black and IrO_2 of 1:1. Activity of supported $PtIrO_2$ electrocatalyst was explored and compared to Pt/C catalyst. It was found that the $PtIrO_2$/C exhibited higher performance in ORR and OER activity, in term of kinetic current density with current density of 0.42 mA/cm^2 at 0.6 V and 1.11 mA/cm^2 at 1.35 V, respectively. Kinetic analysis shows that ORR of all catalysts follows four electron pathway mechanism.

E_005_PF: $NiCo_2S_4$/N-rGO AS A BIFUCNTIONAL OXYGEN REACTION ELECTROCATALYST FOR RECHARGEABLE ZINC-AIR BATTERIES

Phonphiphat Suwannarak, Nisit Tantavichet
Department of Chemical Technology, Faculty of Science, Chulalongkorn University, Bangkok, Thailand
Center of Excellence on Petrochemical and Materials Technology, Bangkok, Thailand
*e-mail: phonphiphat.s@gmail.com

Abstract: Nowadays, zinc–air batteries the one of metal–air batteries have received interest because it has high energy density, the abundance of oxygen, the affluence of zinc, low cost and safety. Rechargeable zinc-air battery can store and release energy by using oxygen reduction reaction (ORR) and oxygen evolution reaction (OER). However, these reactions are slow, so it required catalyst. Recently, nickel cobalt sulfide ($NiCo_2S_4$) which has good performance, inexpensive and useful for both ORR and OER get more attention. Herein, $NiCo_2S_4$ with carbon-based support was investigated in term of electrocatalyst activity for oxygen reduction reaction (ORR) and oxygen evolution reaction (OER) comparing with commercial catalysts. Vulcan carbon (C), reduced graphene oxide (rGO) and nitrogen doped reduced graphene oxide (N-rGO) were used as supporters to improve electrocatalytic activity. The results show that $NiCo_2S_4$ on nitrogen doped rGO had higher electrocatalytic activity more than $NiCo_2S_4$ on non-doped rGO. When consider $NiCo_2S_4$/N-rGO compare with $NiCo_2S_4$/C and commercial catalysts, the result show that $NiCo_2S_4$/N-rGO had higher electrocatalytic activity than cobalt oxide (Co_3O_4) but still lower than $NiCo_2S_4$/C and the commercial platinum (Pt/C) for ORR.

E_006_OF: THE STUDY OF BASEFLOW SEPARATION AT WATERSHEDS IN CHIANG RAI, THAILAND

Prach Sukkavee[1], Schradh Saenton[2], Rungrote Nilthong[1,*]
[1]School of Science, Mae Fah Luang University, Chiang Rai, Thailand
[2]Department of Geological Sciences, Chiang Mai University, Chiang Mai, Thailand
*e-mail: rungrote@mfu.ac.th

Abstract: This paper presents the parameter estimation process of baseflow separation method on 3 watersheds in Chiang Rai, ranging from 31.6 to 434.0 km^2. The main input for the process was daily stream flow data from each watershed. The stream flow analysis was conducted using 6 recursive digital filters (RDF: One-parameter, Boughton-two-parameter, IHACRES, Lyne & Hollick, EWMA, and Chapman algorithm) and hydrograph analysis (DGM: Fixed interval and Sliding interval). First, each method was calibrated by using daily stream flow data in dry periods (January to March and December) for each year (annually) for baseflow separation. Then, optimal parameters were obtained from annual median values. The calibration process was developed for each watershed. Furthermore, validation process was performed by applying the optimal parameters with stream flow data during dry periods in 2018 and 2019 and testing the result with BFI index, RMSE and correlation coefficient. The result showed both DGM and RDF methods give RMSE values less than 0 while BFI index and correlation values found in the RDF method are 0.800 and 0.999 respectively. Both values are better than those of DGM method which are 0.778 and 0.793 respectively. In analytical detail, the RDF method using the IHACRES algorithm provided the best performance. Also the DGM method with Fixed interval algorithm using $N=A^{0.2}$ can be used to separate the baseflow as well.

Keywords: baseflow; separation; digital filter; recursive digital filter; calibration.

E_007_PA: CONVERSION OF PALM OLEIN TO BIOJET FUEL OVER NICKEL SUPPORTED ON BETA AND HY ZEOLITES

Thanawat Sukanan*, Prasert Reubroycharoen
Department of Chemical Technology, Faculty of Science, Chulalongkorn University, Bangkok, Thailand
Center of Excellence on Petrochemical and Materials Technology, Bangkok, Thailand
*e-mail: gotgolf_club@hotmail.com

Abstract: The aim of this study is to produce quality jet biofuel with high amount of normal paraffins, branch chain, low aromatic hydrocarbons and low oxygen content from palm olein using Beta and HY zeolites supporting Ni. The catalysts were characterized by X-ray diffraction, NH_3-temerature-programmed desorption and nitrogen-temperature programmed reduction. The experiments were done at 10 bar of hydrogen pressure in a temperature range of 370 - 460 °C. The experimental results shown that increasing the temperature from 370 to 430 °C over 5%Ni/Beta zeolite, the liquid yield of product decreased little but the jet fuel yield increased to 62% but Beta zeolite obtained high amount of aromatic hydrocarbon decreased jet fuel quality. The quality of biojet fuel from palm oil was improved using 5%Ni/HY catalyst exhibited the highest jet range alkane, branch chain selectivity and decreasing jet range aromatic hydrocarbon selectivity. The Liquid yield and the jet fuel yield increased to 60% and 56%, respectively. when reaction temperature increased to 430 °C.

E_008_PF: PREPARATION OF NiCoS CATALYSTS FOR RECHARGEABLE ZINC-AIR BATTERIES

N. Tangaemsakul[1,2,*], N. Tantavichet[1,2]
[1]Department of Chemical Technology, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand
[2]Center of Excellence on Petrochemical and Material Technology, Chulalongkorn University, Bangkok 10330, Thailand
*E-mail: nuttasith@windowslive.com

Abstract: Nickle cobalt sulfide ($NiCo_2S_4$) was synthesized by a one-pot solvothermal strategy using $Co(OAc)_2$, $Ni(OAc)_2$ and thiourea as precursors and ethylene glycol as the dispersing agent with varied carbon-based support was investigated in term of bifunctional nonprecious electrocatalyst activity for oxygen reduction reaction (ORR) and oxygen evolution reaction (OER) comparing with commercial catalysts. Vulcan carbon (C), Vulcan carbon treated (CT), were used as supporters. The results show $NiCo_2S_4$/CT had higher electrocatalytic activity more than cobalt oxide (20% Co_3O_4/C) but still lower than the commercial platinum (20% Pt/C) for the ORR in 0.1 M KOH but in term of OER $NiCo_2S_4$/CT reveals much higher activity than other commercial catalysts. The result show that $NiCo_2S_4$/CT have the highest electrocatalytic activity for both ORR and OER.

E_009_OA: STRUCTURAL STYLE AND TECTONIC EVOLUTION OF THE TARANAKI BASIN, NEW ZEALAND: INTERPRETATION FROM THE PARIHAKA SEISMIC DATA

Phadungphon Chinokan*, Piyaphong Chenrai
Basin Analysis and Structural Evolution Special Task Force for Activating Research (BASE STAR), Department of Geology, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand
*e-mail: piyaphong_c@hotmail.com

Abstract: The present investigation of seismic data was an effort to identify and interpret structural features and tectonic evolution of the Taranaki Basin. The Taranaki Basin is situated off the western coast of New Zealand's North Island covering an area of approximately 100,000 square kilometers. The basin has complex structural geology because of deformation in tectonic activity by tectonic collision of Australian plate and Pacific plate. This study used seismic and well log data to analyze and classify the difference of structural geology and stratigraphy in the study area. The study area can be divided into 4 different structural zones which consist of western stable zone, Cape Egmont fault zone, Turi fault zone and Northern rotational fault zone. Western stable zone is located in the western part of study area that has little to no tectonic activity and no complex structural geology. Cape Egmont fault zone is the area in the center of study area that composes of group of main faults that have dip direction in the east. This zone has planar normal fault, listric normal fault, normal fault related fold and horst and graben. Turi fault zone is in the east-west area of north Taranaki basin and has rollover structures and main planar normal faults that dip into north-west direction. The last zone is northern rotational fault zone dominated with domino style normal faults. The characteristics of the tectonic evolution of the Taranak Basin include: 1) initial formation of a large-scale half-graben rift basin during Late Cretaceous giving sandstone and coal deposits, and 2 dominant syn-rift during Late Miocene to Recent time giving sandstone interbedded with mudstone within the turbidite sequence and volcanic clastic rocks in the basin.

E_010_PF: HYDROGEN PRODUCTION AND COD REMOVAL FROM BIODIESEL WASTEWATER USING COUPLED SEMICONDUCTOR PHOTOCATALYST

Napat Chuenangkul[1,*], Mali Hunsom[2], Kejvalee Pruksathorn[3]

[1]Department of Chemical Technology, Faculty of Science, Chulalongkorn University, Pathumwan, Bangkok 10330, Thailand

[2]Associated Fellow of Royal Society of Thailand (AFRST), Bangkok 10300, Thailand

[3]Center of Excellence on Petrochemical and Materials Technology (PETROMAT), Chulalongkorn University, Pathumwan, Bangkok 10330, Thailand

*e-mail:napat_c-angkul@hotmail.com

Abstract: Nowadays, many products have been produced from industries together with the generation of wastewater. Thus, many processes have been developed for wastewater treatment such as chemical/physical treatment, electrochemical treatment, as well as biological treatment. In this study, organic pollutants in industrial wastewater was degraded by photocatalytic oxidation using semiconductors simultaneously with hydrogen (H_2) production via the photocatalytic oxidation process. Typically, titanium dioxide (TiO_2) is a common semiconductor used in heterogeneous photocatalysis because of its stability, low cost and non-toxic to the environment. However, TiO_2 has large band gap energy of 3.2 eV and has fast electron-hole recombination. One way to overcome the serious drawbacks of TiO_2 is the coupling of TiO_2 with other semiconductor. Recently, it was reported that the coupling of TiO_2 with semiconductor with different band gap energy such as Bi_2O_3, Nb_2O_5, and WO_3 can enhance the absorption capacity of TiO_2 and to hamper the electron-hole recombination. In this study, the simultaneous H_2 production and COD removal from biodiesel wastewater was tested by the photocatalytic oxidation via coupled semiconductor photocatalysts. It was obvious that the coupled semiconductor photocatalysts showed a higher hydrogen (H_2) production than the pure TiO_2 at 4.0 g/L with 5.93 mW/cm^2 UV-Visible irradiation, after 4 h irradiation. The presence of Bi_2O_3/TiO_2 showed the highest H_2 production rate of 941 µmol/h compared with others, while the WO_3/TiO_2 presented the highest COD removal of 32%.

E_011_OA: HYDROGEN ADSORPTION ON MODIFIED ACTIVATED LUFFA CARBON

Sukanya Meethom[1], Dechmongkhon Kaewsuwan[4], Narong Chanlek[4], Rapee Utke[1,2,3,*]

[1]School of Chemistry, Institute of Science, Suranaree University of Technology, Nakhon Ratchasima 30000, Thailand

[2]Center of Excellent on Advanced Functional Materials (CoE-AFM), Suranaree University of Technology, Nakhon Ratchasima 30000, Thailand

[3]Research Network NANOTEC-SUT on Advanced Nanomaterials and Characterization, School of Chemistry, Suranaree University of Technology, Nakhon Ratchasima 30000, Thailand

[4]Synchrotron Light Research Institute (Public Organization), Nakhon Ratchasima 30000, Thailand

*e-mail: rapee.g@sut.ac.th

Abstract: Hydrogen storage capacity of modified activated luffa carbon was investigated at 50 °C. The highest hydrogen capacity exhibited in carboxylic acid (COOH) and nickel (Ni) doped activated luffa carbon (0.78 wt. % under 50 bar H_2). Normally, hydrogen capacity of porous materials was proportional to their specific surface area and microporous volume, indicating that physical adsorption played an important role. However, Ni- and COOH- doped activated luffa carbon, although the specific surface area and pore volume decreased, the hydrogen storage capacity increased. This could be due to the fact that COOH and Ni nanoparticle enhanced hydrogen adsorption via increment of surface polarlizibility and spillover effect, respectively. Moreover, macropore and mesopore of activated luffa carbon provide the interconnected framework and mass transport channels for hydrogen diffusion, while micropores was beneficial for increase of capillary force and generated high surface area as well as superior hydrogen permeability.

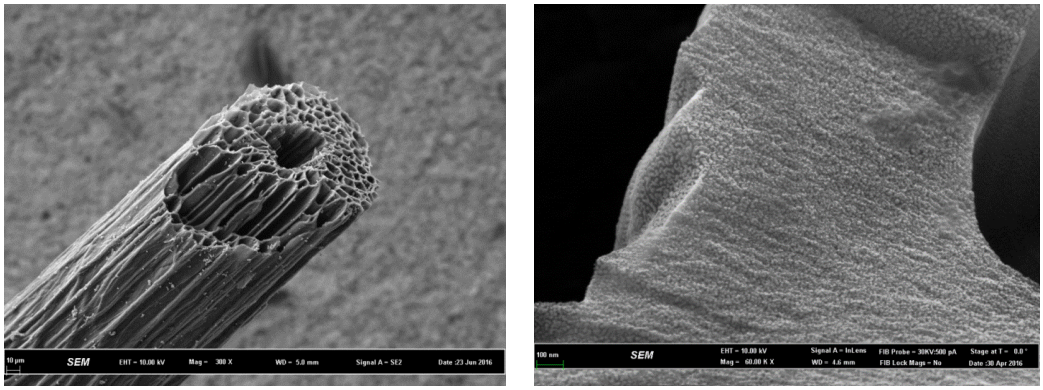


Figure 1.

E_012_OF: ORGANIC GEOCHEMICAL CHARACTERISTICS OF COAL DEPOSITS IN LAMPANG PROVINCE

Patthapong Chaiseanwang*, Piyaphong Chenrai
Department of Geology, Faculty of Science, Chulalongkorn University, Bangkok, Thailand
*e-mail: pchaiseanwang@gmail.com

Abstract: The five hand-picked samples from Mae Teep coal mine, located in Mae Teep basin, Lampang province, were studied on organic geochemical characteristics. The total organic carbon (TOC) content of the coals range from 44.0 to 73.7 wt.%, whereas oil shale and coaly mudstone values in the range of 19.5 wt.% and 4.96 wt.%, respectively. The extractable organic matter (EOM), which is yielded from bitumen extraction, values between 1,277-5,956 ppm representing good to excellent hydrocarbon potential generation for petroleum source rock associated with slightly high thermal maturity based on biomarkers maturity parameters. The coal samples are determined to be mature stage which can be related to high volatile bituminous coal in A.S.T.M. standards. On the condition of depositional environment, the analyzed Mae Teep coals are characterized by high Pr/Ph ratios indicating oxic condition. Whereas, oil shale is represented anoxic condition based on low Pr/Ph ratio and coaly mudstone in suboxic condition showing moderate Pr/Ph ratio. The samples were also investigated that the input of organic matter was derived from higher plant with minor influences of algae and/or bacteria in oil shale formation based on high CPI value, the occurrence of C_{27}, C_{28} and C_{29} regular steranes and the plot of Pr/*n*-C_{17} and Ph/*n*-C_{18}. The depositional environment have been believed to divide into three main system depends on the different rock types; 1) coal seams have been deposited in peat swamp environment, 2) oil shale is considered to be reducing-aquatic terrestrial deposits and 3) coaly mudstone is interpreted to be organic-lean sediment supply in terrestrial environment.

Keywords: Biomarker, Depositional environment, Mae Teep, Thermal maturity

E_013_OF: RECONSTRUCTION OF SEA LEVEL FLUCTUATION AND PALEOENVIRONMENTAL CHANGES IN KHAO SAM ROI YOT NATIONAL PARK, CHANGWAT PRACHUAP KHIRI KHAN DURING THE LATE HOLOCENE

Worakamon Nudnara[1], Paramita Punwong[2], Akkaneewut Chabangborn[1,*]
[1]Morphology of Earth Surface and Advanced Geohazards in Southeast Asia Research Unit (MESA), Department of Geology, Faculty of Science, Chulalongkorn University, Bangkok, Thailand
[2]Faculty of Environment and Resource Studies, Mahidol University, Nakhon Pathom, Thailand
*e-mail: akkaneewut@gmail.com

Abstract: Sediment sequences from the Sam Roi Yot wetland provided the evidences of sea level fluctuation and paleoenvironmental changes in Khao Sam Roi Yot National Park area. Nine sediment sequences were correlated together. Core SRY CP-4 was further analyzed by loss on ignition (LOI) to access the organic and carbonate content and dated by radiocarbon technique. The sediment sequence were divided to 3 units i.e. unit A, B, and C from the bottom to the top respectively. Unit A, dominated by dark grey sandy to silty clay, suggested the tidal influenced deposition at approximately 3300 cal year BP. The gradual change to beige color sediment in unit B was possibly indicated the increase in marine influence at approximately 2075 cal year BP. The deposition of gyttja in unit C probably indicated the subsequently replaced of freshwater wetland at approximately 1150 cal year BP.

E_014_OF: USING INFORMATION AND COMMUNICATION TECHNOLOGY TO SUPPORT THE MANAGEMENT OF HOUSEHOLD HAZARDOUS WASTE: A CASE OF CHIANG RAI PROVINCIAL ADMINISTRATIVE ORGANIZATION

Mudchima Unmuang[1], Panate Manomaivibool[2,*], Anant Eungwanichayapant[2], Kemachart Kemavuthanon[3], Nitisak Charoenroop[4]
[1]School of Science, Mae Fah Luang University, Chiang Rai, Thailand
[2]Circular Economy for Waste-free Thailand Research Group, School of Science, Mae Fah Luang University, Chiang Rai, Thailand
[3]School of Information Technology, Mae Fah Luang University, Chiang Rai, Thailand
[4]Faculty of Business Administration and Liberal Arts, Rajamangala University of Technology Lanna, Chiang Rai, Thailand
*e-mail: panate.man@mfu.ac.th

Abstract: The management of household hazardous waste (HHW) presents a major challenge for Thailand. Less than 0.2% of HHW was collected and sent for safe disposal. In 2017, Chiang Rai Provincial Administrative Organization (CR PAO) and Mae Fah Luang University developed an information center, named D-ToC (the Data-supporting system for the management of Toxic waste in Chiangrai), to coordinate the collection of HHW with the other 143 local governments in the province.

D-ToC employed information and communication technology (ICT) to support the management of HHW. All local governments in Chiang Rai had reported the quantity of HHW they collected through D-ToC mobile and web-based applications. The system allowed CR PAO to monitor the progress and coordinated with private contractors for an orderly shipment of HHW for safe disposal without the need of a central storage facility. CR PAO had managed 23 and 118 tons of waste in 2017 and 2018, respectively – the highest in the country for both years.

E_015_OF: ESTIMATING LONG-TERM GROUND-LEVEL PM10 CONCENTRATIONS OVER NORTHERN THAILAND USING A SATELLITE-BASED

Saran Panjaruang, Pichnaree Lalitaporn*
Department of Environmental Engineering, Kasetsart University, Bangkok 10900, Thailand
*e-mail: fengprla@ku.ac.th

Abstract: Particulate Matters or PM_{10} (Particulate matters with a diameter of 10 microns or less) concentrations have adverse effects on human health and their required for long-term assessing population exposure to PM_{10} over heavily polluted areas. In this study, we developed geographically and temporally weighted regression (GTWR) model to derive estimated 10-years (January 2009 to December 2018) of ground-level PM_{10} concentrations over Northern Thailand, using 10 km resolution aerosol optical depth (AOD) data measurements from the Moderate Resolution Imaging Spectroradiometer (MODIS) aboard NASA's Terra and Aqua satellites with meteorological variables, including temperature, humidity, wind speed, pan evaporation and rainfall as predictors on a monthly basis. The GTWR model shows good performance in model prediction with the coefficient of determination (R^2) of 0.86 and root mean square errors (RMSE) and mean prediction error (MPE) of 11.67 and 8.20 $\mu g/m^3$, respectively. The GTWR model outperforms multiple linear regression, was fitted seasonally these obtained the highest R^2 value and the lowest RMSE and MPE values for this study. Satellite-derived population-weighted mean PM_{10} for Northern Thailand is 43.15 $\mu g/m^3$ over all the whole study period, which lower than Thailand's annual mean PM_{10} standards of 50 $\mu g/m^3$. These results are useful for evaluate short-term exposure and evaluate long-term trends of PM_{10} air pollution in the Northern Thailand, especially in dry season of seasonal open biomass burning when more heavily polluted events occur.

E_016_OA: POTENTIAL BIOFERTILIZER FROM HEAVY METAL CONTAMINATED AREA FOR SUSTAINABLE AGRICULTURE

Anupong Bunyacharoenchit[1], Kunaporn Homyog[2], Puntaree Taeprayoon[3], Parichat Chayapan[3], Weeradej Meeinkuirt[3], Thitinun Sumranwanich[1,*]

[1]Department of Biology, Faculty of Science, Mahidol university 272 Rama 6th Rd., Bangkok, Thailand

[2]The Center for Veterinary Diagnosis, Faculty of Veterinary Science, Mahidol University 999 Phutthamonthon District, Nakhon Pathom 73170. Thailand

[3]Nakhonsawan Campus, Mahidol University, Nakhonsawan, Thailand

*e-mail: thitinun.sum@mahidol.ac.th

Abstract: Soil contamination of heavy metals causes a serious problem for crop production and human health. High concentrations of heavy metals normally inhibit plant growth as well as microbial community. Plants or bacteria alone barely survive in such harsh environment but interaction among them promotes growth and survival of the two taxa. Plants have been shown to secrete nutrients for enhancing growth of certain bacteria. In return, these bacteria chelate toxic metals, dissolve mineral, produce auxin or even fix nitrogen for plants. Our work then aimed to explore interaction between economically important plants and their bacterial community as a potential biofertilizer for cadmium contaminated area. We screened bacteria localizing in root areas for cadmium tolerance, auxin production, phosphate solubility and siderophore production. Ten best performed isolates were identified and verified for zinc (Zn) and lead (Pb) toxicity. Three bacteria strained were used as seed priming and examined for seed germination, root and shoot elongation as well as metal accumulation in plant tissues. Metagenomic analysis of soil bacteria community was also included. The results from both screening and metagenomics analysis will be used to optimize the bacteria consortium as potential biofertilizer for cadmium contaminated area.

E_017_PA: ENHANCEMENT OF CaO AS ECONOMICAL AND GREEN HETEROGENEOUS CATALYST DERIVED FROM ACID TREATED GOLDEN APPLE SNAIL SHELL FOR BIODIESEL PRODUCTION

Sunti Phewphong[1], Pongsakorn Pholsupho[2], Preecha Moonsin[3], Wuttichai Roschat[1,2,*]
[1]Biomass Energy Research Laboratory, Center of Excellence on Alternative Energy, Research and Development Institution, Sakon Nakhon Rajabhat University, Sakon Nakhon 47000, Thailand
[2]Program of Chemistry, Faculty of Science and Technology, Sakon Nakhon Rajabhat University, Sakon Nakhon 47000, Thailand
[3]Program of Chemistry, Faculty of Science, Ubon Ratchathani Rajabhat University, Ubon Ratchathani 34000, Thailand
*e-mail: roschat1@gmail.com

Abstract: High purity calcium oxide (CaO) material was synthesized via the acid treated golden apple snail shell to use as a catalyst for the biodiesel production with transesterification of palm oil. The golden apple snail shell was reacted with hydrochloric acid (HCl) to prepare calcium chloride ($CaCl_2$). Then, the obtained $CaCl_2$ was mixed against sodium carbonate (Na_2CO_3) for sedimentation of high purity calcium carbonate ($CaCO_3$) phase. In the final step, high purity $CaCO_3$ material was converted into CaO as a catalyst by calcination in a furnace at 800 °C for 3 h. XRD, BET by N_2 adsorption, SEM-EDX, TGA, Hammett indicator method and CO_2-chemisorption techniques were used to analyze the physicochemical properties of the obtained CaO catalyst. The high purity CaO catalyst obtained from golden apple snail shell resulted high conversion of palm oil to fatty acid methyl ester (FAME) over 95% conversion under the optimal reaction conditions of catalyst loading amount of 5 wt.%, methanol/oil molar ratio of 12:1, reaction temperature 65 °C and reaction time for 3 h. While CaO catalyst derived from untreated golden apple snail shell gave biodiesel only 79% under the same reaction condition. High-quality biodiesel product after treatments process showed physicochemical properties according requirements of all the ASTM D6751 and EN 14214 standard specifications. All of the results indicated that treatment golden apple snail shell before calcination process directly affected on enhancement catalytic activity of the CaO catalyst.

Figure 1. Graphical abstract of biodiesel production by using CaO catalyst derived from acid treated golden apple snail shell.

E_018_PA: PHYSICOCHEMICAL PROPERTIES OF BLENDING LARD OIL AND RUBBER SEED OIL AS A FEEDSTOCK FOR BIODIESEL PRODUCTION

Wuttichai Roschat[1,2,*], Pongsakorn Pholsupho[1], Supitcha Yapan[1], Sunti Phewphong[2], Preecha Moonsin[3]

[1]Program of Chemistry, Faculty of Science and Technology, Sakon Nakhon Rajabhat University, Sakon Nakhon 47000, Thailand

[2]Biomass Energy Research Laboratory, Center of Excellence on Alternative Energy, Research and Development Institution, Sakon Nakhon Rajabhat University, Sakon Nakhon 47000, Thailand

[3]Program of Chemistry, Faculty of Science, Ubon Ratchathani Rajabhat University, Ubon Ratchathani 34000 Thailand

*e-mail: roschat1@gmail.com

Abstract: This research work aims to study the utilization of blending lard oil and rubber seed oil as a feedstock for biodiesel production. Rubber seed was extracted by using hexane as a solvent following the soxhlet method and compared with maceration, ultrasonic and reflux extraction method. The soxhlet extraction method can give rubber seed oil with a yield of 22.76 wt.%. The physicochemical properties of the extracted rubber seed oil and lard oil were analyzed including fatty acid composition, average molecular weight, density, kinematic viscosity, acid value, and moisture. The extracted rubber seed oil shows higher free fatty acid (FFAs) than lard oil and this leading to soap formation in the transesterification reaction of rubber seed oil. The blending lard oil against rubber seed oil at the ratio of 90:10, 85:15 and 80:20 demonstrate the good physicochemical properties of biodiesel product which obtained from the transesterification of the oil by using CaO-based eggshells as a heterogeneous catalyst. The final biodiesel product obtained from lard oil blending with rubber seed oil of 90:10, 85:15 and 80:20 were found to be within both the ASTM D6751 and EN 14214 for standard test method of biodiesel product especially the major properties for bio-auto fuel. Therefore, the improvement of rubber seed oil by blending with lard oil not only eliminates the disadvantages of the oil for the utility as a raw material in the biodiesel process but also increases the choice of renewable energy sources for people in rural areas, community enterprise and industrial scale of biodiesel production.

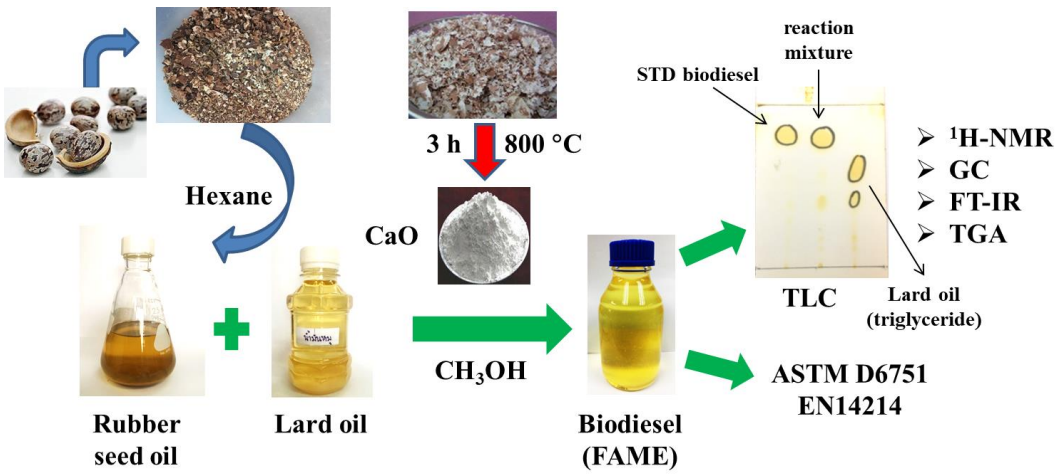


Figure 1. Rubber seed oil mixed with lard oil can be utilized as a potential feedstock in the biodiesel production process for using with agricultural diesel engines of Thailand.

E_019_PA: EFFICIENCY OF BLENDING BIODIESEL OIL AGAINST YANG-NA OIL AND PETROLEUM DIESEL OIL FOR AGRICULTURAL DIESEL ENGINES

Kaewta Donpamee[1], Nantakorn Phoodeetip[1], Sunti Phewphong[2], Preecha Moonsin[3], Wuttichai Roschat[1,2,*]

[1]Program of Chemistry, Faculty of Science and Technology, Sakon Nakhon Rajabhat University, Sakon Nakhon 47000, Thailand

[2]Biomass Energy Research Laboratory, Center of Excellence on Alternative Energy, Research and Development Institution, Sakon Nakhon Rajabhat University, Sakon Nakhon 47000, Thailand

[3]Program of Chemistry, Faculty of Science, Ubon Ratchathani Rajabhat University, Ubon Ratchathani 34000 Thailand

*e-mail: roschat1@gmail.com

Abstract: Biodiesel product derived from waste cooking oil which was blended against distillation Yang-na oil and petroleum diesel oil for use with an agricultural diesel engine was emphasized in this research work. Each of oil was analyzed the chemical composition by several techniques such as FT-IR, GC, ^{1}H and ^{13}C-NMR, and TGA. The physicochemical properties of each pure oil and blending oil were tested followed ASTM D6751 and EN14214 standard method for liquid bio-fuel. The results found that liquid fuel from blending biodiesel oil with Yang-na oil and petroleum diesel oil has high-quality fuel properties within the range of significant properties for liquid bio-fuel standard such as kinematic viscosity, acid number, oxidation stability, density, pour point, cloud point and heating value. Moreover, the obtained liquid fuel demonstrated a high efficiency when directly used with agricultural diesel engines without modification of the engine. Consequently, the use of raw material oil in regional namely waste cooking oil and Yang-na oil is not only promoted the energy self-reliance but also decreased the agricultural production cost.

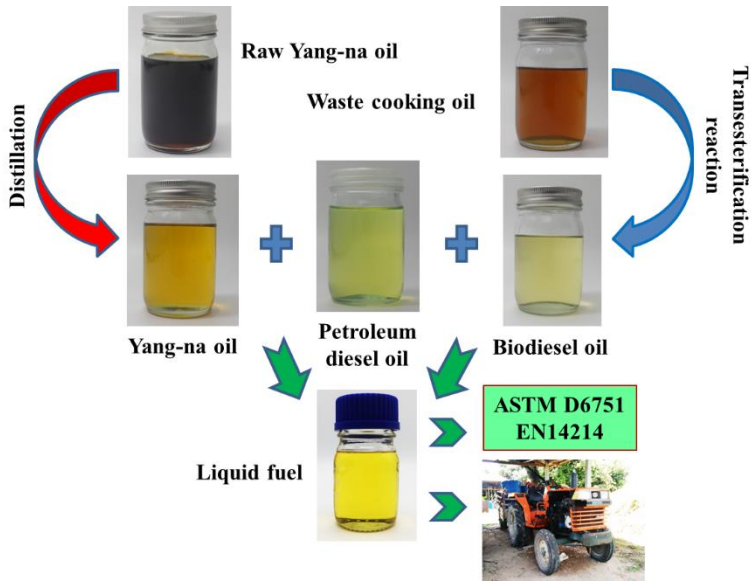


Figure 1. Graphical abstract shows the process of the blending biodiesel oil with Yang-na oil and petroleum diesel oil as a liquid fuel for agricultural diesel engine.

E_020_PF: SOME PETROCHEMICAL FEATURES OF GRANITIC ROCKS ALONG HIGHWAY 1D, XIENGKHOUANG TO XAISOMBOUN PROVINCES, LAO PDR

Sisouphanh Souvongxay[1], Parichat Sriwan[2], Weerapan Srichan[3], Patcharin Kosuwan Jundee[3,*], Burapha Phajuy[3]

[1]Phu Bia Mining Company Limited, 7th Floor, Capital Tower, 23 Singha Road, Saysetha, Vientiane, Lao PDR

[2]Gemological Research (Thailand), 6th and 10th floors, U-Chu-Liang Building, 968, Rama IV Road, Silom, Bangrak, Bangkok 10500 Thailand

[3]Department of Geological Sciences, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand. Tel. 66(0)53943417-9; Fax. 66(0)53943444

*e-mail: patcharinkosuwan.j@cmu.ac.th

Abstract: The Late Carboniferous to Early Permian granitic rocks in the area of Xiengkhouang to Xaisomboun Provinces were constituted by monzogranite and granodiorite. The rocks have striking petrochemical features. They are I-type granitoid as they contain hornblende as a minor constituent but are S-type granitoid as they have normative corundum and Na_2O/K_2O ratios less than 1.03 at Na_2O in a range of 2.36-2.85 wt%. They are most likely to have high-K calc-alkalic affinity; however, their tectonic setting of formation appear to be non-orogenic.

Keywords: Truong Son fold belts, granitic rock, high-K calc-alkaline rocks, non-orogenic granite, transitional granite

E_021_OF: DEVELOPMENT OF LITHIUM METAL OXIDE AS A CATHODE MATERIAL FOR LITHIUM ION BATTERIES

Piyaphat Sunthi[1,2], Sukum Eitssayeam[2,*], Uraiwan Intatha[3], Tawee Tunkasiri[2]
[1]Graduate Master's Degree Program in Faculty of Science, Chiang Mai University
[2]Electro-Ceramics Laboratory, Department of Physics and Materials Science, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand
[3]Materials for Energy and Environment Research Group, School of Science, Mae Fah Luang University, Chiang Rai 57100, Thailand
*e-mail: sukum99@yahoo.com

Abstract: The study on synthesis of lithium metal oxide for positive electrodes for lithium ion batteries was important to the development of the country in the automotive industry and energy storage equipment. This research was a study of the development of lithium metal oxide compound for cathode material. The metal of interest compound is Ni-Mn-Co (NMC) as high performance such as good cycle stability, higher energy and power density, better cycle life and safety for using. [1] The NMC compound was synthesized by co-precipitation method and then the NMC powder was doped and coated with $Ba_3(PO_4)_2$: BP by 1, 3, 5 and 10 wt.%. In doping method, the NMC powder was mixed with BP in solution using DI water as a solvent and then dried the mixture. The obtained powder was then mixed with LiOH and then the mixture was calcined at 550 °C for 5 hrs. While for the coating technique, the mixture of NMC and LiOH was calcined first and then coated with BP in solution of DI water. The obtained powders from 2 routes were characterized in terms of phase formation and microstructure via X-ray diffractometer (XRD) and scanning electron microscope (SEM), respectively. XRD patterns and microstructure of BP doped and coated (1, 3, 5, 10 wt.%) on LiNMC523 have not affected the structure. The average particle size was different due to doping and coating does affect the size of the particle.

E_022_OF: CHARACTERISTICS OF BIOCHAR FROM TEA RESIDUAL FOR SOIL AMENDMENT

Patsara Danwittayakul[1,*], Thitipone Suwunwong[2,3], Khamphe Phoungthong[4,5], Kua-anan Techato[5]

[1]Faculty of Environmental Management, Prince of Songkla University, Songkla 90112, Thailand

[2]Center of Chemical Innovation for Sustainability (CIS), Mae Fah Luang University, Tasud, Muang, Chiang Rai 57100, Thailand

[3]School of Science, Mae Fah Luang University, Tasud, Muang, Chiang Rai 57100, Thailand

[4]Environmental Assesment and Technology for Hazardous Waste Management Research Center, Faculty of Environmental Management, Prince of Songkla University, Songkla 90112, Thailand

[5]Energy and environmental management Research Center, Faculty of Environmental Management, Prince of Songkla University, Songkla 90112, Thailand

*e-mail: patsara26@hotmail.com

Abstract: Biochar was produced from tea residual. For this work, the Elemental analysis, Fourier transform infrared analysis were employed to characterize the physicochemical character of the biochar. Biochar was prepared by pyrolysis process at 500 °C at 5 °C minute and hold for 1 hour at this temperature. From FT-IR spectra and elemental analysis information, the results showed that the composition of biochar derived from tea residual is mainly in organic carbon (OC). Hence, biochar preparation by this pyrolysis process in a close system, limit oxygen, is the way to control the organic carbon to use in soil amendment.

E_023_PA: STUDY AND DEVELOPMENT OF GREEN BIO-SURFACTANT SOLUTION FOR CLEANING

I-Lin Laosri, Marisa Phromahakul, Satcha Kheoichai, Chanchai Homkrilad, Amonrat Thangthong*
Program of Environment Science, Faculty of Science and Technology, Sakon Nakhon Rajabhat University, Mueang District, Sakon Nakhon 47000, Thailand
*e-mail: t.amonrat@snru.ac.th

Abstract: Green bio-surfactant is plays an important role on surfactant pollution worldwide. The purpose of this work was to study the appropriate procedure to produce the eco-friendly cleaning solution which has the properties like the nearest standard cleaning solution. In experiment, the effects of reaction variables such as used oil to soybean oil weight ratio, KOH and bio-extract content were studied. The results showed that the optimum condition of saponification condition was 100:0 of used oil to soybean oil weight ratio and saponification values was 20.13 mg KOH/g. This condition gave the low percentage of free alkali and total fatty matter content were 0.0406±0.0017 and 0.5 respectively, testing under the procedure of Thai industrial standards institute 28-2550. The standard cleaning solution is having alkali and the fatty matter content no more than of 0.1 and 15%,repectively, which shows an indication of good quality. In addition, the cleaning solution showed desirable physical characteristics of cleaning solution with good homogeneous mixture. The satisfaction assessment of the acceptance by consumers was evaluated. It was volunteers are good satisfactory in overview.

Figure 1. Graphical abstract shows the process of the producing of green bio-surfactant from used oil.

E_024_OF: PALEOSEISMIC EVIDENCES OF THE DOI WIANG LA FAULT SEGMENT, MAE HONG SON FAULT, NORTHERN OF THAILAND

Chanista Chansom[1,*], Sukonmeth Jitmahantakul[1], Punya Charusiri[2]

[1]Basin Analysis and Structural Evolution Special Task Force for Activating Research (BASE STAR), Department of Geology, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

[2]Morphology of Earth Surface and Advanced Geohazards in Southeast Asia Research Unit (MESA RU), Department of Geology, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

*e-mail: Chanista.gg@gmail.com

Abstract: Paleoseismological investigation has been carried out to determine the fault evidence of the Mae Hong Son Fault (MHSF) in the Mae Hong Son province, northern Thailand. This is because the existence of an earthquake near the south of Mae Hong Son area on February 1975 with a magnitude of 5.6 at Ban Tha Song Young, Mae Hong Son Province with small earthquakes (Mw 1-3) around Mae Hong Son area till present. Thus, this research aims to explain characteristics of MHSF and to evaluate paleoearthquake magnitudes, recurrence intervals, and slip rate. Major techniques include remote-sensing, field investigation, and paleoseismic excavation together with optical stimulated luminescence (OSL) dating. Several morphotectonic features, particularly offset streams, linear valleys, shuttle ridges and scarplets have been recognized along the fault within the two basins, Mae Hong Son and Mae Sariang basin, in the Mae Hong Son province. The major strike-slip faults have been recognized with an approximate trend in N-S direction, displaying not only dextral but also normal movement faults. The dextral movement along the MHSF with a total length of 150 km, consisting of 45 fault segments ranging from 3.03 km up to 28.55 km. The results from OSL dating of one and earlier excavated paleoseismic trenches along the MHSF indicate at least 2 paleoearthquake events, ca. 34,000 years ago with the latest movement taking in ca. 34,000 to 31,000 years ago. Results also estimated that the maximum credible earthquake magnitudes of Mw 5.64 - 6.77. Therefore, the MHSF is still active till present with the dextral sense of movement and controls the development of the Mae Hong Son and Mae Sariang basin.

E_025_OA: DIRECT ACTIVATION OF *Samanea saman* LEAVES TO NITROGEN SELF-DOPED ACTIVATION CARBONS FOR HIGH ENERGY DENSITY SUPERCAPACITORS

Vichuda Sattayarut[1], Thanthamrong Wanchaem[1], Pundita Ukkakimapan[1], Visittapong Yordsri[2], Paweena Dulyaseree[3], Mayuree Phonyiem[1], Michiko Obata[4], Masatsugu Fujishige[4], Kenji Takeuchi[4], Winadda Wongwiriyapan[1,*], Morinobu Endo[4]

[1]College of Nanotechnology, King Mongkut's Institute of Technology Ladkrabang, Chalongkrung Rd., Ladkrabang, Bangkok 10520, Thailand

[2]Thailand National Metal and Materials Technology Center, Phahonyothin Rd., Khlong Luang, Pathumthani 12120, Thailand

[3]Department of Physics, Faculty of Science Technology and Agriculture,Yala Rajabhat University, 133 Thesaban 3, Sateng, Muang, Yala, 95000, Thailand

[4]Institute of Carbon Science and Technology, Shinshu University, 4-17-1 Wakasato, Nagano, 380-8553, Japan

*e-mail: winadda.wo@kmitl.ac.th.

Abstract: In this study, direct activation of *Samanea saman* green leaves (SSLs) to nitrogen self-doped activated carbon (ACs) was successfully synthesized for high energy density supercapacitor. The SSLs was directly activated by one step using sodium hydroxide (NaOH) as an activating agent at temperature of 720 °C without carbonization (hereinafter referred to SD-ACs). The effect of the weight ratio of raw SSLs to NaOH was studied. The ratio of SSL and NaOH of 1:2 (hereinafter referred to SD2) showed the superior properties than the ACs derived from the two-step conventional method (hereinafter referred to S-AC) in terms of surface area and nitrogen content of 2930 m^2 g^{-1} and 4.6 at%, respectively. Furthermore, the SD-ACs enhanced electrochemical properties with the specific gravimetric capacitances of 179 F g^{-1} in an organic electrolyte and outstanding cycling stability of 97.5 % after 3000 cycles at a current density of 5 A g^{-1}. Besides, the potential window can be enhanced to 3.5 V with an increased energy density up to 79 Wh kg^{-1}. The direct activation of nitrogen-enriched SSLs provides the advantages in terms of a short time, low cost and direct synthesis route to achieve nitrogen self-doped ACs for high energy density supercapacitors.

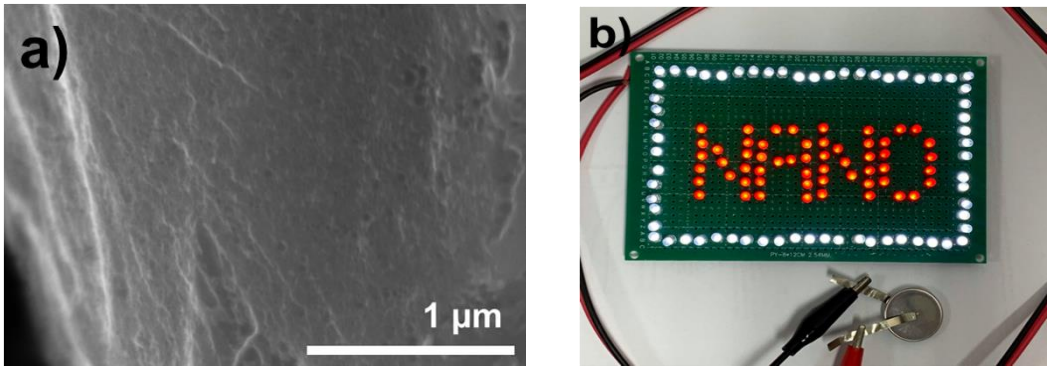


Figure 1. (a) FE-SEM image of SD2 and (b) photograph lighting up 64 white and 54 red LEDs

E_026_PA: WASTE PALM DERIVED SOLID FUEL VIA HYDROTHERMAL CARBONIZATION USING A PRESSURIZED REACTOR

Amornrat Suemanotham[1], Lalita Attanatho[1], Anupong Promtha[1], Zsuzsanna Czégény[2], Emma Jakab[2], Zoltán Sebestyén[2], Bence Babinszki[2], Yoothana Thanmongkhon[1,*]
[1]Expert Center of Innovative Clean Energy and Environment, Thailand Institute of Scientific and Technological Research, 35 Mu 3, Khlong Ha, Khlong Luang, Pathum Thani, 12120, Thailand
[2]Institute of Materials and Environmental Chemistry, Research Centre for Natural Sciences, Hungarian Academy of Sciences, Magyar tudósok körútja 2, H-1117 Budapest, Hungary
*e-mail: yoothana_t@tistr.or.th

Abstract: The utilization of renewable energy, instead of fossil fuels, has widely been promoted in Thailand. Biomass is one of the environmental-friendly and sustainable resources for bioenergy application to help mitigation of environmental crisis and energy security following the Paris Agreement and the Power Development Plan (PDP2018) currently supported by the Government of Thailand. Hydrothermal treatment is a simple and moderate process effectively applied to high moisture content feedstock such as, agricultural residues and municipal or household wastes, etc., for producing various types of fuel, i.e., crude oil, solid char and combustible gas, without the pre-drying step.

The oil palm industry discharges a plenty of wet residual biomass potentially upgraded to the higher calorific fuel. The present research focused on the value creation of oil palm wastes leftover from the palm oil mills to produce a solid fuel, named bio-char, via the hydrothermal carbonization process. It is a thermal decomposition to convert the wet biomass into high energetic solid biofuel. The experiments were carried out in a pressurized batch reactor. Two species of oil palm wastes, empty fruit bunch and palm kernel shell, were selectively investigated under several conditions of reaction temperature (160-320 °C) and residence time (30 and 60 minutes). The influence of operating parameters on production yields and their properties were reported. Empty fruit bunch provided the low yield of bio-char compared to that obtained from palm kernel shell. Increasing reaction temperature led to obtain higher liquid product and lower solid char yield. The results indicated that the reaction time had less significant effect on the yields compared to reaction temperature. The product bio-char had higher carbon content (76%) and higher heating value (30 MJ/kg) compared to the original feed. The hydrothermal carbonization process, therefore, can improve the thermal properties of biomass wastes. Consequently, the derived solid biofuel can be suggested to use as alternative fuel for both direct combustion and co-firing application for industrial heat and power generation as well.

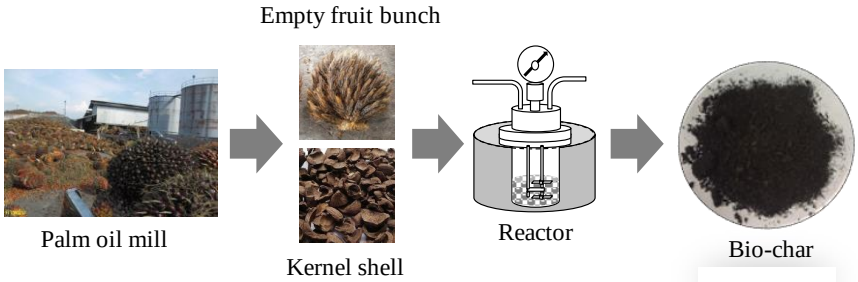


Figure 1. Hydrothermal carbonization of oil palm wastes to bio-char

E_027_OF: PHYSICOCHEMICAL CHARACTERIZATION OF SLOW PYROLYSIS BIOCHAR FROM *Robusta* SPENT COFFEE GROUNDS UTILIZED FOR SOIL AMENDMENT

Naeem Hussain[1,*], Khamphe Phoungthong[1,2], Suchada Chantrapromma[3], Thitipone Suwunwong[4,5], Kuaanan Techato[1]

[1]Environmental Assessment and Technology for Hazardous Waste Management Research Center, Faculty of Environmental Management, Prince of Songkla University, Songkhla 90112, Thailand

[2]Center of Excellence on Hazardous Substance Management (HSM), Bangkok 10330, Thailand.

[3]Department of Chemistry, Faculty of Science, Prince of Songkla University, Hat Yai, Songkhla 90110, Thailand

[4]School of Science, Mae Fah Luang University, Chiang Rai, 57100, Thailand

[5]Center of Chemical Innovation for Sustainability (CIS), Mae Fah Luang University, Chiang Rai, 57100, Thailand

*e-mail: naeemhussain912@gmail.com

Abstract: The waste from coffee is the main suppliers to biomass residue in Thailand. From biomass can produce chemical feedstocks, fuels and absorbents by the pyrolysis process because biomass has potential. In this study, the wastes of coffee i.e. spent coffee grounds were characterized and then pyrolyzed in a muffle furnace underneath the following parameters of pyrolysis: a temperature of 500 °C with heating rate 5 °C / min and residence time of 30 min. After pyrolysis, characterization of the products with an importance of biochar was achieved utilizing several methods such as Moisture content, Biochar yield, FTIR, XRF and CNH/O analyses. The results presented that the pyrolysis of spent coffee grounds biochar yield was 28.0 % the moisture content was 60 %. It was observed that all the coffee waste contained high levels of carbon and oxygen and lower levels of sulfur. It is also suitable for the environment. Additionally, the coffee waste contains 4.0 % minerals and 96.0% pure coffee.

Keywords: Coffee waste, Biochar, Pyrolysis

E_028_OF: SIMULATION OF SHALLOW LANDSLIDES SUSCEPTIBILITY MAP IN THE TOP OF PHU TUB BERK MOUNTAIN, PHETCHABUN, THAILAND

Apiwat Intiyakosat[1], Pawee Klongvessa[4], Srilert Chotpantarat[1,2,3,*]

[1]Department of Geology, Faculty of Science, Chulalongkorn University, Bangkok, Thailand

[2]Research Program on Controls of Hazardous Contaminants in Raw Water Resources for Water Scarcity Resilience, Center of Excellence on Hazardous Substance Management (HSM), Chulalongkorn University, Bangkok, Thailand

[3]Research Unit Control of Emerging Micropollutants in Environment, Chulalongkorn University, Bangkok, Thailand

[4]Department of Environmental Technology and Management, Faculty of Environment, Kasetsart University, Bangkok, Thailand

*e-mail: Srilert.C@Chula.ac.th

Abstract: Landslide frequently occurs in steep slope areas with high rainfall amount in Thailand and causes severe damages. Therefore, predicting landslides is useful. One of the methods to predict landslides is modeling. This study aimed to use the SHALSTAB model to determine shallow landslides susceptibility map in the top of Phu Tub Berk mountain area, which is the location of Doy Nam Peung Din village. Samples were collected in the field and tested in the laboratory. To obtain parameters used in the model. A result of the simulation classified the area by function of a hydrologic ratio (log Q/T) required to instability. into 5 classes as established by Dietrich and Montgomery. Of the total area, 64.82% (18.62 km2) is classified as stable area (log Q/T >-2.2), 6.51% (1.87 km2) has the value of log Q/T between -2.5 and -2.2, 13.09% (3.75 km2) has the value of log Q/T between -2.8 and -2.5, 10.51% (3.01 km2) has the value of log Q/T between -3.1 and -2.8, and 5.08% (1.45 km2) is classified as unstable area (log Q/T <-3.1). The Doy Nam Peung Din village is in the stable area, but some parts of the road number 2331, which is the way to this village, are on the less stable area.

E_029_PF: LOW ASH BIOMASS PELLET FROM CORN STALK: EFFECT OF CALCIUM CARBONATE BASE ADDITIVE ON FUELS AND ASH QUANTITIES

Apisith Suebchompoo, Thanakit Kumwung, Nattakan Soykeabkeaw, Uraiwan Intatha, Nattaya Tawichai*
Center of Innovative Materials for Sustainability (iMatS), Mae Fah Luang University, Chiang Rai 57100, Thailand
School of Science, Mae Fah Luang University, Chiang Rai 57100, Thailand
*e-mail: nattaya.taw@mfu.ac.th

Abstract: This research was studied on effect of $CaCO_3$ on ash content of biomass pellets. The pellets were made from corn stalk and various amounts of $CaCO_3$ (0, 3 and 5%wt). The pellets were formed by using uniaxial compression machine at 80 MPa pressure. The physical properties of pellets such density, moisture content, heating value and ash content were measured. Heating value was measured by bomb calorimeter machine. Ash content and moisture content were measured following the EN standard test methods. According to the result density of pellets was 997 kg/m^3 and when $CaCO_3$, the density of pellets added were increase of 8.36%. Moisture content of pellets was 8.3% and when increased the content of $CaCO_3$, the moisture content was decreased of 17%. From the result, density and moisture content were affected to heating value. The heating value of the pellets was 16 MJ/kg and ash content of pellets was 22%. Heating value of pellets were decreased of 12% and ash content were reduced of 31.5% of add 5 wt% of $CaCO_3$.

SESSION F:
PHYSICS &
APPLIED PHYSICS

F_001_PF: STRUCTURAL AND PHYSICAL PROPERTIES OF $SnS_{1-x}Se_x$ SOLID SOLUTION THIN FILMS PREPARED BYCLOSE SPACED SUBLIMATION METHOD

Parichat Cummon*, Ngamnit Wongcharoen, Thitinai Gaewdang
Department of Physics, Faculty of Science, King Mongkut's Institute of Technology Ladkrabang, Soi Chalongkrung 1, Ladkrabang District, Bangkok 10520, Thailand
*e-mail: bamparichat2@hotmail.com

Abstract: SnS thin films, as one of the important tin chalcogenide semiconductor materials, have attracted considerable attention in recent years as low-toxicity and cost-effective materials for use in solid state device fabrication like photoconductors, photovoltaic conversion, holographic recording media, solar control device and near-infrared detector. SnSe thin films have also been extensively studied in the photovoltaic application for its extraordinary advantages including excellent optoelectronic properties. In this work, $SnS_{1-x}Se_x$ solid solutions were prepared by close spaced sublimation method in vacuum using source temperature in the range 650-670°C. The different between source temperature and substrate temperature was controlled to be approximately 100°C. From XRD patterns, the all prepared films crystallized in orthorhombic structure with the preferred orientation of (400) plane. SEM and EDS were used to study the surface morphology and elemental composition of the samples. Optical properties were investigated by means of UV-Vis-NIR spectroscopy in range of 400-2000 nm. The direct band gap value of the films evaluated from the optical transmission spectra decreased from 1.18 to 0.95 eV as Se composition (x) increased from 0 to 1. In addition, it was found that SnSe films presented two extra indirect band gap values being 0.80 and 0.92 eV, respectively. The electrical properties were carried out by resistivity and Hall effect measurements with van der Pauw configuration. The temperature-dependent conductivity was performed in the temperature range of 20-300 K. It was shown that three types of conduction mechanisms can be expected such as Nearest-Neighbor hopping (NNH) at high temperature range (220-295 K), Mott variable-range hopping (Mott-VRH) at low temperature range (125-190 K) and Efros-Shklovskii variable-range hopping (ES-VRH) at very low temperature range (<105 K). The set of parameters describing the properties of localized electrons in each conduction behavior were determined.

F_002_PF: EFFECTS ON TRIBOLOGICAL BEHEVIORS OF SYNTHETIC HYDROCARBON BASED LUBRICANT FOR MICROELECTRONIC APPLICATIONS

Chanikan Polpattanakul[1], Duangamol Tungasmita[2], Panadda Dechadilok[3], Benjie L. Fernandez[4], Sukkaneste Tungasmita[3,*]

[1]Petrochemistry and Polymer Science Program, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

[2]Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

[3]Department of Physics, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

[4]Western Digital Co. Ltd., Bang Pa-in, Phra Nakhon Si Ayutthaya 13160, Thailand

*e-mail: Sukkaneste.T@chula.ac.th

Abstract: During the lapping process in the hard disk drive fabrication, petroleum-based lubricant is employed in order to reduce heat from the abrasive and prevent materials corrosion. In this work, the functional synthetic hydrocarbon-based lubricants, was characterized using the ball-on-disk tribometer for its tribological properties. The coefficient of friction (COF) of stainless steel ball on the lubricated alumina-titanium carbide surfaces was investigated and the friction regime was determined from the power law relationship. Unlike COF obtained in absence of the lubricant that was independent of the sliding speed, COF measured from an experiment employing synthetic hydrocarbon-based lubricant is found to decrease as a function of the sliding speed, indicating that the friction regime in the presence of synthetic hydrocarbon-based lubricant differs from that of the ball sliding on a dry surface.

F_003_PF: FABRICATION AND CHARACTERIZATION OF $(CdS)_{1-x}(ZnTe)_x$ AND $CuSbS_2$ THIN FILMS FOR PHOTODIODE APPLICATION

Dusit Thueman*, Ngamnit Wongcharoen, Thitinai Gaewdang
Department of Physics, Faculty of Science, King Mongkut's Institute of Technology Ladkrabang, 1, Soi Chalongkrung 1, Ladkrabang District, Bangkok 10520, Thailand
*e-mail: 59605090@kmitl.ac.th

Abstract: $(CdS)_{1-x}(ZnTe)_x$ ($0 \leq x \leq 1$) and $CuSbS_2$ thin films were deposited on glass substrate by a single source vacuum thermal evaporation method. The sets of CdS, ZnTe and Cu_2S, Sb_2S_3 powders with high purity grade were used as the precursors for the first kind and for the second kind of desired films, respectively. The XRD patterns showed that $(CdS)_{1-x}(ZnTe)_x$ thin films were crystallized in pure hexagonal phase with (002) preferred orientation at $x \leq 0.2$. While, $x \geq 0.8$, these films were crystallized in pure cubic phase with (111) preferred orientation. For the composition x=0.4 and 0.6, the hexagonal and the cubic phases were appeared to coexist in the system and the films became less preferentially oriented. However, $CuSbS_2$ phase belonging to orthorhombic crystal structure with small trace of Sb_2S_3 and $Cu_{1.8}S$ phases was formed after the films were annealed at 350°C in pure nitrogen atmosphere for 60 min. FESEM and AFM were used to study morphological features of the films. The optical transmission spectra is calculated to find the energy gap values of the films. Electrical properties were performed by Hall effect measurements with van der Pauw method. In addition, we fabricated $(CdS)_{0.9}(ZnTe)_{0.1}/CuSbS_2$ heterojunction thin films by thermal evaporation method deposited on ITO substrate. Electrical properties of the heterojunction were investigated by means of I-V and C-V characterizations. Under reverse bias condition, it showed a good photoresponse under illumination by ELH halogen lamp and a high pressure mercury vapor lamp. This behavior indicates that the device may be a suitable candidate for white light and UVA light photodiode applications.

F_004_OF: FLOW CROSSOVER DURING COLLISIONLESS MAGNETIC RECONNECTION

Pakkapawn Prapan[1,*], Kittipat Malakit[2], David Ruffolo[1]
[1]Department of Physics, Faculty of Science, Mahidol University, Bangkok, Thailand
[2]Department of Physics, Faculty of Science and Technology, Thammasat University, Pathum Thani, Thailand
*e-mail: p_dv99@hotmail.com

Abstract: Magnetic reconnection is a magnetic field line rearrangement in a plasma (ionized gas) that transfers magnetic energy into kinetic energy and thermal energy of plasma in the outflow regions. In this work we use a particle labeling technique to study symmetric reconnection, especially in the outflow regions. We performed Particle-In-Cell (PIC) simulations, which treat both ions and electrons using representative particles, with labeling to indicate the source region as one of the two inflow regions or the interface region. Finally, we discovered a flow crossover between the two inflow plasmas as they stream out from the reconnection region into an outflow region.

F_005_OF: VERIFICATION OF CURLING PROBE MEASUREMENT IN DC PLASMA

Chatchai Sirithipvanich, Natthapong Jimpaiboon, Boonchoat Paosawatyanyong
Chulalongkorn University, Bangkok, Thailand
e-mail: chatchai.sirithipvanith@gmail.com, mnnatthapong@gmail.com, paosawat@gmail.com

Abstract: The curling probe is one of the active resonance absorption spectroscopic plasma analysis methods, the methods utilized the reflection coefficient of a probe over frequency to determine the plasma density. The proposed model of the curling probe uses the deviation of frequency in which the minimum reflection coefficient occurs when the probe is submerged in different mediums. The probe structure is simple and is claimed to be robust and efficient. The experiment of the curling probe and the simulation of the probe reflection coefficient are repeated. The probe was constructed, the simulations of the previously reported article were followed, and the simulations of the constructed probe were done. Our simulation results of the previously reported probe contradicted with the reported article; however, agreed with experiments in which the frequency where the minimum reflection coefficient occurs did not change when the plasma density changed.

F_006_PF: HEAT TREATMENT OF MOGOK ZIRCON, MYANMAR

Chanisara Srimuang, Kanyarat Kwansirikul*
Department of Geological Sciences, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand
*e-mail: kanyarat.k@cmu.ac.th

Abstract: The studied yellowish green to greenish brown zircons were mined from alluvial deposits in Mogok city, Myanmar, related to metasomatism process within the Mogok metamorphic belt (MMB). Thirty rough zircon samples were characterized using gemological standard methods, FTIR and UV-Vis-NIR spectroscopy. Chemical compositions were analysed using SEM-EDS. The specific gravity of the samples ranged from 4.61 - 4.76 indicating high type of zircon. All samples fluoresced moderate to strong yellow under both long-wave and short-wave ultraviolet radiation. Internal features consisted of fluid inclusions, healed fracture, apatite crystals, iridescence cracks, needle inclusions and oxide-strain. Ten samples were chosen for chemical compositions analysis. They revealed major elements of ZrO_2 and SiO_2. Minor and trace elements were composed of HfO_2 and Al_2O_3. In the darker-tone samples contained greater amounts of Hf than the lighter-tone samples. Heat treatments were carried out under reducing conditions at 900°C, 1000°C and 1100°C soaked for 1 hour at each temperature. After heating, the samples showed reducing of brown color and became near colorless to slightly yellowish green. The internal fractures in the heated stones were more developed and the yellowish brown oxide-strain turned into dark brown and near colorless. Tension cracks were generated around mineral inclusions upon heating. UV-Vis-NIR absorption spectra showed decreasing of the color-center absorption band intensity between 300 - 400 nm which caused the brown color in zircon. The spectra also showed the U^{4+} peaks between 400 - 700 nm and U^{5+} peaks between 1,000 - 1,700 nm which had no significant change after heating. Infrared spectra showed absorption spectra of $[SiO_4]^{4-}$, O-H stretching, U^{4+} and U^{5+} which had no significant change after heating.

F_008_PF: EFFECT OF SINTERING TEMPERATURES ON DENSITY AND VICKERS MICRO-HARDNESS OF BZT CERAMICS PREPARED BY MOLTEN SALT METHOD

Chompoonuch Warangkanagool*
Department of Physics, Faculty of Science, Naresuan University, Phitsanulok 65000, Thailand.
Research Center for Academic Excellent in Applied Physics, Faculty of Science, Naresuan University, Phitsanulok 65000, Thailand.
*e-mail: chompoonuchp@nu.ac.th

Abstract: In this research, the $Ba(Zr_{0.05}Ti_{0.95})O_3$ powders were prepared by molten salt method. The powders were calcined at 1000°C for 3 h with heating rate of 5°C/min. The sintering procedure was carried out at 1200, 1250 and 1300°C for 2 h with a heating/cooling rate of 5°C/min. Phase formation and microstructure were examined by XRD and SEM, respectively. The density of the sintered samples was measured by Archimedes method with distilled water as the fluid medium. The Vickers micro-hardness was determined using the Vickers indentation techniques. It was found that, the perovskite BZT cubic phase was found for all samples. The analysis was carried out based on the basis of Joint Committee on Powder Diffraction Standard (JCPDS) data. The morphology showed that, the ceramics more densification increased with increasing sintering temperature. The optimum sintering temperature for BZT ceramic was found at 1300°C. The highest relative density was about 90.3%, and the Vickers micro-hardness was 6.2 GPa.

F_009_OA: MONITORING PAINT AND PRIMER SAMPLES USING MULTISPECTRAL AND HYPERSPECTRAL IMAGING TECHNIQUES

Nawarat Kaew-On[1], Pichayada Katemake[1,*], Alain Tremeau[2]
[1]Department of Printing and Imaging Technology, Faculty of Science, Chulalongkorn University, Payathai road, Patumwan, Bangkok 10330, Thailand
[2]Univ Lyon, UJM Saint-Étienne, CNRS, Laboratoire Hubert Curien UMR 5516, France
*e-mail: pichayada.k@chula.ac.th

Abstract: Multispectral imaging (MSI) and hyperspectral imaging (HSI) are non-invasive techniques that have been used to map and identify pigments, binders and retouches on work of arts. The spectral reflectance obtained from these techniques could be used for matching pigments. In this research we aimed to use these 2 techniques for monitoring the change of painting samples after they were systematically exposed by heat, moisture and light. Three primer samples, developed in our previous research, were prepared and applied on the acid and lignin free substrate, with the wet film thickness of 40 □m. They were left for 30 days in a controlled condition for drying. Five selected acrylic paints and 4 selected pastels, developed in accordance with Thai color names' dictionary, were similarly prepared and applied on the substrate. All samples were sufficiently prepared and exposed to moist heat in a climatic chamber at 50° C and 60% RH for 10, 20, 30 and 40 days. The rest of the paint samples were exposed to full spectrum of sunlight using the Q-Sun Xenon test chamber, 0.80 W/m^2 in the visible range at 420 nm, for 1, 10, 100 and 1000 hours. In monitoring sample using MSI, the Sony XCD-X71 camera the Thorcam camera were employed for samples exposed with full spectrum of sunlight and for samples exposed by moist and heat, respectively. The samples were exposed by visible light and captured through 31 bandwidth of filters, every 10 nm. The RGB and CIEXYZ data of all images were extracted and analyzed in accordance with their spectral reflectance measured previously. It was found that, by monitoring using MSI, after exposing to moist and heat, some pigments such as PR122 Quinacridone and PG7 Phthalocyanine green relatively changed with the time of exposing and some pigments were less sensitive when the exposing time was limited to 40 days. After exposing to light with the maximum of 1000 hrs, the paint mixture containing Phthalocyanine green and Oxide yellow was the most sensitive. The rest could not be detected using MSI. Extending exposed time to moist heat and light should be further studied and recorded. The HSI technique provided larger dataset of stack images from 400 nm to 1000 nm with 1 nm interval. It was employed to monitor the change of paint samples after exposing to light. It could detect the change of samples effectively.

F_010_PA: EFFICIENCY OF UV FLEXOGRAPHIC INK COLOR MATCH PREDICTION ON POLYPROPYLENE LABEL USING ARTIFICIAL NEURAL NETWORK AND COLOR MATCH PREDICTION SOFTWARE

Nutthawit Soha, Pichayada Katemake*, Jakkarin Singnoo
Department of Printing and Imaging Technology, Faculty of Science, Chulalongkorn University, Payathai road, Patumwan, Bangkok 10330, Thailand
*e-mail: pichayada.k@chula.ac.th

Abstract: Most printed labels required customer attention. Consequently, they employ extra or special colors apart from 4-color process, CMYK. These special colors needs to be matched with the standard colors which is given by brand owner or designer beforehand. The algorithm of color matching process usually includes iterative method and the goals of the process are accuracy, precision and high speed. This research is aimed to compare the efficiency of UV flexographic ink color match prediction on polypropylene label using artificial neutral network (ANN) and color match prediction (CMP) software. The single-output ANN and X-Rite ink formulation software were employed. Preparation of ink database for both methods were different. However, the number of primary colors or inks used for comparison were the same. For the CMP method, 8 levels of ink concentration including 100% ink were made by diluting ink with medium into 7 levels and printed on polypropylene label. Their spectral reflectances were measured and the absorption and scattering coefficients were subsequently calculated for all concentrations. For the single-output ANN method, 2 of primary inks were mixed to obtain 182 secondary mixtures and 3 of primary inks were mixed to obtain 122 tertiary mixtures. They were printed on to the same substrate. Again their spectral reflectances were recorded. Ninety percentage of database then were randomly selected for training set. The number of hidden units in hidden layer were optimized. In the CMP process using software and single-output ANN method, 32 color test samples were used and CIE color differences (ΔE^*_{ab}), between samples and predicted formulae were used as one of evaluation criteria in terms of accuracy apart from speed of calculation, time of making database and cost. We found that the advantage of the single-output ANN is accuracy with less average ΔE^*_{ab}, whereas the disadvantages are time consuming in making database which consequently the labour cost is high. Speed of calculation is approximately the same.

SESSION G:
MATHEMATICS / STATISTICS / COMPUTER SCIENCE

G_001_PF: EDGE-ODD GRACEFUL LABELING IN THE CONTEXT OF DUPLICATION OF GRAPH ELEMENTS

Pijittra Sangthong[1], Siwaporn Saewan[2,*]
[1]Students, Department of Mathematics and Statistics, Faculty of Science, Thaksin University, Phatthalung 93210, Thailand
[2]Assist. Prof. Dr., Department of Mathematics and Statistics, Faculty of Science, Thaksin University, Phatthalung 93210, Thailand
*e-mail: si_wa_pon@hotmail.com

Abstract: Let G be a simple connected and undirected graph with vertex set $V(G)$ and edge set $E(G)$. An edge-odd graceful labeling of a graph G with p vertices and q edges is a bijection function f from the set of edges $E(G)$ to the set $\{1, 2, 3, \ldots 2q-1\}$ with the property that, for each vertex $v \in V(G)$ is assigned the sum of all edges incident to it $mod\, 2q$. The edge labels and the vertex labels are distinct. A graph is called edge-odd graceful if it admits an edge-odd graceful labeling. In this paper we show that the graph obtained by duplication of an element of a cycle with even vertices are edge-odd graceful.

G_002_OF: EXPLORING DATA CLASSIFICATION MODELS FOR IDENTIFICATION OF CKD PROGRESSION INTERVAL: A CASE STUDY

Theeranai Sangjan*, Natthakan Iam-On, Pattariya Singpant, Sujitra Arwachananukul
IQD-IT Research Group, School of Information Technology, Mae Fah Luang University, Chiang Rai 57100, Thailand
*e-mail: thesangjan@gmail.com

Abstract: Chronic kidney disease (CKD) has become one of the major health problems, witnessed globally over decades. Given a high rate of death, patients with CKD are to receive an appropriate treatment as soon as they are diagnosed as stage 3rd. Sooner or later, depending on medical treatment and personal conditions, CKD will progress to stage 5th. The cost of kidney dialysis in this later stage can be very high, with a number of patients normally overwhelm the treatment capacity. Ability to predict the translational interval between these stages may well be useful for both patients and medical service providers. This paper responses to the quest by investigating a classification model for a real case study. Given the original data obtained from Phan hospital, Chiang Rai, different approaches have been explored to improve predictive performance of conventional classifiers. These include feature selection, dimensionality reduction and imbalanced data classification. Based on 10-fold cross validation, the model yielding the best accuracy is K-Nearest Neighbors (K = 1), with the rate of 84.60%.

SESSION H:
FOOD SCIENCE & TECHNOLOGY

H_001_PA: EFFECTS OF MALTODEXTRIN AND INLET AIR TEMPERATURE ON THE PROPERTIES OF SPRAY-DRIED MANGOSTEEN POWDER

Mintra Nugthum, Pitiporn Ritthiruangdej*
Department of Product Development, Faculty of Agro-Industry, Kasetsart University, Bangkok 10900, Thailand
*e-mail: pitiporn@gmail.com

Abstract: Mangosteen is one of the major fresh fruits exported from Thailand to many countries, popularly known as “Queen of tropical fruits”. It is produced in the eastern and southern provinces usually between early March and the month of June. Therefore, the fresh mangosteen can be marketed only for a few months each year. Mangosteen price fluctuates according to several factors such as supply, demand, selling season and quality. However, mangosteen is considered to be an important new superfruit due to its many nutritional benefits and medicinal properties. Several researchers studied methods to extend mangosteen shelf life such as drying, modified atmosphere packaging, and edible coatings. Generally, the powdered products produced from fruit juices can be preserved for months to years depending on the packaging. Spray drying is one of the most economic techniques for maintaining quality by rapid dehydration. The quality of the spray-dried powder depends on the conditions of spray drying process, especially carrier agent and inlet temperature. Therefore, the objective of this research was to study the effects of different maltodextrin concentrations (25%, 30% and 35%) as the carrier agent, and inlet air temperature (150°C, 160°C and 170°C) on product yield and physical properties of spray-dried mangosteen powder. The product yield was generally increased with increasing content of maltodextrin and temperature. Powder moisture contents were generally lower than 6.35%. The results showed that maltodextrin concentration had significant ($p<0.05$) effects on all of the responses. With the increase in maltodextrin concentration, the moisture content, glass transition temperature and L* value increased, while hygroscopicity and a* values decreased. The inlet air temperature significantly ($p<0.05$) affected only moisture content, color properties and morphology of the powder. Higher temperatures lead to higher a* and b* values. Based on scanning electron microscopic images, powders produced with 25% maltodextrin concentration were spherical in shape and varying sizes were noticed. With a higher concentration of maltodextrin, a higher degree of shrinkage was attained. In addition, powders dried under higher inlet air temperatures had a relatively larger agglomerate than those dried under lower temperatures. It can be concluded that using 35% maltodextrin and inlet air temperature of 150°C leads to better physical properties such as yield, solubility, hygroscopicity and glass transition temperature.

H_002_PA: MONITORING MOISTURE CONTENT IN STIR-FRIED GREEN CURRY PASTE USING NEAR-INFRARED SPECTROSCOPY

Patcharanun Suksangpanomrung[1], Pitiporn Ritthiruangdej[1,*], Arisara Hiriotappa[1], Piyamart Khongkhaem[2]
[1]Department of Product Development, Faculty of Agro-Industry, Kasetsart University, Bangkok 10900, Thailand
[2]Ampol Food Processing Ltd., Sam Phran District, Nakhon Pathom 73220, Thailand
*e-mail: pitiporn@gmail.com

Abstract: Green curry is one of the favorite curries in Thailand. It is a dish combining a paste made with ingredients such as green chili, ginger, lemongrass, fish sauce, and coconut milk with vegetables and often a source of protein. The consistency of the sauce can be adjusted by the amount of coconut milk used. In order to minimize the cooking time for consumers, the food industry serves them with a green instant curry soup. In the instant curry process, the moisture content of curry paste during stir-frying with oil must be controlled to conserve the authentic flavor. Therefore, the manufacturers require a rapid method, such as near-infrared (NIR) spectroscopy, to determine the moisture content. In this study, the stir-frying of green curry with oil at 90 °C was imitated for 3 hours. The stir-fried curry was sampled every 15 minutes and subsequently scanned with an NIR instrument in the ranged of 950 - 1650 nm and then analyzed for moisture content by oven method. Partial least squares (PLS) regression with full-cross validation method was applied to develop the NIR calibration model. A total of ninety samples was randomly selected to be part of the calibration set (N = 70 samples) and the test set (N = 20 samples). The result showed that the moisture content ranged between 14.72 and 53.38%. The NIR spectra region shows the signal peaks at wavelengths of 1210 and 1450 nm which can be associated with oil and water, respectively. It is clear that the observed intensities varied in the 1000–1450 nm range which depends on the amount of water, this factor being affected by the stir-frying time. With the aids of Standard Normal Variate, a spectral pretreatment method, the PLS model yielded a good prediction of moisture content with correlation coefficient and root mean square error of prediction values of 0.996 and 0.899%, respectively. Results found through this study indicate that NIR technique offers a rapid alternative to laboratory equipment for monitoring of moisture content in curry paste during stir-frying process with low prediction error.

H_003_PA: RAPID ANALYSIS OF FRESH SUGAR CANE JUICE BY NEAR-INFRARED SPECTROSCOPY

Arisara Hiriotappa[1], Pitiporn Ritthiruangdej[1,*], Sumaporn Kasemsumran[2]
[1]Department of Product Development, Faculty of Agro-Industry, Kasetsart University, Bangkok 10900, Thailand
[2]Kasetsart Agricultural and Agro-Industrial Product Improvement Institute, Kasetsart University, Bangkok 10900, Thailand
*e-mail: pitiporn@gmail.com

Abstract: Sugar cane juice is commonly used as a soft, refreshing drink due to its pleasing taste and flavor. It is mainly composed of water and sugar and therefore deteriorates rapidly even when refrigerated. In order to extend the shelf life of cane juice it is necessary to apply technologies to control and monitor the factors responsible for its deterioration. The industry achieves it by heating and adding preservative reagents such as sodium benzoate, citric acid, ascorbic acid and potassium metabisulphite. The organoleptic properties of pasteurized cane juice are affected not only by the treatment conditions during juice extraction and pasteurization but also by the raw sugar cane (such as cane variety and maturity at harvest). To avoid loss of quality of raw sugar cane the processors need a rapid method to determine its quality. In this study, near-infrared (NIR) spectroscopy was used as a rapid technique to analyze the total soluble solids (TSS) and total sugar content (TS) of 100 fresh cane juice samples. Prior to NIR and reference analyses, the temperature of samples was controlled at 20 °C by water bath. NIR spectra of samples were collected in reflectance mode in a wavelength region of 600-2500 nm using an NIR instrument with a liquid cell. Subsequently, the TSS and TS of samples were analyzed according to the AOAC method. Partial least squares (PLS) regression with a full cross-validation method was applied to develop the calibration model. All of the samples for modelling were split into a calibration set (n = 70) and prediction set (n = 30). The results show that the TSS of the samples are from 7.40 to 21.80 °brix, whereas the TS are from 7.05 to 24.13%. The NIR spectra of cane juice samples are dominated by water absorption bands at 1450 and 1950 nm. It is known that sugars display bands in the wavelength region of 1100-1600 nm and 1700-2300 nm. The PLS calibration models with a high predictive performance are devised for TSS and TS with the residual predictive deviation values of 14.47 and 9.50, respectively, indicating acceptable performance of the NIR models developed. Based on the results, it can be concluded that NIR spectroscopy is a good rapid technique to be considered for use in the routine analysis to ensure satisfactory fresh cane juice quality control by juice industry.

H_004_PA: EFFECT OF MANGO PUREE ON THE RHEOLOGY OF BATTER AND QUALITIES OF CRISPY WAFFLE

Prassara Kanokbodeevanit, Pitiporn Ritthiruangdej*
Department of Product Development, Faculty of Agro-Industry, Kasetsart University, Bangkok 10900, Thailand
*e-mail: pitiporn@gmail.com

Abstract: Mango (*Mangifera indica L.*) is one of the most popular fruits in Thailand, widely appreciated globally thanks to its juiciness, delicious taste, exotic flavor and nutritional value. In addition, it is rich in bioactive profiles, including carotenoids and polyphenolics, which have been showing health benefits and play a role in preventing cerebrovascular diseases. Because of the short shelf life of fresh mango, mango puree is often produced to extend the storage period and improve its marketability. Generally, mango puree is used as an intermediate product in the manufacturing of various kinds of products such as beverages, ice-cream, mango leather and other products. The rheological properties of puree play an important role in the fruit products processing and have been studied by various researchers. However, no information is available on the effect of the mango puree on the rheology of batter and the qualities of crispy waffle. Therefore, the aim of this research was to study these effects in terms of shape, color, physical, chemical and sensory parameters. In this study, commercial mango puree was used for the experiments. It contained 11.7% of reducing sugar, 25.3% of total sugar, 69.8% of moisture, and 40 °Brix of total soluble solids. Three different levels of commercial mango puree (30g, 40g and 50g) were added in 100 g of waffle batter. Based on the flow behavior test results, the data provided a good fit (R^2>0.99) for the power law model. The flow behavior index (n) ranged from 0.42 to 0.48, which showed a shear thinning behavior (n<1). The consistency index (K) of batters decreased with increasing mango puree which affected the qualities of crispy waffles. The values of diameter, spread ratio, L*, a*, and b*, and the contents of moisture, ash, reducing and total sugars of crispy waffles increased with increasing mango puree content whereas the thickness, hardness and fat content of the sample showed a reverse trend. Considering the nine-point hedonic sensory scores, the results suggested that 30g of mango puree added to 100g of batter could be used to prepare crispy waffle with an overall liking score of about 7.0.

H_005_PA: EFFECTS OF PEELING AND STEAMING TIME ON THE PASTING AND GEL TEXTURAL PROPERTIES OF GREEN BANANA FLOUR

Supamas Hanpermchai, Pitiporn Ritthiruangdej*, Nantawan Therdthai
Department of Product Development, Faculty of Agro-Industry, Kasetsart University, Bangkok 10900, Thailand
*e-mail: pitiporn@gmail.com

Abstract: Bananas are among the most widely produced and consumed fruits throughout the world. Over the last decade, various researchers studied the use of green or unripe banana flour as a functional ingredient, because of its high content of resistant starch, dietary fiber and potassium. However, the green banana flour in native form is inherently unsuitable for most applications. For example, the low solubility of the flour limits its use in instant foods. Physical and/or chemical treatments are therefore needed to improve the flour properties. Physical modifications are usually simpler, less expensive and safer because they require no chemical agents. One of these modifications is pre-gelatinization of the starch through steaming. This can improve water solubility and reduce particle size since the granular structure of starch is totally destroyed by heating. However, the processes of pre-gelatinization have a significant impact on the quality of obtained flour. Therefore, this study aimed to evaluate the effects of peeling and steaming time of unripe banana on its pasting and the gel textural properties of flour. Green bananas (75-76% of moisture, ripening stage 1 or 2) were divided into 5 groups and used for preparing 5 banana flour samples. In 3 of these groups, bananas were washed, peeled and sliced (2 mm thick). Slices were immersed in a 0.5% citric solution (1:2 w/v) for 1 min and subsequently steamed for 0 min (Control-sample), 5 min (P5-sample) and 10 min (P10-sample). Each sample was drained to eliminate the excess of water and dried individually at 70 °C for 24 hours. Dried bananas were ground, sifted and then stored at room temperature. For the other 2 groups, unpeeled green bananas were steamed for 5 min (U5-sample) and 10 min (U10-sample), and subsequently processed the same way as the control sample. Pasting properties of obtained flour samples were tested with a Rapid Visco Analyzer (RVA), whereas the flour gel samples containing 30% total solid flour (w/v) were subjected to Texture Profile Analysis (TPA) using a Texture Analyzer. Based on the RVA results, the peak, trough, final, breakdown, and setback viscosities, peak times, and pasting temperatures decreased significantly ($P < 0.05$) with an increase in steaming time. Moreover, peeling the banana prior to steaming caused a decrease in all pasting properties. Based on the TPA results, the pregelatinized flour gels became weaker and less cohesive than the native flour gel. In conclusion, it can be noted that pregelatinized banana flour through steaming has improved properties, since they were able to rapidly absorb water and had a decreased viscosity at ambient temperature.

H_006_PA: ANTIBACTERIAL ACTIVITY OF ESTERIFIED SATURATED FATTY ACIDS WITH MALTODEXTRIN AGAINST *Escherichia coli* AND *Staphylococcus aureus*

Thidarat Pantoa[1], Sirinan Shompoosang[2], Thongkorn Ploypetchara[3], Shoichi Gohtani[3], Sunsanee Udomrati[1,*]

[1]Department of Food Chemistry and Physics Institute of Food Research Product Development Kasetsart University 50 Chatuchak, Bangkok 10900, Thailand

[2]Department of Applied Microbiology Institute of Food Research and Product Development Kasetsart University 50 Chatuchak, Bangkok 10900, Thailand

[3]Department of Applied Biological Science Faculty of Agriculture Kagawa University 2393 Miki, Kagawa 761-0795, Japan

*e-mail: ifrsnu@ku.ac.th

Abstract: Esterification of saccharide and fatty acid results the esterified saccharides can act as a surfactant in emulsion system. Since they are taste-odorless and non-toxic which are better for health than adding synthetic surfactants. Moreover, enzymatic synthesis was used in this study as it is a mind process for esterification than chemical synthesis. This study investigated the antimicrobial activities of esterified chain length fatty acids with maltodextrin by using native maltodextrin as a control in various concentration (0, 5, 10, 15, and 20%). Three saturated fatty acids of Decanoate;C-10, Laurate;C-12, and Palmitate;C-16 were esterified with maltodextrin (DE16) by lipase esterification at 60°C for 4 hours. The esterified products were observed by Proton Nuclear Manetic Resonance (NMR). Their antimicrobial activities were investigated using broth dilution method against two pathogenic bacteria of *Staphylococcus aureus* and *Escherichia coli,* gram-positive and gram-negative bacteria, respectively. The result showed no antimicrobial activities of native maltodextrin in both bacteria which indicated by increasing amount of both bacteria after 24 h incubation. However, all esterified maltodextrins showed antimicrobial activity against *E. coli,* but no activity against *S. aureus* after 24 h incubation. The esterified maltodextrin-Laurate showed the most effective among the other esterified maltodextrins. Antibacterial activity increasing alone concentration increase (0-20% w/w) as to reduce amount of *E. coli* as approximately 2 log CFU/mg (20%). Thus, esterified maltodextrin-Laurate might be able to use as an antibacterial ingredient in various food applications.

H_007_PA: LIPID DIGESTIBILITY OF SOYBEAN POLYSACCHARIDE-STABILIZED OIL-IN-WATER EMULSIONS PASSING THROUGH *in vitro* GASTROINTESTINAL DIGESTION

Sunsanee Udomrati[1,*], Thidarat Pantoa[1], Shoichi Gohtani[4], Mitsutoshi Nakajima[3], Kunihiko Uemura[2], Isao Kobayashi[2]

[1]Institute of Food Research and Product Development, Kasetsart University, 50 Chatuchak, Bangkok, Thailand

[2]Food Research Institute, National Agriculture and Food Research Organization,2-1-12 Kannondai, Tsukuba, Ibaraki, Japan

[3]Faculty of Life and Environmental Sciences, University of Tsukuba, 1-1-1 Tennoudai, Tsukuba, Ibaraki, Japan

[4]Department of Applied Biological Science, Faculty of Agriculture, Kagawa University,2393 Miki, Kagawa, Japan

*e-mail: ifrsnu@ku.ac.th

Abstract: Water-soluble soybean polysaccharide (SSPS) was used as the sole emulsifier to stabilize an oil-in-water (O/W) emulsion, which contained 5% (w/w) of soybean oil and prepared using high-speed homogenization at 15,000 rpm for 5 min. The effects were investigated of different SPSS concentrations (3-20% (w/w)) on the lipid digestibility of fresh O/W emulsions during *in vitro* gastrointestinal digestion. The α-amylase, pepsin, and lipase were used to digest the emulsion samples in oral, gastric, and intestinal phase, respectively. SSPS clearly inhibited lipid digestibility at all concentrations (3-20% (w/w)), especially at a high SPPS concentration (20% (w/w)) which efficiently retarded lipid digestion and SSPS (20% w/w)-stabilized emulsion was rather stable until gastric digestion. Inhibition of lipid digestibility may have been caused by: (1) the SPSS stabilization film prevented enzyme access by acting as a barrier on the oil droplets surface, (2) SSPS may bind bile acid and interact with lipase, and (3) the viscous system retarded enzyme and substrate mobility. Thus, SSPS may not only be used as an emulsifier and/or stabilizer to control emulsion stability, but it may be an attractive alternative ingredient to control the lipid digestibility of emulsion foods. Our results suggested that SSPS may be an attractive alternative ingredient to control the lipid digestibility of emulsions for various applications in food products.

H_008_PA: DEVELOPMENT OF LAMP COMBINED WITH A PORTABLE ELECTROCHEMICAL SENSOR FOR RAPID DETECTION OF *E. coli* O157:H7 IN FOOD SAMPLES

Sarawut Sirithammajak[1], Jantana Kampeera[1], Narong Arunrut[1], Assawapong Sappat[2], Chanpen Karuwan[2], Adisorn Tuantranont[2], Wansika Kiatpathomchai[1,*]

[1]Bioengineering and Sensing Technology Research Team, National Center for Genetic Engineering and Biotechnology, National Science and Technology Development Agency (NSTDA), Pathum Thani 12120, Thailand

[2]Graphene and Printed Electronics for Dual-Use Applications Research Division (GPERD), National Science and Technology Development Agency (NSTDA), Pathum Thani 12120, Thailand

*e-mail: wansika@biotec.or.th

Abstract: Loop-mediated isothermal amplification (LAMP) has become a powerful alternative for detection of pathogens. *Escherichia coli* (*E. coli*) O157: H7 is one of the most important foodborne pathogens that cause various life-threatening diseases in human and animal. This work aims to develop a rapid detection platform for *E. coli* O157:H7 contaminated food by combining LAMP with disposable electrochemical sensors based on screen-printed graphene electrodes and portable potentiostat. The LAMP reactions using a specific set of primers for the *wzx* gene were optimized at an isothermal temperature of 63 °C for 45 minutes. The LAMP products were detected by using redox active molecule, Hoechst-33258 on the electrochemical sensors. The platform could detect *E. coli* O157:H7 contaminated food samples at the detection limit of 2 CFU per 25 g.

H_009_PF: COMPARISON OF EXTRACTION TECHNIQUES USING DHS-TENAX TA, SBSE AND SPME FOR ANALYSIS OF DRIED CHILI VOLATILES

Ersa Aurora Ria Diani, Suwimon Keeratipibul, Panita Ngamchuachit*
Department of Food Technology, Faculty of Science, Chulalongkorn University, Phayathai Road, Pathumwan, Bangkok 10330, Thailand
*e-mail: Panita.N@chula.ac.th, panita.nuun@gmail.com

Abstract: The volatile compounds in dried chili samples were extracted using three different solvent-free techniques: dynamic headspace-Tenax TA (DHS-Tenax TA), headspace – stir bar sorptive extraction (HS-SBSE), headspace – solid phase micro extraction (HS-SPME). Seven groups of compound were found in dried chili. The result showed that DHS had highest number of compounds followed by headspace SBSE and SPME which 34, 13 and 17 compounds, respectively. DHS was efficient to adsorb hexanal, hydrocarbons and alcohols. Eventough HS-SPME had lowest identified compound, it was efficient to adsorb esters, hydrocarbons, and sesquiterpene hydrocarbons compared to HS-SBSE. Hexanal appeared as a compound with highest % peak area found in DHS-Tenax TA and HS-SBSE.

H_010_PF: EFFECTS OF JIAOGULAN ON HEXANAL CONTENT IN *SAI-UA* (NORTHERN STYLE HERBAL-PORK SAUSAGE)

Sirichanut Thongsew[1], Atikorn Panya[2], Nipa Khuankuab[3], Siriporn Riebroy Kim[1,*]
[1]Major of Food and Nutrition, Department of Home Economics, Faculty of Agriculture, Kasetsart University, Bangkok, Thailand
[2]National Center for Genetic Engineering and Biotechnology, NSTDA, Pathum Thani, Thailand
[3]Doi Pui Research Station, Faculty of Agriculture, Kasetsart University, Bangkok, Thailand
*e-mail: siriporn.r@ku.th

Abstract: The effect of ground jiaogulan addition on hexanal content in *Sai-ua* was studied. Three formulas of *Sai-ua* (S1, S2, and S3) were produced and analyzed. Different amounts and types of ingredients contributed to the contents of protein and lipid as well as color. Hexanal content in cooked S1 and S3 were not different ($p>0.05$) but S3 had the lowest hexanal content even pork backfat added ($p<0.05$). For sensorial properties, S2 had the highest likeness scores for appearance, color, flavor and overall liking ($p<0.05$). S2 added with ground jiaogulan at 0% (SJ-0), 0.5% (SJ-0.5), 1.0% (SJ-1.0), 1.5% (SJ-1.5), and 2.0% (SJ-2.0) were produced and analyzed. Before grill, the free fatty acid content of all samples were slightly different ($p<0.05$). Decrease in free fatty acid content was observed in each sample after grill ($p<0.05$). This might be resulted from free fatty acid oxidation. Before grill, hexanal content in SJ-0, SJ-1.0 and SJ-2.0 was lower than SJ-0.5 and SJ-1.5 ($p<0.05$). After grill, hexanal content of each sample sharply increased, particularly SJ-0 ($p<0.05$). As compared to sample without addition of ground jiaogulan (SJ-0), sample added with ground jiaogulan had lowered hexanal content ($p<0.05$). No differences in L*, a*, and b* in all samples before grill ($p>0.05$), but a* and b* of all samples after grill were slightly different ($p<0.05$). No difference in appearance of all samples but SJ-2.0 had the lowest this liking score ($p<0.05$). Sample added with ground jiaogulan had lower liking score for color. Lower flavor liking score was found in samples added with ground jiaogulan ($p<0.05$). The bitter flavor in samples was detected in those added with 1% and 2% ground jiaogulan. However, the taste liking score of SJ-0.5 was similar to SJ-0 ($p>0.05$). Among samples added with ground jiaogulan, SJ-0.5 showed a greater acceptability ($p<0.05$). Although the bitter flavor of ground jiaogulan effect to *Sai-ua*, the addition of ground jiaogulan at 0.5% was possible to improve the hexanal development and its sensorial property can be equivalent to *Sai-ua* without ground jiaogulan addition.

H_011_PA: NUTRITIONAL COMPOSITIONS AND ANTIOXIDANT ACTIVITY OF TORCH GINGER (*Etlingera elatior*) FLOWER

Ladda Sangduean Wattanasiritham*, Apinya Chudhangkura, Janpen Saengprakai
Institute of Food Research and Product Development, Kasetsart University, Bangkok, Thailand
*e-mail: ifrlds@ku.ac.th

Abstract: Torch ginger flower (*Etlingera elatior*) is an edible flower that is used in cooking as ingredient in some local foods in the south of Thailand. The present study was conducted to investigate the nutritional composition of white and red torch ginger flower. The proximate compositions (moisture, ash, protein, fat, and carbohydrate contents), mineral, vitamin and antioxidant activity were determined. The result showed that Torch ginger flowers had high content of moisture (> 90%) and contained high carbohydrate (4.85-7.03%) and low fat and protein content (< 1.00%). The white and red flower contained major minerals being: P(226.04, 256.86 mg/100 g), Ca (1.231, 1.429 mg/100g), Fe (0.723, 0.824 mg/100 g)), Zn (0.625, 0.697 mg/100g), and Cu (0.187, 0.188 mg/100 g), respectively. Vitamin B1, B2 and C content were 25.56 and 24.40, 28.00 and 23.56 µg/100g and 2.35 and 1.51 mg/100g for white and red flower, respectively. There was no significant differences between mineral, vitamin B1, B2 and C content of white and red flower. The antioxidant activity was also determined by 2,2-Diphenyl-1-picrylhydrazyl (DPPH) radical scavenging activity and found that the red flower possessed higher antioxidant activity (868 µg Vitamin C eq./100g) than white flower (506 µg Vitamin C eq./100g). The results suggested that Torch ginger flower has high content of mineral and antioxidant activity. These nutritional characteristics are basic data for supporting cultivation and human food consumption.

Keywords: Torch ginger flower, chemical composition, antioxidant activity

H_012_PA: OPTIMIZATION OF SPRAY DRYING CONDITION FOR 'HOM THONG' BANANA FLOWER EXTRACTS USING RESPONSE SURFACE METHODOLOGY

Karuna Wongkrajang[1,*], Maradee Phongpipatpong[2], Ladda Sangduean Watanasiritham[1], Nisareen Muanguming[2], Prasong Phuakbuakhao[2]
[1]Institute of Food Research and Product Development, Kasetsart University, Bangkok, Thailand
[2]King Mongkut's Institute of Technology Ladkrabang, Bangkok, Thailand
*e-mail: ifrknw@ku.ac.th

Abstract: This research presents a study on the production of banana flower extracts powder by spray drying technique. The banana flower extracts was obtained from 'Hom Thong' variety. The main objective was to determine the effects of processing variables on the chemical and physical properties of the powder products. The studied processing variables included inlet air temperature (160-200° C), maltodextrin (10-30%) and gum Arabic (0-20%). The physical and chemical properties of powdered products were analyzed for production yield, moisture content, water activity, density, solubility, powder color and total phenol content (TPC) in product powder. The experiments were conducted based on Box-Behnken design and the obtained results were analyzed and expressed as a second-order polynomial mathematical equations demonstrated the relation between the processing variables and the properties of the banana flower extract powder by response surface methodology (RSM). Based on the analysis of the properties, the condition was finally optimized for production to achieve high product yield, good solubility and having benefits to consumers as well as a smooth production. The optimized condition was a combination of 180° C inlet air temperature and 30% of maltodextrin and 20% of gum Arabic resulting into spray dried powder with 68.40% yield, 1.61% moisture content and having a solubility of 91.43% and TPC of 221g GAE/100g.

H_013_PF: INFLUENCE OF STEVIA CONCENTRATION AND GUAR GUM ON RHEOLOGY AND PHYSICO CHEMICAL PROPERTIES OF GUAVA JUICE

Napassorn Peasura*, Pornrat Sinchaipanit
Institute of Nutrition, Mahidol University, Thailand
*e-mail: napassorn.pea@mahidol.ac.th

Abstract: In the beverage section is mainly focused on the achievement of an adequate sweetness while improving health and appearance. Sugar is often reduced or replaced with natural non-nutritive sweeteners which often changes food texture. Rheological behaviors of guava juice are the most important features. Guava juice is one of a most preferred non-alcoholic beverage in Thailand. They had unique flavour, taste, and health-promoting qualities. Therefore, the effect of stevia and guar gum in guava juice on the physicochemical, antioxidant and rheological at different concentration were studied. Guava juice was added stevia at 0.1, 0.125 and 0.15% and guar gum at 0.1 and 0.3%. The result showed that guava juice with 1.5% stevia and 0.3% guar gum had the highest antioxidant capacity. The appearance was uniformly which pulp did not precipitate. In addition, the viscosity of guava juice was increased with increasing guar gum. This study indicated that 0.3% guar gum could improve physico chemical properties of guava juice in term of stability and turbidity. It was not observed phase separation and sedimentation. Moreover, stevia could promote antioxidant capacity in guava juice when compared to non-added stevia.

H_014_PA: EXTRACTION OF CAFFEINE AND BIOACTIVE COMPOUNDS FROM COFFEE CHERRY PEEL

Somruedee Thaiphanit*, Warintorn Wedprasert, Aristha Srabua
Department of Food Technology, Faculty of Science, Siam University, Bangkok, Thailand
*e-mail: somruedee.tha@siam.edu

Abstract: Coffee, one of the most popular beverages, is consumed by millions of worldwide people in every day. In Thailand, there are two types of coffee that are produced, namely, Arabica (*Coffea arabica* L.) in the north, and Robusta (*Coffea canephora* Pierre ex A. Froehner) in the south. They are an important source of high cash income for Thailand, being the third largest producer (after Vietnam and Indonesia) among the coffee producing countries of Asia which 11,007 and 23,887 tons of Arabica and Robusta are produced in 2018/2019, respectively. Moreover, coffee bean industries in Thailand have experienced a constant growth in the last few years. As a consequence, large amounts of by-products (coffee cherry peel) consisting of skin, pulp, mucilage and parchment of coffee cherry which obtained from the processing of coffee bean (green bean) production has been wholly generated. Therefore, the purposes of this research were to measure the quantities of caffeine and bioactive compounds in the dried coffee cherry peel from mature fruits of Arabica and Robusta and to study the effect of the conventional extraction and the microwave-assisted extraction on the caffeine and bioactive compounds in the aqueous extracts. The results showed that carbohydrate, crude fiber and protein were the most abundant chemical compositions found in the coffee cherry peel. Arabica green bean by-products had higher caffeine, phenolics and antioxidant activity than Robusta by-products significantly ($p<0.05$). The quantitative and qualitative of bioactive compounds in the aqueous extracts were mostly rely on the selection of proper extraction method. For both type of the coffee cherry peel, the optimum microwave-assisted extraction that provided the extracts with highest caffeine and antioxidant activity was 900 W microwave power, 5 min holding time, having final water temperature of 89°C. Results found through the study indicate that the dried Arabica cherry peel has a potentiality to use as a natural source of caffeine and bioactive compounds. The microwave-assisted extraction is more efficient extracting method for the bioactive compounds than the conventional extraction.

SESSION SP1:
CRYSTALLOGRAPHY

SP1_001_OA: A SUPRAMOLECULAR Cd(II) FRAMEWORK: A SOLID-STATE LUMINESCENT SENSOR FOR AMINE VAPORS

Sujitra Tunsrichon, Sujittra Youngme, Jaursup Boonmak*
Materials Chemistry Research Center, Department of Chemistry and Center of Excellence for Innovation in Chemistry, Faculty of Science,
Khon Kaen University, Khon Kaen 40002, Thailand
*e-mail: jaursup@kku.ac.th

Abstract: A new stable Cd(II) complex (1) containing mixed functionalized luminophore ligands was synthesized by layer diffusion method. Single-crystal X-ray diffraction analysis demonstrated that 1 possessed a 3D supramolecular framework enclosing ethanol molecule in the lattice. The supramolecular structure is stabilized by hydrogen bonds and π-π interactions through various functional groups of the coordinated ligands. The solid-state luminescence property of 1 was investigated that exhibited an intense yellow emission under UV light. In addition, complex 1 has been applied as a solid-state luminescent sensor for detection of amine vapors. Complex 1 displays a high selective luminescent response to NH_3 and ethylenediamine (EDA) vapors, showing the large blue shift of emission spectra with the distinguishable luminescent color under UV light. The luminescent response time, concentration dependent-luminescent emission, and the recyclability of 1 upon exposure to NH_3 and EDA vapors were also studied.

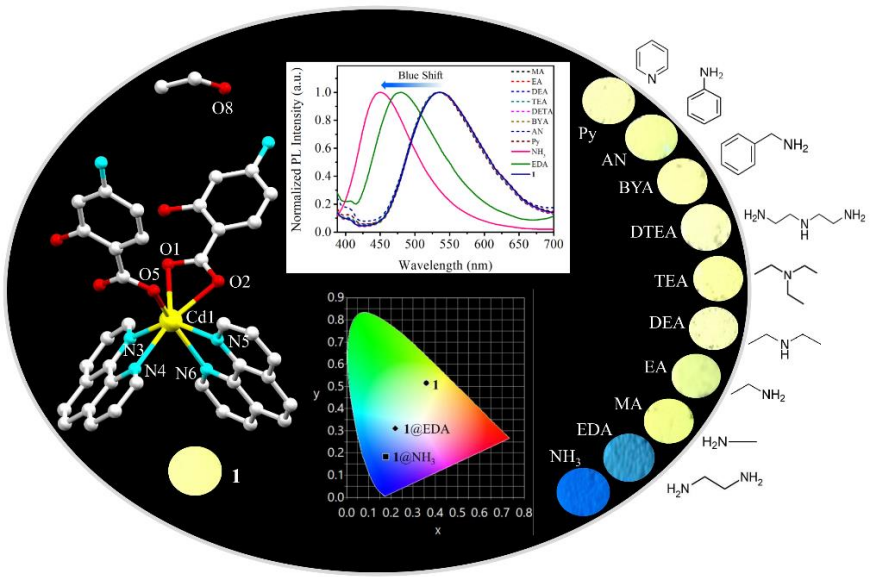


Figure 1. Crystal structure of 1 and its application as a solid-state luminescent sensor for amine vapors.

SP1_002_OA: SYNTHESIS, STRUCTURE, STRUCTURAL TRANSFORMATION AND VAPOCHROMISM OF AN IMINODIACETATO Ni(II) COMPLEX

Jitti Suebphanpho, Sujittra Youngme, Jaursup Boonmak*
Materials Chemistry Research Center, Department of Chemistry and Center of Excellence for Innovation in Chemistry, Faculty of Science, Khon Kaen University, Khon Kaen 40002, Thailand
*e-mail: Jaursup@kku.ac.th

Abstract: A new Ni(II)-complex consisting of iminodiacetic acid (H_2IDA) and neutral coligand has been synthesized by layer diffusion method. This complex was spectroscopically characterized. The crystal structure determined by single-crystal X-ray diffraction technique demonstrates that the Ni(II) center is coordinated with IDA^{2-} and coligand to form a dinuclear complex. Each dinuclear unit is joined together via H-bonding forming a 3D-supramolecular network. The structural transformation of the complex was carried out at 200 °C, confirmed by TGA and XRPD techniques. The color of polycrystalline solid was changed from light-blue to green. In addition, this complex exhibits a vapochromic behavior upon ammonia and ethylenediamine capture.

Figure 1. Crystal structure of the metal complex, the color changed after heating and exposure in various amine vapors.

SP1_003_OA: EFFECT OF POSITION ON IMIDAZOLYIMINE LIGAND ON THE CONTROL OF SPIN CROSSOVER PROPERTIES IN Iron(II) COMPLEXES

Saruda Yokputtaraksa[1], David J. Harding[2], Shinya Hayami[3], Darunee Sertphon[1,*]
[1]Department of Chemistry, Faculty of Science, Rangsit University, Pathum Thani 12000, Thailand
[2]Functional Materials and Nanotechnology Center of Excellence, Walailak University, Thasala, Nakhon Si Thammarat 80160, Thailand
[3]Department of Chemistry, Faculty of Advanced Science and Technology
Institute of Pulsed Power Science (IPPS) Kumamoto 860-8555, Japan
*e-mail: darunee.s@rsu.ac.th

Abstract: We recently published a series of Fe(II) complexes *fac*-$[Fe(4\text{-ima-Bp})_3][ClO_4]_2 \cdot EtOH$ 1 and $[Fe(4\text{-ima-Bp})_3][BF_4]_2 \cdot EtOH \cdot 4H_2O$ 2 which show moderately abrupt spin crossover. We now report a new imidazolyimine ligand and the complexes $[Fe(2\text{-ima-Bp})_3][Y]_2 \cdot sol$ (Y = ClO_4;·sol = EtOH 3, Y = BF_4;·sol = EtOH 4, Y = ClO_4;·sol = MeOH 5, Y = BF_4;·sol = MeOH 6) where a 2-imidazole group is used. The structure of 1 has been determined by X-ray crystallography with a LS Fe(II) centre. Vast C–H···π interactions between the cations form 2D layers, due to N-H···O and O-H···O hydrogen bonds, resulting in high cooperativity. Complexes 1 and 2 undergo a clear and reversible colour change in the solid state with heating associated with a LS to HS transition, while 3-6 show only small changes in colour. Magnetic measurements reveal moderately abrupt spin crossover for 1 and 2; becoming more gradual and only 50% complete in 1 due to solvent loss. The position of the imidazole plays an important role in spin crossover properties.

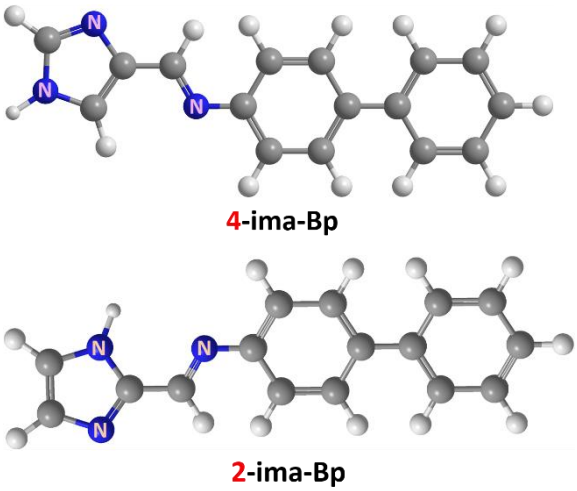


Figure 1. Structure of 2-ima-Bp and 4-ima-Bp

SP1_004_PF: THERMAL ANALYSIS OF PHASE TRANSITION AND CRYSTALLIZATION OF $EuBa_2Cu_3O_{7-\delta}$ POWDER PREPARED BY SOLID-STATE REACTION

Paitoon Boonsong[1, 2], Anucha Watcharapasorn[1, 3, 4,*]
[1]Department of Physics and Materials Science, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand.
[2]Graduate Ph.D.'s Degree Program in Applied Physics, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand.
[3]Center of Advanced Materials for Printed Electronics and Sensors, Materials Science Research Center, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand.
[4]Center of Excellence in Materials Science and Technology, Materials Science Research Center, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand.
*e-mail: anucha@stanfordalumni.org

Abstract: $EuBa_2Cu_3O_{7-\delta}$ (Eu-123) powders were synthesized using the solid-state reaction technique. The mixed powders were prepared using a stoichiometric ratio (i.e. Eu:Ba:Cu = 1:2:3) of high-purity Eu_2O_3, $BaCO_3$ and CuO precursors. The powders were analyzed using thermo analytical (DSC/TGA) techniques. The exotherm was related to the formation of Eu-123 which occurred at around 900-930°C. This temperature was selected for calcination process with various time of 12-24 h. Phase identification was determined using an X-ray diffractometer (XRD) and the quantitative phase analysis was performed by fitting the XRD pattern using the GSAS-II program. The morphology was observed by scanning electron microscopy (SEM) with chemical composition identification from EDS mode. For the calcination temperature of 930°C, X-ray diffraction performed at room temperature along with Rietveld analysis showed single phase of an orthorhombic structure Eu-123 for all samples. Rietveld refinement confirmed a good agreement between observed and calculated intensity and a low value of goodness of fit (*GOF*). Orthorhombicity decreased but the oxygen content tended to increase with increasing time which might be a factor that caused the enhancement of the transport properties. Scanning electron microscope (SEM) revealed that the particles had irregular shapes which are randomly distributed. Average particle sizes were < 30 µm in the Eu-123 powders. The approximated stoichiometry of the powder was near the expected nominal composition of Eu-123.

Keywords: Eu-123, solid state reaction, powder synthesis

SP1_005_PF: A NEW ZINC(II) COORDINATION POLYMER BASED ON 5-NITROISOPHTHALATE; SYNTHESIS, CRYSTAL STRUCTURE AND HIGHLY SENSITIVE FLUORESCENCE SENSING PROPERTIES OF SMALL MOLECULES AND METAL IONS

Pornsan Lueangseephet[1], Supakorn Boonyeun[1,*], Sukanya Mingphimai[1], Kittipong Chainok[2], Premjit Arpornmaeklong[3], Yuki Shirosaki[4]

[1]Department of Chemistry, Faculty of Science and Technology, Thammasat University, Pathum Thani 12120, Thailand

[2]Materials and Textile Technology, Faculty of Science and Technology, Thammasat University, Pathum Thani 12120 Thailand

[3]Faculty of Dentistry, Thammasat University, Pathumthani 12120, Thailand

[4]Department of Materials Science, Faculty of Engineering, Kyushu Institute of Technology, Kitakyushu, Japan

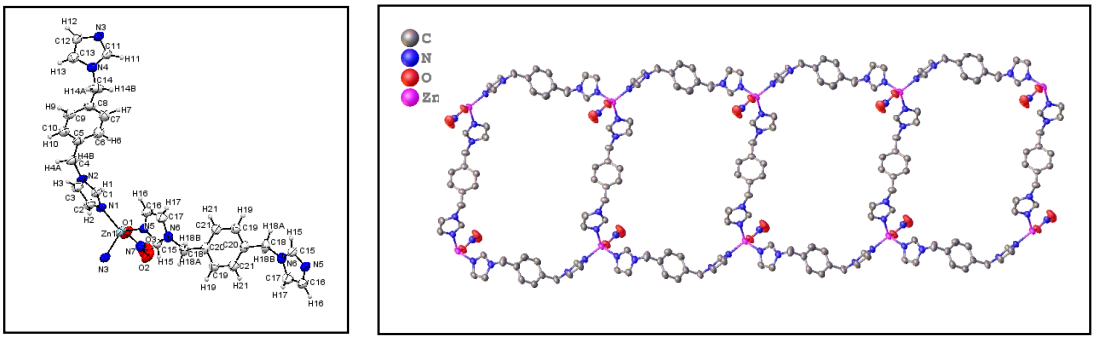
*e-mail: chemistrytu@gmail.com

Abstract: A new Zn(II) coordination polymers $[Zn(Nip)(apm)(DMF)]_n$ (1) was synthesized by direct method thru the reactions of $Zn(NO_3)_2$ with 5-nitroisophthalate and 2-aminopyrimidine in the mixture of solvent. The compound was characterized by IR spectroscopy, single and powder X-ray diffraction. The compound crystallizes in the triclinic crystal system and *P*1 space group. The Zn(II) ion adopts four-coordinated in a distorted tetrahedral geometry that is constructed to give 1D polymeric chain through carboxylate group of 5-nitroisophthalate ligands. The double layers of 1D chain is created by π - π interaction. The 2 and 3 dimension was encouraged by hydrogen bond interactions and CH - π interactions. The Zinc(II) compound represented as fluorescence sensing highly sensitive for acetone and Fe^{3+} ion.

SP1_006_PA: SYNTHESIS, CHARACTERIZATION AND X-RAY STRUCTURAL STUDIES OF A NEW 1D LADDER-LIKE CHAIN ZINC(II) COORDINATION POLYMER CONTAINING 1,4-BIS(IMIDAZOL-1-METHYL) BENZENE

Chanoknan Sangphuek[1], Kittipong Chainok[2], Nanthawat Wannarit[1,*]
[1]Department of Chemistry, Faculty of Science and Technology, Thammasat University, Pathum Thani 12121, Thailand
[2]Materials and Textile Technology, Faculty of Science and Technology, Thammasat University, Pathum Thani 12121, Thailand
*e-mail: nwan0110@tu.ac.th

Abstract: A new one-dimensional ladder-like chain structure Zn(II) coordination polymer, $\{[Zn(1,4\text{-bix})_{1.5}(NO_3)]\ NO_3\}_n$ (I) (1,4-bix = 1,4-bis(imidazole-1-ylmethyl) benzene) have been successfully synthesized by solvothermal method. The title compound (I) was characterized by means of Fourier-transform infrared spectroscopy (FT-IR), solid state diffuse reflectance spectroscopy, thermogravimetric analysis (TGA), powder X-ray diffraction (PXRD) and single-crystal diffraction techniques (SCXRD). The title compound (I) crystallizes in triclinic crystal system with P-1 space group. Each Zn(II) ions adopts a distorted tetrahedral geometry and coordinated by three nitrogen atoms (N1, N3 and N5) from three different 1,4-bix ligands, and one oxygen atom (O1) from one NO3– anion (Figure 1a). Interestingly, the 1,4-bix ligand acts as a bridging ligand with trans conformation to Zn(II) ions, resulting one-dimensional ladder-like chain structure as shown in (Figure 1b). Moreover, the organic dye adsorption properties of the title compound have been investigated.



(a) (b)

Figure 1. (a) The coordination environment of Zn(II) ions and (b) 1D ladder-like chain structure of $\{[Zn(1,4\text{-bix})_{1.5}(NO_3)]\cdot NO_3\}_n$ (I)

SP1_007_PA: SYNTHESIS, CRYSTAL STRUCTURES AND HIRSHFELD SURFACE ANALYSIS OF THREE NEW MONONUCLEAR 3-CHLOROBENZOATE COPPER(II) COMPLEXES WITH 2,2′-BIPYRIDINE AND 1,10-PHENANTHROLINE CHELATING LIGANDS

Wanussanun Chaisuriya[1], Kittipong Chainok[2], Nanthawat Wannarit[1,*]
[1]Department of Chemistry, Faculty of Science and Technology, Thammasat University, Pathum Thani 12121, Thailand
[2]Materials and Textile Technology, Faculty of Science and Technology, Thammasat University, Pathum Thani 12121, Thailand
*e-mail:nwan0110@tu.ac.th

Abstract: Three new mononuclear copper(II) complexes namely $[Cu(3\text{-}Clbenz)(2,2'\text{-}bpy)_2]\text{-}NO_3\cdot H_2O$ (1) $[Cu(3\text{-}Clbenz)_2(2,2'\text{-}bpy)(H_2O)]$ (2) and $[Cu(3\text{-}Clbenz)(phen)_2]NO_3\cdot 3H_2O$ (3) (3-Clbenz = 3-chlorobenzoate, 2,2′-bpy = 2,2′-bipyridine and phen = 1,10-phenanthroline) have been successfully synthesized. The crystal structures of these complexes have been determined by single-crystal X-ray diffraction. Complexes 1 and 3 crystallize in monoclinic crystal system with $P2_1/c$ and $C2/c$ space group, respectively, while that of complex 2 crystallizes in triclinic crystal system with $P\bar{1}$ space group. In complex 1, the Cu(II) ion adopts a distorted octahedral geometry, while that of complexes 2 and 3 exhibit a distorted square pyramidal geometry due to the different coordination modes of 3-Clbenz ligand. The packing structures of these complexes have been stabilized by intermolecular interactions including C–H···π, halogen···π and π···π. The Hirshfeld surfaces analysis and fingerprint plots have been investigated in order to study the intermolecular interactions of all synthesized complexes.

SP1_008_PA: CRYSTAL STRUCTURE AND HIRSHFELD SURFACE ANALYSIS OF A NEW MONONUCLEAR TETRAHEDRAL ZINC(II) COMPLEX

Nanthawat Wannarit[1,*], Prapapit Thinawut[1], Kittipong Chainok[2]
[1]Department of Chemistry, Faculty of Science and Technology, Thammasat University, Pathum Thani 12121, Thailand
[2]Materials and Textile Technology, Faculty of Science and Technology, Thammasat University, Pathum Thani 12121, Thailand
*e-mail: nwan0110@tu.ac.th

Abstract: A novel mononuclear Zn(II) complex, $[Zn(BZI)_2(NCS)_2]$ (I) (BZI = 1-benzylimidazole) has been successfully synthesized and spectroscopically characterized by using IR and solid state diffuse reflectance spectroscopy techniques. The X-ray structure of complex I has been determined by means of single-crystal X-ray diffraction technique. It crystallizes in monoclinic crystal system and C_2 space group. The asymmetric unit consists of a half of Zn(II) ion, one BZI and one NCS^- anion. The Zn(II) ion is four-coordinated by two N-donor atoms of thiocyanate ions and two N-donor atoms from imidazole ring of BZI ligands, resulting a distorted tetrahedral with $[ZnN_4]$ chromophore. The bond distances between Zn-N and the angles around Zn(II) center are in the range of 1.935(2) to 2.000(1) Å and 106.28(6) to 118.82(11)°, respectively. The crystal structure of this complex is stabilized by the intermolecular interactions namely hydrogen bonding C-H···S and C-H···π, providing three-dimensional supramolecular network. The existence of these weak interactions have been investigated by Hirshfeld surface analysis.

SP1_009_PA: SYNTHESIS AND PROPERTIES OF A NEW ADENINE-BASED Zn (ii) COORDINATION POLYMERS FOR SENSITIVE SENSING OF NITROAROMATICS

Phakinee Srilaoong[1], Kittipong Chainok[2], Tanwawan Duangthongyou[1,*]
[1]Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok 10900, Thailand
[2]Materials Innovation and Technology, Department of Physics, Faculty of Science and Technology, Thammasat University, PathumThani 12120, Thailand.
*email: fscitwd@ku.ac.th

Abstract: The hydrothermal reaction between adenine (ad) and biphenyl-3,3,5,5-tetracarboxylic acid (BPTC) organic lingers with Zn(II) ions has been prepared and the complex (1) namely $[Zn_4(ad)_3(BPTC)(H_2O)_3]\bullet H_2O$ was obtained. Single crystal X-ray diffraction reveals that complex (1) possesses three different coordination sphere around Zn (II) ions centers, tetrahedron (ZnN_3O), tetrahedron (ZnN_2O_2) and octahedron ($ZnNO_5$). The adenine and BPTC ligands act as bridging ligand with coordination modes μ_3, η^1: η^1: η^1: and μ_4, η^1: η^2: η^1: η^2: respectively. The 3D framework was formed from the various coordination modes of the ligands. The complex (1) was structural characterized by X-ray diffraction powder, FT-IR, UV-visible diffuse reflectance, Thermogravimetric analysis and elemental analysis. Solid-state photoluminescence of complex (1) was studied, which shows maximum emission band at 345 nm (λ_{ex} = 310). In addition, complex (1) acts as sensor for detection of nitro compounds via quenching of its fluorescent intensity.

SP1_010_PA: AN UNEXPECTED ZINC(II) COORDINATION POLYMER BASED ON N-VINYLIMIDAZOLE AND 2-ANIMOTEREPHTHALIC ACID MIXED LIGANDS

Patsara Kwanmuang, Boontana Wannalerse, Tanwawan Duangthongyou*
Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok 10900, Thailand
*e-mail: fscitwd@ku.ac.th

Abstract: The unexpected Zn(II) coordination polymer of the formula [Zn(NVI)(2ATP)(DMF)]n (1) (NVI = N-vinylimidazole, 2ATP = 2-aminoterephthalic acid, DMF = dimethylformamide), have been synthesized under solvothermal conditions and characterized by FT-IR, thermogravimetric analysis and elemental analysis. Complex 1 crystallizes in the monoclinic with space group P21/c. The Zn(II) ion is in a square pyramidal coordination geometry coordinated by two oxygen atoms from 2ATP, two oxygen atom from DMF molecules, and one nitrogen atom from NVI. It was expected that N-vinylimidazole was obtained from 1,2-bis(imidazole-1'-yl)ethane that we use as starting material. Complex 1 shows a three-dimensional (3D) framework connected by two-dimensional (2D) layer structures through intermolecular hydrogen bonds between oxygen atom and nitrogen atom of 2ATP molecules. The solid-state fluorescence properties of complex 1 display a strong fluorescent emission peak at 533 nm upon excitation at 336 nm.

SP1_011_PA: STRUCTURAL TRANSFORMATION OF $[Cu_2(tp)(bipy)_2(H_2O)_4][Cu_2(tp)_3(bipy)_2(H_2O)_2]$ COMPLEX IN ETHANOL UNDER HYDROTHERMAL CONDITION AND THEIR Cu^{2+} ADSORPTION PROPERTIES AFTER ACID TREATMENT

Winya Dungkaew[1,*], Kantipa Srisuk[1], Suwadee Jiajaroen[2], Chatphorn Theppitak[2], Kittipong Chainok[3]

[1]Department of Chemistry, Faculty of Science, Mahasarakham University, Kantarawichai, Maha Sarakham 44150, Thailand

[2]Department of Chemistry, Faculty of Science and Technology, Thammasat University, Pathum Thani 12121, Thailand

[3]Department of Materials and Textile Technology, Faculty of Science and Technology, Thammasat University, Pathum Thani 12121, Thailand

*e-mail: winya.d@msu.ac.th

Abstract: A discrete copper (II) complex, $[Cu_2(tp)(bipy)_2(H_2O)_4][Cu_2(tp)_3(bipy)_2(H_2O)_2]$ (1) was synthesized and studied for it structural change. Transformation of (1) to one-dimensional (1D) $[Cu_2(bipy)_2(tp)_2(H_2O)]_n$ (2) coordination polymer was observed upon heat treatment in ethanol. Complexes (1) and (2) were then treated with 1% v/v HNO_3 before studied their Cu^{2+} adsorption. It was found that both complexes after acid treatment contain high Cu^{2+} adsorption capacity of 179.57 and 269.86 mg Cu^{2+}/g for (1) and (2), respectively, from initial concentration of 0.1 M Cu^{2+}. This level of adsorption capacity was relatively high compared to various adsorbents reported previously.

SP1_012_OA: CRYSTAL ENGINEERING OF ZINC(II) COORDINATION POLYMERS BASED ON TRITOPIC AND N-DONOR MIXED LIGANDS

Kenika Khotchasanthong[1], Winya Dungkaew[2], Filip Kielar[3], Mongkol Sukwattanasinitt[4], Kittipong Chainok[5,*]

[1]Division of Chemistry, Faculty of Science and Technology, Thammasat University, Pathum Thani 12121, Thailand

[2]Department of Chemistry, Faculty of Science, Mahasarakham University, Mahasarakham 44150, Thailand

[3]Department of Chemistry, Faculty of Science, Naresuan University, Phitsanulok 65000 Thailand

[4]Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

[5]Materials and Textile Technology, Faculty of Science and Technology, Thammasat University, Pathum Thani 12121, Thailand

*e-mail: kc@tu.ac.th

Abstract: Four new zinc(II) coordination polymers based on benzenetribenzoate and *N*-donor mixed ligands, $[Zn_2(btb)_2(im)_2][dma]_2 \cdot 2DMF \cdot 3MeOH$ (1), $[Zn(btb)(ppy)][dma] \cdot 3H_2O \cdot MeOH$ (2), $[Zn_2(btb)_2(apm)][dma]_2 \cdot 3H_2O \cdot 2DMF \cdot 2MeOH$ (3), and $[Zn_3(\mu_4\text{-}O)(btb)_2(pyz)][dma] \cdot 4H_2O \cdot 3DMF \cdot MeOH$ (4), where apm = aminopyrimidine, btb = benzenetribenzoate, dma = dimethylammonium, im = imidazole, pyz = pyrazine, ppy = phenylpyridine, were synthesized under solvothermal conditions. 1 and 2 crystallize in the monoclinic space group $P2_1/n$ and display a two-dimensional honeycomb-like (6,3) network. 3 crystallizes in the triclinic space group *P*-1 and exhibits a two-dimensional double layered structure. 4 crystallizes in the orthorhombic space group *Pnma* and exhibits two-fold interpenetrated 3D network. All compounds display the photoluminescent emission in the solid-state at room temperature. Moreover, compounds 1-3 exhibit multifunctional luminescent probe properties for the detection of Cu^{2+}, Cr^{3+}, and Fe^{3+} ions based on the fluorescence quenching mechanism. While, 4 is a potential fluorescent material for sensing of Al^{3+} and Fe^{3+} ions through fluorescent enhancement (turn-on) and quenching (turn-off) effects.

SP1_013_PA: CRYSTALLOGRAPHIC INVESTIGATION OF LANTHANIDE COORDINATION POLYMERS OF (HYDRAZIDECARBONYL) BENZOATE

Chatphorn Theppitak[1], Filip Kielar[2], Mongkol Sukwattanasinitt[3], Kittipong Chainok[4,*]
[1]Division of Chemistry, Faculty of Science and Technology, Thammasat University, Pathum Thani 12121, Thailand
[2]Department of Chemistry, Faculty of Science, Naresuan University, Phitsanulok 65000, Thailand
[3]Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand
[4]Materials and Textile Technology, Faculty of Science and Technology, Thammasat University, Pathum Thani 12121, Thailand
*e-mail: kc@tu.ac.th

Abstract: Four novel lanthanide coordination polymers, $[Ln(HCB)_2]\cdot X$; Ln = Eu, Tb; X = Cl^-, NO_3^-; HCB = (hydrazidecarbonyl)benzoate, were prepared hydrothermally and structural characterized by single crystal X-ray diffraction. These isostructural compounds crystallize in the orthorhombic space group *Pccn* and present a three-dimensional cationic framework with one-dimensional channels. The charge-balancing anions (i.e. Cl^-, NO_3^-) are located in these channels. Under an N_2 atmosphere, these compounds can keep thermally stable up to ~350 °C and exhibit sensitized luminescence in the solid state at room temperature.

SP1_014_OA: CRYSTALLOGRAPHIC INVESTIGATION OF REVERSIBLE CRYSTTAL-TO-CRYSTAL TRANSFORMATION OF NEW COPPER(II) COORDINATION POLYMERS

Kodchakorn Samakun[1], Winya Dungkeaw[2], Shinya Hayami[3], Kittipong Chainok[1,*]
[1]Materials and Textile Technology, Faculty of Science and Technology, Thammasat University, Pathum Thani 12121, Thailand
[2]Department of Chemistry, Faculty of Science, Mahasarakham University, Mahasarakham 44150, Thailand
[3]Faculty of Advanced Science and Technology Institute of Pulsed Power Science, Kumamoto University 860-8555, Japan
*e-mail: kc@tu.ac.th

Abstract: The reversible single-crystal to single-crystal (SC-SC) structural transformations and magnetic properties in novel copper(II) coordination polymers (CPs) based on 2,5-dibromobenzene-1,4-dicarboxylic acid (H_2Br_4bdc) are reported. Two three-dimensional (3D) framework structures, $[Cu(Br_2bdc)(4,4'\text{-bipy})][H_2Br_2bdc]$ (1) and $[Cu_2(Br_2bdc)_2]\cdot H_2O$ (2) (Br_2bdc = 2,5-dibromobenzene-1,4-dicarboxylate, 4,4'-bipy = 4,4'-bipyridine) were prepared and structurally characterized. Compound 1 exhibits a neutral 3D open-framework structure constructed by six-coordinated Cu^{2+} ions connected with fully deprotonated Br_2bdc^{2-} and 4,4'-bipy ligands, having six-connected pcu topology. The 3D framework of 1 contains 1D channels occupied by the H_2Br_2bdc molecules which act as templates for space-filling. Compound 2 also display a neutral 3D framework with six-connected pcu topology, where the fully deprotonated Br_2bdc^{2-} ligands adopt in the μ_4-bridging and μ_5-bridging-chelating coordination modes to bind the dicopper paddlewheel $\{Cu_2(COO)_4\}$ secondary building units. These 3D frameworks can be transformed to the four-connected 2D (4,4) topology of compounds $[Cu(Br_2bdc)(4,4'\text{-bipy})(H_2O)_2]$ (3) and $[Cu(Br_2bdc)(DMF)]\cdot 0.75H_2O\cdot DMF$ (4), upon soaking the crystals of 1 and 2 in mixed DMF/H_2O and subsequent heating at 50 °C for 12 h. Interestingly, 3 or 4 can also be readily reverted back to the initial 3D frameworks after soaking their daughter crystals into the mother liquors of 1 and 2 at 100 °C for 24 h. More interestingly, the 3D frameworks of 1 and 2 can also be reversibly transformed with each other through the intermediate phases 3 or 4 involving two steps of the structural transformation. This SC-SC structural transformation was confirmed by single crystal X-ray diffraction, powder X-ray diffraction, thermogravimetric analysis, infrared spectroscopy and elemental analysis. In addition, the magnetic properties of 1, 3, and 4 were also investigated.

SP1_015_OA: POROUS-NONPOROUS STRUCTURAL PHASE TRANSFORMATIONS IN MOLECULAR SCHIFF BASE NICKEL(II) COMPLEXES: CRYSTAL STRUCTURE AND HIRSHFELD SURFACE ANALYSIS

Siripak Jittirattanakun[1], Nanthawat Wannarit[1], Winya Dungkaew[2], Kittipong Chainok[3,*]
[1]Division of Chemistry, Faculty of Science and Technology, Thammasat University, Khlong Luang, Pathum Thani 12121, Thailand
[2]Department of Chemistry, Faculty of Science, Mahasarakham University, Kantharawichai, Maha Sarakham 44150, Thailand
[3]Materials and Textile Technology, Faculty of Science and Technology, Thammasat University, Khlong Luang, Pathum Thani 12121, Thailand
*e-mail: kc@tu.ac.th

Abstract: A porous molecular crystal of Schiff base nickel(II) complex, $[Ni(NCS)_2L_2]\cdot 1.5H_2O$ (1), (L = [(2-Pyridyl)methylidene](*p*-fluorophenyl)amine), was synthesized and characterized. 1 crystallizes in the trigonal system with space group $R\bar{3}$ (Z' = 2, V = 29913(26) Å^3). The adjacent complex molecules are assembled *via* intermolecular π···π stacking and S···S interactions to form a porous three-dimensional supramolecular framework. The host framework of 1 contains 1D channels and occupied by guest water molecules. A porous trigonal phase 1 undergoes structural transformation to the non-porous monoclinic phases 1A ($C2/c$, Z' = 1, V = 5327.8(3) Å^3) and 1B ($C2/c$, Z' = 1, V = 5085(4) Å^3) upon heating in water at different temperatures. The intermolecular interactions in these complexes are also investigated by Hirshfeld surface analysis.

SP1_016_OA: SEQUENTIAL SINGLE-CRYSTAL-TO-SINGLE-CRYSTAL TRANSFORMATIONS OF ERBIUM COORDINATION POLYMERS TRIGGERED BY SOLVENT EXCHANGE

Suwadee Jiajaroen[1], Winya Dungkaew[2], Kittipong Chainok[3,*]
[1]Division of Chemistry, Faculty of Science and Technology, Thammasat University, Pathum Thani 12121, Thailand
[2]Department of Chemistry, Faculty of Science, Mahasarakham University, Mahasarakham 44150, Thailand
[3]Materials and Textiles Technology, Faculty of Science and Technology, Thammasat University, Pathum Thani 12121, Thailand
*e-mail: kc@tu.ac.th

Abstract: The trigonal *P*$6_3/mcm$ phase of 3D erbium(III) coordination polymer, $[Er(Br_4tp)_{1.5}]\cdot 3H_2O$, ($Br_4tp$ = tetrabromoterephthalate), was synthesized and structural characterized. This material consists of a six-coordinated Er^{3+} metal center in octahedral geometry with six oxygen atoms from the different Br_4tp ligands. This material undergoes multi-step sequential single-crystal-to-single-crystal transformations to the monoclinic *P*$2_1/n$ phase 3D $[Er_2(Br_4tp)_3(H_2O)_2]\cdot 3H_2O$ (CN = 7), the trigonal *R*-3 phase 3D $[Er_2(Br_4tp)_3]\cdot 3.5H_2O$ (CN = 6), and 1D $[Er(Br_4tp)(H_2O)_5][Er(Br_4tp)_2(H_2O)_5]\cdot 6H_2O$ (CN = 9), triggered by solvent exchange for the removal of lattice/coordinated water and partial organic ligands. The crystallographic investigations of the structural transformations between these materials are discussed in detail.

SP1_017_PA: SUPRAMOLECULAR STRUCTURE OF $[(VO_4)_2][Na_6(H_2O)_{18}]\cdot 2H_2O$

Chana Panyanon, Kittipong Chainok*
Materials and Textile Technology, Faculty of Science and Technology,
Thammasat University, Khlong Luang, Pathum Thani 12121, Thailand
*e-mail: kc@tu.ac.th

Abstract: The crystal structure and supramolecular interactions in $[(VO_4)_2][Na_6(H_2O)_{18}]\cdot 2H_2O$ is reported. The title complex crystallizes in the cubic system with space group *Fd*-3*c*. The asymmetric unit contains two (VO_4) units, one $[Na_6(H_2O)_{18}]$ cluster, and two lattice water molecules. All vanadium atoms are located on the special position and adopt a distorted tetrahedral geometry. While the central sodium atoms lie on the general position and display a distorted octahedral geometry with six oxygen atoms from coordinated water molecules. In the crystal, the (VO_4) unit, $[Na_6(H_2O)_{18}]$ cluster, and lattice water components are linked together through extensive intermolecular O–H···O hydrogen bonding interactions to give rise to a three-dimensional supramolecular structure.

SP1_018_PA: EXPERIMENTAL AND THEORETICAL INVESTIGATION OF 2D HALOGEN-BONDED ORGANIC FRAMEWOKS BASED ON TETRABROMOTEREPHTHALIC ACID BUILDING BLOCK

Nucharee Chongboriboon[1], Thitirat Inprasit,[1] Filip Kielar[2], Winya Dungkaew[3], Lawrence W.-Y. Wong[4], Snežana D. Zarić[5,6], Kittipong Chainok[1,*]

[1]Materials and Textile Technology, Faculty of Science and Technology, Thammasat University, Pathum Thani 12121, Thailand

[2]Department of Chemistry, Faculty of Science, Naresuan University, Phitsanulok 65000, Thailand

[3]Department of Chemistry, Faculty of Science, Mahasarakham University, Mahasarakham 43100, Thailand

[4]Department of Chemistry, The Hong Kong University of Science and Technology, Clear Water Bay, Kowloon, Hong Kong

[5]Faculty of Chemistry, University of Belgrade, Studentski trg 12-16, Belgrade, 11000, Serbia

[6]Science Program, Texas A&M University at Qatar, Education City, Doha, Qatar

*e-mail: kc@tu.ac.th

Abstract: Two-dimensional (2D) halogen-bonded organic frameworks were readily engineered by strong and directional effects of the primary Br···O and the secondary Br·π halogen bonding interactions from the tetrabromoterephthalic acid (H_2Br_4tp) building molecule involving 100% supramolecular yields. The 2D assembly can function as a host layered framework for the intercalation of various guest solvents including acetone (ATN), ethanol (EtOH), dimethyl sulfoxide (DMSO), and ethylene glycol (EG) resulting in a 1 : 2 host : guest complexation stoichiometry *viz.* $H_2Br_4tp{\cdot}2S$ (S = ATN (1_{ATN}), EtOH (2_{EtOH}), DMSO (3_{DMSO}) and EG (4_{EG})). All the solvates show remarkable similarities in their 2D layered sheets and the bilayer distance significantly responds to the size, shape, molecular conformation, as well as the strength of the hydrogen bonding capability of the intercalated solvent molecules. The transition between the solvate formation and the desolvation was found to be facile and reversible upon the desolvation-resolvation process. The estimated Br···O halogen bonding energy of the solvates is in the –0.6 to –1.7 kcal/mol range, which was determined by quantum-mechanical calculations based on the density functional theory (DFT) calculations. Furthermore, to quantitatively identify the host-guest intermolecular interactions of these solvates, they were visually compared by use of Hirshfeld surface analysis.

SP1_019_OA: ANIONS AND SOLVENT CONTROL SPIN CROSSOVER PROPERTIES OF IRON(II) IMIDAZOLYLIMINE COMPLEXES

Darunee Sertphon[1,*], David J. Harding[2], Keith S. Murray[3], Boujemaa Moubaraki[3], Lujia Liu[4], Shane G. Telfer[4], Guillaume Chastanet[5]

[1]Department of Chemistry, Faculty of Science, Rangsit University, Pathum Thani 12000, Thailand

[2]Functional Materials and Nanotechnology Center of Excellence, Walailak University, Thasala, Nakhon Si Thammarat 80160, Thailand

[3]School of Chemistry, Monash University, Clayton, VIC 3800, Australia

[4]MacDiarmid Institute for Advanced Materials and Nanotechnology, Institute of Fundamental Sciences, Massey University, Palmerston North 4442, New Zealand

[5]Institut de Chimie de la Matière Condensé de Bordeaux-UMR5026, France

*e-mail: darunee.s@rsu.ac.th

Abstract: A novel Fe(II) complexes $[Fe(1Me\text{-}2\text{-}ima\text{-}Bp)_3][Y]_2 \cdot sol$ (Y = ClO_4; sol = EtOH 1, Y = BF_4; sol = EtOH 2, Y = ClO_4; sol = MeCN 3, Y = BF_4; sol = MeCN 4) were synthesized and characterized. Complex 3 and 4 have been determined by X-ray crystallography with meridional geometry and HS Fe(II) centre. The structure shows π···π and C-H···π interactions to form 1D chain and also link to the other chain. Complex 1 and 2 undergo a clear and reversible colour change from red to dark purple in the solid state with heating associated with a HS to LS transition. Magnetic measurements reveal moderately abrupt spin crossover for 1 and 4; The LIESST effect is clearly observed under red (650 nm) light irradiation at 10 K.

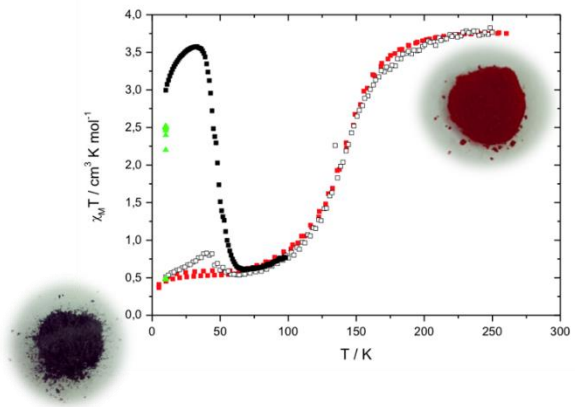


Figure 1. Spin Crossover of $[Fe(1Me\text{-}2\text{-}ima\text{-}Bp)_3][ClO_4]_2$ in EtOH

SP1_020_PA: SYNTHESIS OF A COORDINATION POLYMER [Cu_2(NICOTINATO)$_4$] BY THREE DIFFERENT METHODS

Orrasa In-noi*, Winya Dungkaew
Department of Chemistry, Faculty of Science, Mahasarakham University, Thailand
*e-mail: orrasa.i@msu.ac.th

Abstract: In this work, a 3D coordination polymer of copper and nicotinic acid were prepared by three different methods; hydrothermal, precipitation and grinding method. The ratio of copper(II) to nicotinic acid were designed to 1: 2. The blue block single crystals can be obtained from hydrothermal method while the blue needle crystals and blue-green powder can be obtained from precipitation and grinding method, respectively. Products were characterized by various techniques including XRD, SEM, FT-IR, TGA and SC-XRD. The results revealed that three products from different synthesis methods show same phase. However, the product morphology, size and percent yield are different. The SC-XRD study confirmed the structure of product to 3D coordination framework with formula [Cu_2(nicotinato)$_4$]. The solubility of the needle crystals in water and nine organic solvents were tested. The needle crystals is insoluble in any tested solvents which should be a good property for potential use as sorbent materials.

SP1_021_PA: CRYSTALLIZATION AND STRUCTURAL STUDIES OF ORGANIC-INORGANIC HYBRID BASED ON DECAVANADATE CLUSTER: $[(V_{10}O_{28})_2][ImH]_{12}\cdot 3H_2O$

Purita Aroonchat[1], Kittipong Chainok[2,*]
[1]Science Classroom in University-Affiliated School Projects (SCiUS), Suankularb Wittayalai Rangsit School, Muang, Pathum Thani 12120, Thailand
[2]Materials and Textile Technology, Faculty of Science and Technology, Thammasat University, Khlong Luang, Pathum Thani 12121, Thailand
*e-mail: kc@tu.ac.th

Abstract: A new polyoxovanadate based on the $[V_{10}O_{28}]^{6-}$ anions, $[(V_{10}O_{28})]_2[ImH]_{12}\cdot 3H_2O$ was synthesized and characterized by single crystal X-ray diffraction, powder X-ray diffraction, infrared spectroscopy, thermogravimetric analysis, scanning electron microscopy/energy dispersive X-ray spectroscopy, X-ray photoelectron spectroscopy, and elemental analysis. The title complex crystallizes in the centrosymmetric triclinic space group *P*1bar and its asymmetric unit comprises two classical decavanadate $[V_{10}O_{28}]^{6-}$ anions, twelve imidazolium $[ImH]^+$ cations and three lattice water molecules. In the crystal, the three components *viz*. organic, inorganic and water, are connected together into a three-dimensional supramolecular structure through O–H···O N–H···O, and C–H···O hydrogen bonds. Intermolecular aromatic π–π stacking interactions are also observed.

SP1_022_PA: CRYSTAL STRUCTURE OF SILVER (I) BROMIDE COMPLEX CONTAINING 1-(4-NITROPHENYL) THIOUREA AND TRIPHENYLPHOSPHINE LIGANDS

Yupa Wattanakanjana[1,*], Arunpatcha Nimthong-Roldan[2], Paramee Sripa[1], Walailak Puetpaiboon[1]

[1]Department of Chemistry, Faculty of Science, Prince of Songkla University, HatYai, Songkhla 90112, Thailand

[2]Pre-Development Sciences, 211, 2nd Ave, Waltham, Massachusetts 02451, USA

*e-mail:yupa.t@psu.ac.th

Abstract: Silver(I) with thiourea derivatives complexes have been studied due to their antimycobacterial, antileishmanial, antibacterial and antifungal activities. In the title compound, [AgBr(NPTU)(PPh_3)$_2$], exhibits a distorted tetrahedral coordination with two P atoms from two triphenylphosphine (PPh_3) ligands, one terminal S atom from the 1-(4-nitrophenyl)thiourea (NPTU) ligand and bromide ion. Intramolecular N—H···Br hydrogen bond is observed (graph set motif S(6)). In the crystal, amine and bromide are linked via bifurcated (N—H)2···Br hydrogen bonds forming 1D zigzag chains along [001] axis with $R_2^1(6)$ motif. The chains are connected through C—H···O hydrogen bonds lead to the formation of a three-dimensional network.

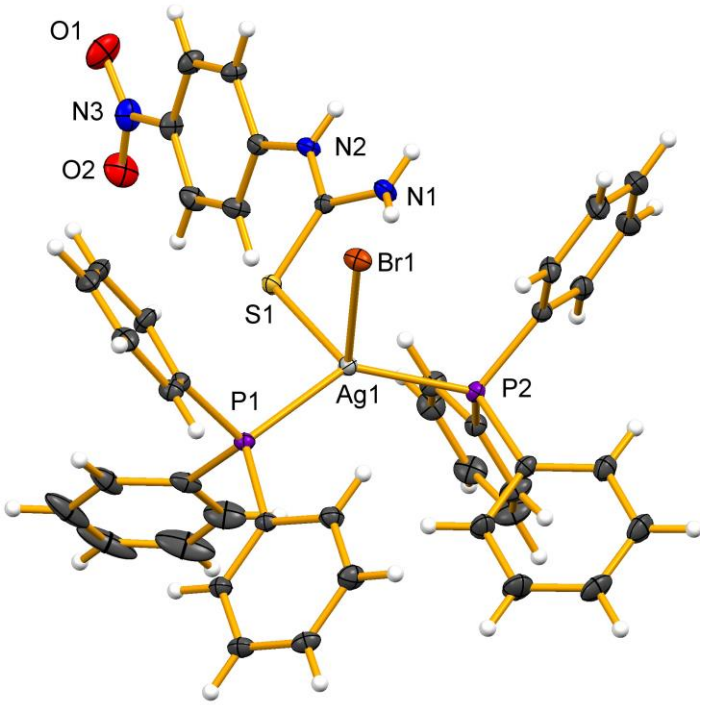


Figure 1. The molecular structure of (I), with displacement ellipsoids drawn at the 50% probability level.

สมาคมวิทยาศาสตร์แห่งประเทศไทยในพระบรมราชูปถัมภ์
THE SCIENCE SOCIETY OF THAILAND UNDER THE PATRONAGE OF HIS MAJESTY THE KING
สำนักงาน : คณะวิทยาศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย กรุงเทพฯ ๑๐๓๓๐ โทร. ๐-๒๒๑๘-๕๒๔๕, ๐-๒๒๕๒-๗๙๘๗ แฟกซ์ ๐-๒๒๕๒-๗๙๘๗
Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand. Tel. 0-2218-5245, 0-2252-7987 Fax : 0-2252-7987
E-mail : scisoc.thailand@gmail.com Homepage : http://www.scisoc.or.th

ประกาศสมาคมวิทยาศาสตร์แห่งประเทศไทยในพระบรมราชูปถัมภ์
ครั้งที่ 6 / 2562
เรื่อง แต่งตั้งคณะกรรมการอำนวยการ

.....

เพื่อให้การดำเนินงานของสมาคมวิทยาศาสตร์แห่งประเทศไทยในพระบรมราชูปถัมภ์เกี่ยวกับการดำเนินงานของการจัดประชุมวิชาการวิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย ครั้งที่ 45 (วทท 45) เป็นไปด้วยความเรียบร้อย และมีประสิทธิภาพ สมาคมวิทยาศาสตร์ฯ จึงขอแต่งตั้งคณะกรรมการอำนวยการดังนี้

1.	รองศาสตราจารย์ ดร.ชยาพร วัฒนศิริ	ที่ปรึกษา
2.	ศาสตราจารย์กิตติคุณ ดร.เปี่ยมสุข พงษ์สวัสดิ์	ที่ปรึกษา
3.	รองศาสตราจารย์ ดร.ทิพาพร ลิมปเสนีย์	ที่ปรึกษา
4.	นายกสมาคมวิทยาศาสตร์แห่งประเทศไทยฯ	ประธาน
5.	อุปนายกสมาคมวิทยาศาสตร์แห่งประเทศไทยฯ (รศ.ดร.ธารารัตน์ ศุภศิริ)	รองประธาน
6.	ศาสตราจารย์ ดร.สุจิตรา วงศ์เกษมจิตต์	กรรมการ (รองอธิการบดี)
7.	ผู้ช่วยศาสตราจารย์ ดร.อุไรวรรณ อินต๊ะถา	กรรมการ (คณบดีสำนักวิชาวิทยาศาสตร์)
8.	ศาสตราจารย์ ดร.ประณัฐ โพธิยะราช	กรรมการ
9.	รองศาสตราจารย์ ดร.อรฤทัย ภิญญาคง	กรรมการ
10.	รองศาสตราจารย์ ดร.รัชลิดา ลิปิกรณ์	กรรมการ
11.	รองศาสตราจารย์ ดร.สุรัตน์ ละภูเขียว	กรรมการ
12.	รองศาสตราจารย์ ดร.สายวรุฬ ชัยวานิชศิริ	กรรมการและเลขานุการ
13.	นางฤดีมล แสวงธรรม	กรรมการและผู้ช่วยเลขานุการ
14.	นางสาวศิรดา อารมณ์ชื่น	กรรมการและผู้ช่วยเลขานุการ

ทั้งนี้ตั้งแต่บัดนี้เป็นต้นไป

ประกาศ ณ วันที่ 5 กรกฎาคม 2562

(รองศาสตราจารย์ ดร.นภาวรรณ นพรัตนราภรณ์)
นายกสมาคมวิทยาศาสตร์แห่งประเทศไทยในพระบรมราชูปถัมภ์

สมาคมวิทยาศาสตร์แห่งประเทศไทยในพระบรมราชูปถัมภ์
THE SCIENCE SOCIETY OF THAILAND UNDER THE PATRONAGE OF HIS MAJESTY THE KING
สำนักงาน : คณะวิทยาศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย กรุงเทพฯ ๑๐๓๓๐ โทร. ๐-๒๒๑๘-๕๒๔๕, ๐-๒๒๕๒-๗๙๘๗ แฟ็กซ์ ๐-๒๒๕๒-๗๙๘๗
Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand. Tel. 0-2218-5245, 0-2252-7987 Fax : 0-2252-7987
E-mail : scisoc.thailand@gmail.com Homepage : http://www.scisoc.or.th

ประกาศสมาคมวิทยาศาสตร์แห่งประเทศไทยในพระบรมราชูปถัมภ์
ครั้งที่ 7 / 2562
เรื่อง แต่งตั้งคณะกรรมการดำเนินงานจัดประชุมวิชาการ
วิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย ครั้งที่ 45 (วทท 45)

.....

เพื่อให้การดำเนินงานของสมาคมวิทยาศาสตร์แห่งประเทศไทยในพระบรมราชูปถัมภ์เกี่ยวกับการจัดประชุมวิชาการวิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย ครั้งที่ 45 (วทท 45) ระหว่างวันที่ 7 – 9 ตุลาคม 2562 ณ มหาวิทยาลัยแม่ฟ้าหลวง นั้น เป็นไปด้วยความเรียบร้อย และมีประสิทธิภาพ สมาคมวิทยาศาสตร์ฯ จึงขอแต่งตั้งคณะกรรมการดำเนินงานจัดประชุมวิชาการวิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย ครั้งที่ 45 (วทท 45) ดังนี้

นายกสมาคมวิทยาศาสตร์แห่งประเทศไทยฯ (รศ.ดร.นภาวรรณ นพรัตนราภรณ์)	ที่ปรึกษา
อุปนายกสมาคมวิทยาศาสตร์แห่งประเทศไทยฯ (รศ.ดร.ธารารัตน์ ศุภศิริ)	ที่ปรึกษาและประธานฝ่ายจัดนิทรรศการ
ศาสตราจารย์กิตติคุณ ดร.เปี่ยมสุข พงษ์สวัสดิ์	ที่ปรึกษา
รองศาสตราจารย์ ดร.สายวรุฬ ชัยวานิชศิริ	ประธานวทท
รองศาสตราจารย์ ดร.ประณัฐ โพธิยะราช	ประธานฝ่ายวิชาการ
รองศาสตราจารย์ ดร.อรฤทัย ภิญญาคง	รองประธานฝ่ายวิชาการ
รองศาสตราจารย์ ดร.ทิพาพร ลิมปเสนีย์	ประธานฝ่ายพิธีการและต้อนรับ
รองศาสตราจารย์ ดร.รัชลิดา ลิปิกรณ์	ประธานฝ่ายประชาสัมพันธ์และดูแลเว็บไซต์
รองศาสตราจารย์ นฤมล จียโชค	ประธานฝ่ายกิจกรรมเยาวชน
นางฤดีมล แสวงธรรม	กรรมการฝ่ายเลขานุการ
นางสาวศิรดา อารมณ์ชื่น	กรรมการและผู้ช่วยเลขานุการ

ทั้งนี้ตั้งแต่บัดนี้เป็นต้นไป

ประกาศ ณ วันที่ 5 กรกฎาคม 2562

(รองศาสตราจารย์ ดร.นภาวรรณ นพรัตนราภรณ์)
นายกสมาคมวิทยาศาสตร์แห่งประเทศไทยในพระบรมราชูปถัมภ์

สมาคมวิทยาศาสตร์แห่งประเทศไทยในพระบรมราชูปถัมภ์
THE SCIENCE SOCIETY OF THAILAND UNDER THE PATRONAGE OF HIS MAJESTY THE KING
สำนักงาน : คณะวิทยาศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย กรุงเทพฯ ๑๐๓๓๐ โทร. ๐-๒๒๑๘-๕๒๔๕, ๐-๒๒๕๒-๗๙๘๗ แฟกซ์ ๐-๒๒๕๒-๗๙๘๗
Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand. Tel. 0-2218-5245, 0-2252-7987 Fax : 0-2252-7987
E-mail : scisoc.thailand@gmail.com Homepage : http://www.scisoc.or.th

ประกาศสมาคมวิทยาศาสตร์แห่งประเทศไทยในพระบรมราชูปถัมภ์
ครั้งที่ 8 / 2562
เรื่อง แต่งตั้งคณะกรรมการฝ่ายวิชาการของการประชุมวิชาการ
วิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย ครั้งที่ 45 (วทท 45)

.....

เพื่อให้การดำเนินงานตามคณะกรรมการฝ่ายวิชาการของการประชุมวิชาการวิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย ครั้งที่ 45 (วทท 45) เป็นไปด้วยความเรียบร้อย และมีประสิทธิภาพยิ่งขึ้น สมาคมวิทยาศาสตร์ฯ จึงขอแต่งตั้งคณะกรรมการฝ่ายวิชาการของการประชุมวิชาการวิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย ครั้งที่ 45 (วทท 45) ดังนี้

1. ศาสตราจารย์ ดร.ประณัฐ โพธิยะราช	ประธานฝ่ายวิชาการ
2. รองศาสตราจารย์ ดร.สุรัตน์ ละภูเขียว	ประธานร่วมฝ่ายวิชาการ
3. รองศาสตราจารย์ ดร.อรฤทัย ภิญญาคง	รองประธานฝ่ายวิชาการ

สาขา A: AGRICULTURAL SCIENCE / BIOTECHNOLOGY

1. รองศาสตราจารย์ ดร.ณัฏฐา ทองจุล	ประธานสาขา
2. รองศาสตราจารย์ ดร.อภิชาติ กาญจนทัต	ประธานร่วม
3. อาจารย์ ดร.สมฤดี นิลทอง	ประธานร่วม
4. อาจารย์ ดร.นิรมล สันติภาพวิวัฒนา	ประธานร่วม

สาขา B: BIOLOGICAL SCIENCE

1. รองศาสตราจารย์ ดร.ตวงพร สุทธิพงษ์ชัย	ประธานสาขา
2. ศาสตราจารย์ ดร.ศุภจิตรา ชัชวาลย์	ประธานร่วม
3. รองศาสตราจารย์ ดร.พญ.ชนิตรา ธุวจิตต์	ประธานร่วม
4. ผู้ช่วยศาสตราจารย์ ดร.นพดล กิตนะ	ประธานร่วม
5. ผู้ช่วยศาสตราจารย์ ดร.เอกชัย ชูเกียรติโรจน์	ประธานร่วม
6. อาจารย์ ดร.พัฒนา ค้ากำยาน	ประธานร่วม

สาขา C: CHEMISTRY

1. ศาสตราจารย์ ดร.วัชรินทร์ รุกขไชยศิริกุล	ประธานสาขา
2. ศาสตราจารย์ ดร.อรวรรณ ชัยลภากุล	ประธานร่วม
3. ศาสตราจารย์ ดร.ธวัชชัย ตันทุลานิ	ประธานร่วม
4. ศาสตราจารย์ ดร.พรเทพ สมพรพิสุทธิ์	ประธานร่วม
5. รองศาสตราจารย์ ดร.วีณา เสียงเพราะ	ประธานร่วม
6. ผู้ช่วยศาสตราจารย์ ดร.เยาวภา สุขพรมา	ประธานร่วม
7. ผู้ช่วยศาสตราจารย์ ดร.จิตตรียา ตันสกุล	ประธานร่วม

8. อาจารย์ ดร.กาญจนา วัดละเอียด ประธานร่วม
9. อาจารย์ ดร.พัชรนันท์ โชโต ประธานร่วม
10. อาจารย์ ดร.ฐิติพร สุวรรณวงศ์ ประธานร่วม

สาขา D: POLYMER & MATERIALS SCIENCE / NANOTECHNOLOGY

1. ศาสตราจารย์ ดร.สุพล อนันตา ประธานสาขา
2. รองศาสตราจารย์ ดร.ดรุณี วัฒนศิริเวช ประธานร่วม
3. รองศาสตราจารย์ ดร.ทวีชัย อมรศักดิ์ชัย ประธานร่วม

สาขา E: ENERGY / ENVIRONMENTAL & EARTH SCIENCE

1. รองศาสตราจารย์ ดร.ประเสริฐ เรียบร้อยเจริญ ประธานสาขา
2. รองศาสตราจารย์ ดร.ไกรชาติ ตันตระการอาภา ประธานร่วม
3. ผู้ช่วยศาสตราจารย์ ดร.รุ่งโรจน์ นิลทอง ประธานร่วม
4. อาจารย์ ดร.ปเนต มโนมัยวิบูลย์ ประธานร่วม

สาขา F: PHYSICS / APPLIED PHYSICS

1. รองศาสตราจารย์ ดร.พิศิษฐ์ สิงห์ใจ ประธานสาขา
2. ผู้ช่วยศาสตราจารย์ ดร.สุธี วัฒนศิริเวช ประธานร่วม
3. อาจารย์ ดร.สมวัน ชุ่มพงษ์พันธ์ ประธานร่วม

สาขา G: MATHEMATICS / STATISTICS / COMPUTER SCIENCE

1. รองศาสตราจารย์ ดร.ฉัฐไชย์ ลีนาวงศ์ ประธานสาขา
2. รองศาสตราจารย์ น.ท.ดร.ทศพล บุญเกิน ประธานร่วม
3. อาจารย์ ดร.ธีรเดช หมูคำ ประธานร่วม

สาขา H: FOOD SCIENCE & TECHNOLOGY

1. รองศาสตราจารย์ ดร.ขนิษฐา ธนานุวงศ์ ประธานสาขา
2. รองศาสตราจารย์ ดร.สาโรจน์ รอดคืน ประธานร่วม
3. อาจารย์ ดร.สมฤดี ไทพาณิชย์ ประธานร่วม
4. อาจารย์ ดร.ณัฏยา คนซื่อ ประธานร่วม

สาขา SP1: CRYSTALLOGRAPHY

1. ศาสตราจารย์ ดร.นงนุช เหมืองสิน ประธานสาขา
2. ผู้ช่วยศาสตราจารย์ ดร.กิตติพงศ์ ไชยนอก ประธานร่วม

สาขา DP1: EXPLORING THE KNOWLEDGE BOUNDARY OF HAZE: FROM SCIENTIFIC FINDINGS TO ACTIONABLE INTELLIGENCE POLICY

1. อาจารย์ ดร.ปเนต มโนมัยวิบูลย์ ประธานสาขา

สาขา DP2: INNOVATION IN APPLIED BIOMEDICAL SCIENCE

1. อาจารย์ นพ.อานนท์ จำลองกุล ประธานสาขา
2. อาจารย์ นพ.เกษตร ฉิมพลี ประธานร่วม

สาขา DP3: DIALOGUE FOR ECOLOGICAL REGENERATION: ENGAGING WITH ENVIRONMENTAL KNOWLEDGE IN THE NORTH OF THAILAND

1. อาจารย์ ดร.อิกนาซี รีโบ ประธานสาขา

สาขา DP4: BORDER DEVELOPMENT

1. นายสิทธิชาติ สมตา ประธานสาขา

ให้กรรมการชุดนี้มีหน้าที่ดำเนินงานด้านวิชาการของการประชุมวิชาการวิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย ครั้งที่ 45 (วทท 45) การเชิญวิทยากรพิเศษในการปาฐกถาเปิดงานและปาฐกถาพิเศษ การจัดการบรรยาย การอภิปราย การพิจารณาและตรวจแก้ผลงานที่นำเสนอ การวิเคราะห์ผลงาน การจัดทำเอกสารและข้อมูลทางวิชาการ

ทั้งนี้ตั้งแต่บัดนี้เป็นต้นไป

ประกาศ ณ วันที่ 18 มิถุนายน 2562

(รองศาสตราจารย์ ดร.นภาวรรณ นพรัตนราภรณ์)
นายกสมาคมวิทยาศาสตร์แห่งประเทศไทยในพระบรมราชูปถัมภ์

สมาคมวิทยาศาสตร์แห่งประเทศไทยในพระบรมราชูปถัมภ์
THE SCIENCE SOCIETY OF THAILAND UNDER THE PATRONAGE OF HIS MAJESTY THE KING
สำนักงาน : คณะวิทยาศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย กรุงเทพฯ ๑๐๓๓๐ โทร. ๐-๒๒๑๘-๕๒๔๕, ๐-๒๒๕๒-๗๙๘๗ แฟกซ์ ๐-๒๒๕๒-๗๙๘๗
Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand. Tel. 0-2218-5245, 0-2252-7987 Fax : 0-2252-7987
E-mail : scisoc.thailand@gmail.com Homepage : http://www.scisoc.or.th

ประกาศสมาคมวิทยาศาสตร์แห่งประเทศไทยในพระบรมราชูปถัมภ์
ครั้งที่ 12 / 2562
เรื่อง แต่งตั้งคณะกรรมการฝ่ายวิชาการของการประชุมวิชาการ
วิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย ครั้งที่ 45 (วทท 45) เพิ่มเติม

.....

เพื่อให้การดำเนินงานตามคณะกรรมการฝ่ายวิชาการของการประชุมวิชาการวิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย ครั้งที่ 45 (วทท 45) เป็นไปด้วยความเรียบร้อย และมีประสิทธิภาพยิ่งขึ้น สมาคมวิทยาศาสตร์ฯ จึงขอแต่งตั้งคณะกรรมการฝ่ายวิชาการของการประชุมวิชาการวิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย ครั้งที่ 45 (วทท 45) ดังนี้

สาขา SP1: CRYSTALLOGRAPHY

1. รองศาสตราจารย์ ดร.เกื้อการุณย์ ครูส่ง ประธานร่วม

ให้กรรมการชุดนี้มีหน้าที่ดำเนินงานด้านวิชาการของการประชุมวิชาการวิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย ครั้งที่ 45 (วทท 45) การเชิญวิทยากรพิเศษในการปาฐกถาเปิดงานและปาฐกถาพิเศษ การจัดการบรรยาย การอภิปราย การพิจารณาและตรวจแก้ผลงานที่นำเสนอ การวิเคราะห์ผลงาน การจัดทำเอกสารและข้อมูลทางวิชาการ

ทั้งนี้ตั้งแต่บัดนี้เป็นต้นไป

ประกาศ ณ วันที่ 10 กันยายน 2562

(รองศาสตราจารย์ ดร.นภาวรรณ นพรัตนราภรณ์)
นายกสมาคมวิทยาศาสตร์แห่งประเทศไทยในพระบรมราชูปถัมภ์

สมาคมวิทยาศาสตร์แห่งประเทศไทยในพระบรมราชูปถัมภ์
THE SCIENCE SOCIETY OF THAILAND UNDER THE PATRONAGE OF HIS MAJESTY THE KING
สำนักงาน : คณะวิทยาศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย กรุงเทพฯ ๑๐๓๓๐ โทร. ๐-๒๒๑๘-๕๒๔๕, ๐-๒๒๕๒-๗๙๘๗ แฟกซ์ ๐-๒๒๕๒-๗๙๘๗
Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand. Tel. 0-2218-5245, 0-2252-7987 Fax : 0-2252-7987
E-mail : scisoc.thailand@gmail.com Homepage : http://www.scisoc.or.th

ประกาศสมาคมวิทยาศาสตร์แห่งประเทศไทยในพระบรมราชูปถัมภ์
ครั้งที่ 13 / 2562
เรื่อง แต่งตั้งคณะกรรมการดำเนินงานจัดประชุมวิชาการ
วิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย ครั้งที่ 45 (วทท 45)

.....

เพื่อให้การดำเนินงานของสมาคมวิทยาศาสตร์แห่งประเทศไทยในพระบรมราชูปถัมภ์เกี่ยวกับการจัดประชุมวิชาการวิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย ครั้งที่ 45 (วทท 45) ระหว่างวันที่ 7 – 9 ตุลาคม 2562 ณ ณ มหาวิทยาลัยแม่ฟ้าหลวง นั้น เป็นไปด้วยความเรียบร้อย และมีประสิทธิภาพ สมาคมวิทยาศาสตร์ฯ จึงขอแต่งตั้งคณะกรรมการดำเนินงานจัดประชุมวิชาการวิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย ครั้งที่ 45 (วทท 45) ดังนี้

รองศาสตราจารย์ ดร.นภาวรรณ นพรัตนราภรณ์	ที่ปรึกษา
ศาสตราจารย์กิตติคุณ ดร.เปี่ยมสุข พงษ์สวัสดิ์	ที่ปรึกษา
รองศาสตราจารย์ ดร.สายวรุษ ชัยวานิชศิริ	ประธานวทท

คณะกรรมการฝ่ายจัดนิทรรศการ

1. รองศาสตราจารย์ ดร.ธารารัตน์ ศุภศิริ ประธาน

มีหน้าที่

- ดำเนินการและประสานงานเพื่อจัดเตรียมสถานที่สำหรับออกบูธนิทรรศการ นิทรรศการเฉลิมพระเกียรติ บอร์ดจัดโปสเตอร์แสดงผลงานทางวิชาการ และบูธแสดงสินค้า
- ประสานงานกับผู้สนับสนุนการประชุม เพื่ออำนวยความสะดวกในการจัดพื้นที่แสดงสินค้า
- ปฏิบัติหน้าที่อื่นตามที่ได้รับมอบหมาย

คณะกรรมการฝ่ายวิชาการ

1. รองศาสตราจารย์ ดร.ประณัฐ โพธิยะราช ประธาน
2. รองศาสตราจารย์ ดร.อรฤทัย ภิญญาคง รองประธาน

มีหน้าที่

- ดำเนินการด้านวิชาการ และจัดโปนแกรมการประชุม
- ประสานเชิญวิทยากร สำหรับการบรรยายในสาขาต่างๆ
- ประสานงานแจ้ง และรับข้อมูลที่เกี่ยวข้องทางด้านวิชาการกับประธาน/ประธานร่วมแต่ละสาขา
- จัดทำหนังสือบทคัดย่อ และ Proceeding การประชุม
- ดำเนินการประสานงานการพิจารณา และตรวจแก้ผลงานที่นำเสนอ การจัดทำเอกสาร และข้อมูลทางวิชาการ
- ปฏิบัติหน้าที่อื่นตามที่ได้รับมอบหมาย

คณะกรรมการฝ่ายพิธีการและต้อนรับ

1. รองศาสตราจารย์ ดร.ทิพาพร ลิมปเสนีย์ ประธาน

มีหน้าที่

- ดำเนินการและประสานงานในส่วนของพิธีการรับเสด็จ ร่วมกับสำนักพระราชวัง
- ดำเนินการด้านพิธีเปิดงาน การจัดเลี้ยง และจัดเตรียมพิธีกรตลอดงาน
- จัดทำหนังสือเชิญ จัดที่นั่ง และให้การต้อนรับแขกผู้มีเกียรติในห้องพิธีการ
- ปฏิบัติหน้าที่อื่นตามที่ได้รับมอบหมาย

คณะกรรมการฝ่ายประชาสัมพันธ์และดูแลเว็บไซต์

1. รองศาสตราจารย์ ดร.รัชลิดา ลิปิกรณ์ ประธาน

มีหน้าที่

- ดูแลเว็บไซต์รับลงทะเบียน
- ประสานงานเชิญนักข่าว และสื่อมวลชนเข้าร่วมงาน
- ประชาสัมพันธ์ผ่านสื่อต่างๆ สถานศึกษา ระดับมัธยมศึกษา และอุดมศึกษาเข้าร่วม
- ปฏิบัติหน้าที่อื่นตามที่ได้รับมอบหมาย

คณะกรรมการฝ่ายกิจกรรมเยาวชน

1. อาจารย์กรองทอง ด้วงสงค์ ที่ปรึกษา
2. รองศาสตราจารย์ นฤมล จียโชค ประธาน

มีหน้าที่

- ดำเนินการและประสานงานการจัดกิจกรรมเยาวชน การเดินทาง และการดูแลที่พักของครู และนักเรียนที่เข้าร่วมกิจกรรม
- ปฏิบัติหน้าที่อื่นตามที่ได้รับมอบหมาย

คณะกรรมการฝ่ายเลขานุการ

1. นางฤดีมล แสวงธรรม กรรมการ
2. นางสาวศิรดา อารมณ์ชื่น กรรมการและผู้ช่วยเลขานุการ

มีหน้าที่

- ประสานงานรับเงินค่าลงทะเบียน เงินสนับสนุน และออกใบเสร็จรับเงิน
- ประสานงานและจัดเตรียมที่พัก และการเดินทาง สำหรับคณะกรรมการ วิทยากร และผู้เข้าร่วมประชุม
- ปฏิบัติหน้าที่อื่นตามที่ได้รับมอบหมาย

ทั้งนี้ตั้งแต่บัดนี้เป็นต้นไป

ประกาศ ณ วันที่ 18 กันยายน 2562

(รองศาสตราจารย์ ดร.นภาวรรณ นพรัตนราภรณ์)

นายกสมาคมวิทยาศาสตร์แห่งประเทศไทยในพระบรมราชูปถัมภ์

ACKNOWLEDGEMENT FOR THE SPONSORS OF STT45

TITANIUM

NATIONAL RESEARCH COUNCIL OF THAILAND

PLATINUM

THE NATIONAL HIGHER EDUCATION, SCIENCE, RESEARCH AND INNOVATION POLICY COUNCIL

GOLD

BARA SCIENTIFIC COMPANY LIMITED (HEAD OFFICE)

GE MEDICAL SYSTEMS (THAILAND) COMPANY LIMITED

SILVER

BECTHAI BANGKOK EQUIPMENT AND CHEMICAL COMPANY LIMITED

BRUKER SWITZERLAND AG

GIBTHAI COMPANY LIMITED (HEAD OFFICE)

THAI OIL PUBLIC COMPANY LIMITED (HEAD OFFICE)

THAILAND SCIENCE RESEARCH AND INNOVATION

FOUNDATION FOR THE PROMOTION OF SCIENCE AND TECHNOLOGY UNDER THE PATRONAGE OF HIS MAJESTY THE KING

BRONZE

DENTSPLY SIRONA (THAILAND) COMPANY LIMITED

THAI-CHINA FLAVOURS & FRAGRANCES CO., LTD.

EXHIBITION BOOTHS

AGILENT TECHNOLOGIES (THAILAND) COMPANY LIMITED

ANALYTIK JENA FAR EAST (THAILAND) LIMITED

BIOMERIEUX THAILAND LIMITED

CARL ZEISS COMPANY LIMITED

CHARPA TECHCENTER COMPANY LIMITED (HEAD OFFICE)

EPPENDORF (THAILAND) COMPANY LIMITED
(HEAD OFFICE)

HOLLYWOOD INTERNATIONAL LIMITED

IKA WORKS (ASIA) SDN BHD

LOUIS T. LEONOWENS (THAILAND) LIMITED

MEDITOP COMPANY LIMITED (HEAD OFFICE)

PETRO-INSTRUMENTS COMPANY LIMITED (HEAD OFFICE)

RUSHMORE PRECISION COMPANY LIMITED

U.P.MARKETING GENERAL SUPPLY COMPANY LIMITED

A-aesoh Luebaesa 263
Abdulwahab Salae 254
Adisak Romsang .. 95, 134, 150, 158, 159, 160
Adisorn Tuantranont 329, 377
AdisornTuantranont 164
Akio Ojida 205
Akkaneewut Chabangborn 339
Alain Tremeau 364
Amisa Laprom 137
Amnat Phetrungnapha 127
Amonrat Thangthong 349
Amornpun Sereemaspun 269
Amornrat Phongdara 157
Amornrat Suemanotham 352
Ampapan Naknaen 139
Anant Eungwanichayapant 101, 340
Anawat Pinisakul 327
Angkana Chaiprasert 165
Anirut Suppasombut 228
Anon Noochanong 322
Antikan Klomchit 199
Anucha Watcharapasorn 279, 388
Anuchit Ruangvittayanon 90
Anudthida Maphon 317
Anumart Buakeaw 92, 96
Anupan Kongbangkerd 85, 263
Anuparp Wunkanapol 98
Anupong Bunyacharoenchit 342
Anupong Promtha 352
Anyaporn Boonmahittsud 319, 320
Apanee Luengnaruemitchai 227
Aphichart Karnchanatat 116
Aphiwat Pongwisuthiruchte 288
Apicha Maharat 237
Apichart Suksamrarn 238, 251
Apichet Boonsoong 265
Apichet Ngenyoung 110
Apinan Limmongkol 167
Apinun Limmongkon 85
Apinya Chudhangkura 380
Apinya Huskul 201
Apisit Lueangyangyuen 112
Apisith Suebchompoo 355
Apiwat Intiyakosat 354
Archrob Khuhapinant 166
Aree Laikul 141
Areerat Ruankham 171, 172
Arirush Wongnutpranont 191
Arisara Hiriotappa 371, 372
Aristha Srabua 383
Ariya Patompotipatarasuk 280
Arnon Kraipok 298, 303, 322
Arocha Jatakanont 227
Aroonsiri Shitangkoon 211
Artit Wongsa 143
Artorn Iatsui 119
Arunpatcha Nimthong-Roldan 406
Asada Leelahavanichkul 168
Asmita Khaniya 140
Assatorn Sukrachart 118
Assawapong Sappat 164, 377
Athit Chaiwichien 97, 102, 103
Atikorn Panya 379
Attasith Parnsubsakul 276
Aungsana Prajaksangsiri 306
Autchima Buatavee 118
Aylada Kaenu 125
Balaji Rao Ravuri 296
Bancha Lawang 191
Banthot Chomsawan 235
Bence Babinszki 352
Benchamaporn Tangnorawich 267
Benjie L. Fernandez 358
Benya Nontaleerak 134
Benyakan Pongkitwitoon 152
Boonchoat Paosawatyanyong 361
Boon-ek Yingyongnarongkul 236
Boonrat Tassaneetrithep 143, 166
Boontana Wannalerse 394
Boujemaa Moubaraki 403
Burapha Phajuy 346
Bussayapat Phanyot 318
Catleya Rojviriya 90
Chaicumpa Wanpen 163
Chainarong Tocharus 251
Chaiwat Boonpeng 113, 197
Chaiya Prasittichai 281, 283
Chalermchai Mitrpant 166
Chalisa Jaturapaktrarak 141
Chalisa Visvajit 227
Chana Panyanon 401
Chanapimon Keerathiwattanarat 150
Chanchai Homkrilad 349
Chanikan Polpattanakul 358
Chanisara Srimuang 362
Chanista Chansom 350

Channarong Rodkhum 122
Chanoknan Sangphuek..... 390
Chanpen Karuwan.....377
Charernmee Chamchoy.....182, 184
Charinee Thonthong 259
Chatchai Putson..... 210
Chatchai Sirithipvanich..... 361
Chatchawan Chaisuekul..... 179
Chatphorn Theppitak 395, 397
Chatwarin Poochai.....329
Chawanakorn Kongsak 221
Chayaphon Sripannam 127
Cheewita Suwanchawalit..... 286, 287
Chidchanok Ritkamrop 143
Chidkamon Thunkhamrak..... 216
Chintana Phawong 143
Chiraphat Phromthong 244
Chiravoot Pechyen 266, 267, 268
Chitsanuphong Phanthian 179
Chittanon Buranachai 256
Chompoonek Yurayart 141
Chompoonuch Warangkanagool..... 363
Chongdee Thammakhet-Buranachai 206
Chonlatee Cheewasedtham 121, 209
Chopaka Thongbumrer 236
Chortip Khokerd.....154
Chotika Neamchey 206
Chotikan Tungklan..... 132
Christoph Sontag.....223
Chulanetra Monrat..... 163
Chutimon Tangaiad 158
Chutintorn Punwong..... 256
Chutipong Chiamkunakorn.....153
Clara Chepkirui 100
Damratsamon Surangkul 127
Darunee Sertphon.....387, 403
Darunee Wattanasiriwech 284, 304
David J. Harding.....387, 403
David Ruffolo 360
Decha Dechtrirat 295
Dechmongkhon Kaewsuwan 337
Depicha Jindatip 269
Dhassida Sooksawat..... 206, 228
Donruetai Thalapphet..... 167
Duangamol Tungasmita..... 358
Duangkamol Tiarpattaradilok..... 248
Dusit Jit-ueakul 166
Dusit Thueman 359
Eakkasit Punrat 219
Ekachai Chukeatirote.....133, 135, 136, 137
Eleni Gentekaki 118, 120
Eliot Cline.....101
Emma Jakab 352
Ersa Aurora Ria Diani 378
Filip Kielar 396, 397, 402
Gasidit Panomsuwan 274
Gitchanaphon Sriwichai 273
Glab-ampai Kittirat 163
Gobwute Rujijanagul 312
Guenter Grampp 261
Guillaume Chastanet..... 403
Gun Anantasomboon.....107
Ha Thanh Dong 112, 153
Hafeezee Chema.....121
Hanh Le Thi My.....299
Harit Boonyaputthikul.....110
Hathaikarn Manuspiya 274
Hirun Saelim 157
Htoo Pyei Hlaing 166
I-Lin Laosri..... 349
Indiah Ratna Dewi 210
Intira Tampayak 107
Itaru Hamachi 205
Itthipol Sungwienwong 108
Iyarit Thaipisuttikul 140
Jakkarach Sa-udon 212
Jakkarin Singnoo..... 365
Jakrada Attarataya 270
Janista Thumrongtharadol 134
Janpen Saengprakai..... 380
Janpen Tangjitjaroenkun.....106
Jantana Kampeera..... 87, 164, 165, 377
Jantip Saelee 143
Jantrararuk Tovaranonte.....176, 178, 180
Janya Jaiprasert.....108
Jarichad Toosaranont 166
Jarinphorn Pukkao 282
Jariyaporn Sangkaworn..... 286
Jaroon Jakmunee..... 216
Jaruwan Kanthachan 316
Jaursup Boonmak.....385, 386
Jeerus Sucharitakul..... 129
Jes Kettratad 201
Jesada Maneewong 242, 252
Jinda Sirita 235
Jintana Duangnkern 150, 158
Jintana Duang-nkern 159, 160
Jirakan Sriwiyod..... 213
Jirapant Dutchaneephet..... 260
Jirapast Sichaem..... 234
Jirapat Chinapunjaphol 172
Jirarut Wongkongkatep..... 205

Jirativat Nanthachan....250
Jitti Suebphanpho....386
Jittra Piapukiew....116
Joongjai Panpranot....294
Juarsup Boonmak....222
Jumroensri Thawonsuwan....139
Junpen Suwimonteerabutr....92
Juthamas Thongduang....324
Juthathip Phumaenam....261
Kaewta Donpamee....345
Kalyarat Kaewnirat....138
Kamonpan Pengpat.297, 298, 300, 301, 303
Kamonwan Meesuwan....217
Kanchana Kiriyadee....94
Kanchana Watla-iad....172, 212, 213, 214
Kanet Wongravee....258
Kangsadan Boonprab....105
Kanjana Soodpakdee....135
Kanjanakorn Muangsong....117
Kanlaya Jumpatong....235
Kannikar Kaewapai....312
Kanokwan Yawichai....325
Kansri Boonpargob....113
Kansri Boonpragob....197
Kantapon Suraprasit....328
Kantipa Srisuk....395
Kanyamas Choocheep....170
Kanyanat Dee-ying....281
Kanyarat Kwansirikul....362
Karuna Wongkrajang....381
Kawinnat Buaruang104, 183, 192, 193, 194, 195, 198
Kawinthida Moolsarn....216
Kazuhito Fujiyama....95
Kazumichi Fujii....115
Keith S. Murray....403
Kejvalee Pruksathorn....330, 336
Kemachart Kemavuthanon....340
Kenika Khotchasanthong....396
Kenji Takeuchi....351
Kenneth Rasmussen....261
Ketsuda Pawong....213
Khamphe Phoungthong....348, 353
Khanittha Ponsanti....267
Khanobporn Tangtrakulwanich....93, 94
Khatcharin Siriwong....222
Kheamrutai Thamaphat....114
Khwannarin Khemsom....134, 150
Kiattikhun Manokruang....264
Kirakorn Pongpan....143
Kitiphong Khongphinitbunjong...93, 118, 120
Kittinan Komolpis....92, 96
Kittipat Malakit....360
Kittipong Chainok389, 390, 391, 392, 393, 395, 396, 397, 398, 399, 400, 401, 402, 405
Kodchakorn Samakun....398
Komsil Rattanasroi....154
Korakoj Pethasanayothin....327
Kornkanok Nukard....272
Kotchakorn Supabowornsathit....246, 248
Krai Meemon....97, 102, 103
Kriangsak Songsrirote....275
Krisana Chongsri....311
Krit Sutjarittangtham....323, 324
Krit Tantanarat....127
Krit Won-in....260
Kritapas Laohhasurayotin....286
Kritsakorn Saninjuk....159
Kuaanan Techato....353
Kua-anan Techato....348
Kunaporn Homyog....342
Kwanchanok Virasiri....176
Kwandee Chamchoy....278
Ladawan Thupchai....330
Ladda Sangduean Watanasiritham....381
Ladda Sangduean Wattanasiritham....380
Laemthong Chuenchom....294, 295
Lalida Chanchaem....172, 214
Lalisa Bunmechimma....310
Lalita Attanatho....352
Lalita Srimoon....302
Laongdow Jungrak....185, 189
Lawrence W.-Y. Wong....402
Lillibeth Chaverra-Muñoz....100
Luckika Panthiya....251
Lujia Liu....403
Luksamee Vittaya....250
Makamas Sutthacheep182, 184, 185, 186, 187, 188, 189, 190, 191, 196
Mali Hunsom....330, 336
Manatchanok Pattanasing....236
Mangheny Godfrey....216
Manlika Kamnoy....301
Manutchaya Wongkaewmoon....293
Maradee Phongpipatpong....381
Marc Stadler....100
Marisa Phromahakul....349
Martin van de Bult....180
Masatsugu Fujishige....351
Mathivathani Kandiah....229
Mattika Sodamuk....192
Mayura Thongchuang....236

Mayuree Phonyiem 351
Methinee Prongjit 129
Michiko Obata 351
Ming Tang 329
Mintra Nugthum 370
Mitsutoshi Nakajima 376
Mongkol Phaengphech 104, 113
Mongkol Sukwattanasinitt 396, 397
Montakan Tamtin 97, 102, 103
Montarop Yamabhai 145, 146, 171
Montri Choowong 328
Monwadee Wonglapsuwan 155, 156
Morakot Kaewpet 228
Morinobu Endo 351
Mudchima Unmuang 340
Muthita Molsil 104
N. Tangaemsakul 334
N. Tantavichet 334
Naeem Hussain 353
Naengnoy Yossundara 196
Najwa Leema 209
Nakarin Suwanarach 144
Nakorn Niamnont 97, 102, 103
Nampet Prakobsin 98
Nannipa Phuphuripan 95, 159
Nantakorn Phoodeetip 345
Nantawan Therdthai 374
Nanthanit Jaruseranee 145, 146, 171
Nanthawat Wannarit 390, 391, 392, 399
Nanthika Kongchareonporn 96
Nantinee Moontan 118
Nantinee Moontun 120
Napassorn Peasura 382
Napat Chuenangkul 336
Napatsawan Khwanchuen 254
Naphat Laksanayothin 229
Napida Hinchiranan 290
Narawit intarashot 149
Narin Changklungmoa 97, 102, 103, 149, 151, 154
Narit Triamnak 287
Narong Arunrut 87, 164, 165, 377
Narong Chanlek 337
Narumon Lertcumfu 312, 313, 314
Narumon Phonrung 231, 232
Natapol Suetrong 283
Natavudh Townamchai 168
Natchapong Choungsom 156
Natdanai Moondong 265
Natee prasertmunkongdee 149
Natsajee Nualkaew 143
Natsaran Saichana 144, 171, 212
Nattakan Soykeabkaew 307, 317, 318, 319, 320, 321
Nattakan Soykeabkeaw 355
Nattakarn Kumchonmaynukoul 118
Nattarika Pacharoen 287
Nattaya Manpadung 120
Nattaya Tawichai 317, 318, 319, 320, 321, 355
Nattaya Wongyai 127
Nattha Yongwattana 205
Natthakan Iam-On 368
Natthapol Chittamart 115
Natthapong Jimpaiboon 361
Natthaporn Khwanmuang 155
Natthawika Sankham 307
Natthaya Chuaypen 238
Natthiya Saehlim 242, 252
Natthkrista Kaewkan 285
Nattida Pankaew 142
Nattiya Hirankarn 168
Natwara Dangnordang 139
Nawarat Kaew-On 364
Nawasit Chotsaeng 245
Netiya Karaket 130
Ngamnit Wongcharoen 357, 359
Nichada Jeeranaikoon 90
Nion Taikerd 268
Nipa Khuankuab 379
Nipaporn Ngernyuang 267
Niparat Sritharet 266
Nisareen Muanguming 381
Nisit Tantavichet 331
Nitisak Charoenroop 340
Nontawat Sricharoen 258
Nontivich Tandavanitj 175, 203
Noodchanath Kongchouy 139
Nootchanat Klinjan 200
Nootcharee Kunkit 264
Nucharee Chongboriboon 402
Nunticha Limchoowong 215
Nutchanad Kunfong 317, 318, 321
Nuttawan Pramanpol 90
Nutthanun Khantasup 175
Nutthapong Poompiew 291
Nutthawit Soha 365
Onthida Kosasang 293, 308
Onuma Piasai 104
Orathep Mue-suea 185
Orathep Muresare 190
Orawan Khamman 292
Orawan Piaprad 128

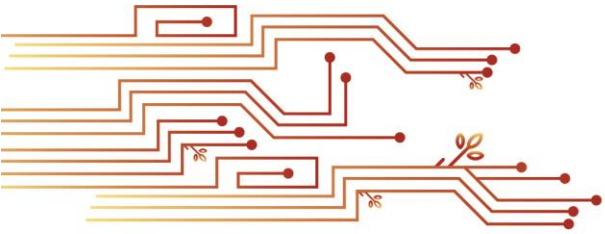
Orawan Wanachewin 170
Orrasa In-noi 404
Pachara Mongkolsuk 183, 192, 193
Padet Tummaruk 92
Painuparp Jindaratanawong 105
Paitoon Boonsong 388
Paitoon Rashatasakhon 237
Pakapreud Khumwan 165
Pakkanan Chansonkrow 126
Pakkapawn Prapan 360
Pakorn Juleang 219
Pakorn Varanusupakul 217
Pakwuan Wongshaya 85
Palita Paewthaisong 162
Panadda Dechadilok 358
Panate Manomaivibool 340
Panaya Kotchaplai 109
Panchalika Deachamag 119
Panchika Prangkio 243
Panita Ngamchuachit 378
Panote Thavarungkul 206
Panupun Limpachayaporn 238
Panuwat Padungros 249
Paramee Sripa 406
Paramita Punwong 339
Parichart Onsri 295
Parichart Sornwai 230
Parichat Chayapan 342
Parichat Cummon 357
Parichat Niyomthai 185, 190
Parichat Sriwan 346
Pariya Na Nakorn 229
Parkpoom Jarupoom 315
Passanee Deachamag 155
Patamas Bintachitt 298
Patchanee Charoenying 245
Patchara Mongkolsuk 104, 198
Patcharanan Choto 230, 232, 261
Patcharanun Suksangpanomrung 371
Patcharapon Jumsri 203
Patchararujee Ngamdee 290
Patcharee Pratumpong 268
Patcharida Buaklee 120
Patcharin Kosuwan Jundee 346
Patsara Danwittayakul 348
Patsara Kwanmuang 394
Pattana Kakumyan 144
Pattara Thiraphibundet 306
Pattarachat Ingrugruenglue 105
Pattarana Sae-Chew 141
Pattarin Tangtanatakul 168
Pattariya Singpant 368
Patthapong Chaiseanwang 338
Pawarit Chumpon 305
Pawee Klongvessa 354
Paweena Dulyaseree 351
Pawnprapa Pitakjakpipop 225
Peerapol Saisaard 178
Peeravat Natrsanga 240
Peerawat Saejong 243
Penpak Siripitak 114
Penpan Payattikul 141
Penwisa Pisitsak 278, 282
Phadungphon Chinokan 335
Phakinee Srilaoong 393
Phanupol Mongkolsiri 130
Pharatree Jaita 312, 313, 314, 315
Phattharasaya Rattanawongkun317, 318, 321
Phawiya Suksomboon 151
Phijitra Umalee 117
Phimchanok Jaturapiree 111
Phimpha Nirongbut 195
Phimpisa Phraphuchamnong 198
Phisit Limtrakun 265
Phitchan Sricharoen 215
Phonlawat janpiw 151
Phonphiphat Suwannarak 331
Phurich Boonsanit 177
Pichamon Srisawad 142, 144
Pichayada Katemake 364, 365
Pichayanan Srisuwan 228
Pichayaporn Junmaha 200
Pichnaree Lalitaporn 341
Piengchan Sonthayanon 141
Pijittra Sangthong 367
Pimonsri Mittraparp-arthorn 142
Pimpilai Wannasut 279
Pimpimol Phukpattaranont 208
Pinnara Rojvirat 126, 130
Pipat Sudying 111
Pirachat Namsri 114
Piriyaporn Chongtrakool 141
Pisit Tangkijvanich 238
Pisutti Dararutana 260
Pitakchai Fuanngkeaw 197
Pitiporn Ritthiruangdej370, 371, 372, 373, 374
Piyada Yodsoontorn 235
Piyamart Khongkhaem 371
Piyamit Toumsri 294
Piyaphat Sunthi 347

Piyaphong Chenrai 335, 338
Piyaporn Phukhatmuen 247
Plaipol Dedvisitsakul 171, 172, 212, 214
Ploypailin Rangseethampanya 187
Pongchai Dumrongrojwatthana 181
Pongsak Khunrae 110, 112, 114, 152, 153
Pongsakorn Pholsupho 343, 344
Poorichaya Somparn 168
Porawach Chin-orn 219
Pornanan Kueakhai 102, 103, 149, 151, 154
Pornanan Kuekai 97
Pornchiwin Banjong 307
Pornphimon Meesakul 250
Pornrat Sinchaipanit 382
Pornsan Lueangseephet 389
Pornthep Sompornpisut 257
Pornthip Boonsri 259
Prach Sukkavee 332
Prachai Leophairatana 122
Prachak Inkaew 218, 272
Prachaub Chaibu 98
Prachya Kongtawelert 170
Pranpariya Ponpakdee 249
Pranut Potiyaraj 288, 289, 291
Prapapit Thinawut 392
Prapat Punpee 88
Praput Thavornyutikarn 221
Prasert Reubroycharoen 333
Prasert Sobhon 97, 102, 103
Prasong Phuakbuakhao 381
Prassara Kanokbodeevanit 373
Prateep Leopairut 122
Pratthana Intawin 297, 298, 303
Prawit Nuengmatcha 215
Preecha Moonsin 343, 344, 345
Premjit Arpornmaeklong 226
Priya Chinnarat 285
Proespichaya Kanatharana 206
Prompong Pienpinijtham 258
Pruchya Malasri 312, 314
Puncharat Promsuvong 93
Pundita Ukkakimapan 351
Punsab Chaisurat 305
Puntaree Taeprayoon 342
Punya Charusiri 350
Purita Aroonchat 405
Puttachard Hensanghong 106
Puttinan Meepowpan 277
Rachanikon Dandi 108
Rachapirom Tueyassa 135
Ramita Khamprasit 284, 304
Rapee Utke 337
Rapheephat Suvannakad 86, 87, 88
Ras B. Pandey 257
Ratabongkot Sanjoom 312, 313, 314
Ratarat Kaewnak 133, 136
Ratchanaporn Chokchaisiri 251
Rattachat Mongkolnavin 299
Rattanaruji Pomwised 138, 139
Rattanasiri Deeklom 117
Rattanawadee Niamsiri 185, 189, 190
Rattaphan Lamoon 166
Rawiwan Charoensup 247
Ritbey Ruga 253
Roongkan Nuisin 299
Ruengwit Sawangkeaw 116
Rujiraporn sakura 271
Rujirek Chaiwongsa 170
Rungnapa Noina 251
Rungnapa Tangchitcharoenkhul 106
Rungnapha Saeeng 242, 252
Rungrote Nilthong 332
Rungthiwa Tosaard 171
Sa-ad Riyajan 99
Sa-Ad Riyajan 310
Saengchan Senapin 87, 112, 153
Saifon Nopnipa 134, 158
Saisamorn Lumyong 144
Sajee Noitang 116
Sakaowduen Preampree 319, 320
Sakonsupa Duangrasee 135
Saksit Chanthai 215
Salitta Supanam 172
Samley Sok 327
Sanong Ekgasit 258, 276
Sanruethai Pongsakunpassorn 145, 146
Santi Tip-pyang 240
Saowaluk Madkoksung 212
Saowanuch Tawornpruek 115
Saowapa Chotisuwan 263
Saran Panjaruang 341
Sarawut Jitrapakdee 126, 130
Sarawut Sattayakawee 127
Sarawut Sirithammajak 88, 165, 377
Sarintip Sooksai 116
Sarinya Palakhachane 238
Sarocha Muangsook 280
Saruda Yokputtaraksa 387
Sarunyou Chusri 138
Sasikarn Looprasertkul 269
Sasikarn Teepakornwornkul 229
Sasimanas Unajak 112

Sasitorn Wilapana..... 108
Satcha Kheoichai 349
Schradh Saenton.....332
Scorn Mongkolsuk..... 158
Sermpong Sairiam.....299
Shane G. Telfer 403
Shinya Hayami 387, 398
Shoichi Gohtani.....375, 376
Siam popluechai..... 118
Siam Popluechai.....120
Sineenat Siri 124, 132, 162
Siraprapa Brooks..... 199, 200
Sirawich Limkul..... 90
Sirichanut Thongsew 379
Sirikanya Anantasena.....169
Siriluck Rongprakhon.....186
Sirinan Kulchat 224
Sirinan Shompoosang 375
Sirintip Dangtip..... 86, 87, 88
Siripak Jittirattanakun.....399
Siriphong Somprasong 239
Siripong Sirimongkolwattana 325
Siriporn Riebroy Kim 379
Sirirat Jaiharn..... 185
Sirirung Wongsakul.....317
Siritron Samosorn 259, 275
Siriwan Boonmeewiriya..... 276
Siriwan Chaikwang.....172
Siriwat radabutra1 271
Siriwimol Noymak 329
Sisouphanh Souvongxay 346
Sitanan Nuengjumnong.....327
Sitthi Duangphet.....307, 317, 318, 321
Sittiporn Pengsakun.....188, 191, 196
Siwaporn Meejoo Smith..... 227
Siwaporn Saewan.....367
Skorn Mongkolsuk.....150, 159, 160
Snežana D. Zarić 402
Somrudee Nilthong 117, 137
Somruedee Thaiphanit 383
Somtop Santibenchakul.....311
Somwan Chumphongphan 272
Somyos Yossundara.....196
Songchan Puthong.....92, 96
Songsuda Promthong 207
Soontorn Suvokhiaw.....287
Souwalak Phongpaichit.....156
Srilert Chotpantarat.....354
Stephan Hüttel 100
Suchada Chantrapromma 353
Suchada Muangsri 211
Suchada Phimsen 167
Suchao Donpudsa 108, 128
Suchaphat Kongthong 180
Suchila Techawongstien 215
Suchittra Inthong 301, 302
Sujitra Arwachananukul.....368
Sujitra Tunsrichon 385
Sujittra Youngme..... 222, 385, 386
Sukanya Meethom 337
Sukanya Mingphimai 389
Sukanya Pengpanich.....88
Sukanya Sukathanarak 149
Sukkaneste Tungasmita.....358
Sukonmeth Jitmahantakul.....350
Sukum Eitsayeam 322
Sukum Eitssayeam297, 298, 300, 303, 316, 323, 324, 347
Sukum Eittsayeam..... 301, 302
Sumaporn Kasemsumran 372
Sumrit Senglek 197
Sunaree Choknud.....270
Sunaree Saejong.....168
Sunsanee Udomrati.....375, 376
Sunti Phewphong 343, 344, 345
Supachai Thongsuksaengcharoen.....275
Supakarn Paodung 190
Supakorn Boonyeun.....389
Supakorn Boonyuen..... 226, 227, 229
Supamas Hanpermchai.....374
Supanut Pairohakul.....177
Suparut Narksitipan.....273
Supasara Ounsuk.....205
Supattara Phokaeo..... 194
Supattra Klayya 317, 318, 321
Supawadee Hamanee.....191
Supawadee Osotprasit 97, 102, 103, 151
Supawan Meena 156
Supeera Nootchanat 276
Supitcha Yapan 344
Supon Ananta.....292
Supranee Kongkham 125
Surachet Aramrak..... 115
Surangkana Chimthai 199
Surapong Panyata 298, 303
Surat Laphookhieo 144, 247, 250
Sureeporn Saknaphawuth 294
Sutada Banchuen..... 311
Sutanan Pinmaneenopparat..... 181
Suthee Mangmee 141
Suthee Wattanasiriwech284, 285, 304, 305
Sutima Preeprem..... 142

Suttita Rattanawong 308
Suvimol Soithongsuk 91
Suvit Loprasert 157
Suwadee Jiajaroen 395, 400
Suwimon Keeratipibul 378
Tanwawan Duangthongyou 393, 394
Tasanee Kham-oun 120
Tasawan Khawsejan 196
Tassanee Lohnoo 141
Tassapon Krajangdara 201
Tawee Tunkasiri297, 298, 300, 303, 312, 313, 324, 347
Teerapong Jantarat 206
Teerapong Mamanee 325
Teetouch Kajornchaitut 95
Teparksorn Pengpan 256
Tepparit Samrit 102
Tepprit Samrit 97, 103
Thamasak Yeemin182, 184, 185, 186, 187, 188, 189, 190, 191, 196
Thana Sutthibutpong 110
Thanakit Kumwung 355
Thanaphat Auwattanamongkol 160
Thanaphut Boonpetch 320
Thanapon Deekaikam 264
Thanaporn Wichai 116
Thanatorn Thanyapanich 319
Thanawadee Leejarkpai 310
Thanawat Sukanan 333
Thaneeya Hawiset 218
Thanthamrong Wanchaem 351
Thanyarat Onlamun 199
Thapong Teerawatananond 226
Thawan Chotimarnon 321
Theanchai Wiwasuku 222
Theerakarn Srisangsung 118
Theeranai Sangjan 368
Theerapong Krajaejun 141
Theresa Briem 100
Thidarat Pantoa 375, 376
Thidarat Rujirawat 141
Thitikan Jitpromkam 118
Thitima Benjachat Suttichet 164
Thitima Rujiralai 209, 210
Thitinai Gaewdang 357, 359
Thitinun Sumranwanich 342
Thitipone Suwunwong230, 231, 232, 261, 348, 353
Thitirat Inprasit 280, 282, 402
Thitiya Sripakdee 215
Thodsapon Sutthiphibun 154
Thongchai Ngamprasertwong 175, 203
Thongkoon Priengprom 143
Thongkorn Ploypetchara 375
Thuc-Huy Duongf 234
Thunchanok Kawinate 328
Tian Cheng 100
Tirayut Vilaivan 246, 248
Tittita Aksonkird 142
Tiwa Rotchanapreeda 141
Todsaporn Bunpote 152
Torsak Luanphaisannont 243
Torsak Luanphaisarnnont 239
Torsak Luanphisarnnont 241
Tossapon Phromsatit 226
Treerawat Sangsrijan 218
Triwit Rattanarojpong .. 110, 112, 114, 152, 153
Tu Thi Phuong Nguyen 225
Tulyapruek Tawonsawatruk 205
Udom Lao-On 126
Udomrak Meethong 193
Udomsak Kitthawee 309
Uma Prawat 254
Umaporn Pimpitak 92, 96
Unruethai Phupornprasert 254
Urairat Phrommee 254
Uraiwan Intatha301, 302, 307, 316, 317, 318, 319, 320, 321, 347, 355
Vachiraporn Ajavakom 236
Vararanda Chinprateep 278
Varodom Chaoroensawan 126
Vasun Poengsungnoen 104, 183
Vatcharin Rukachaisirikul 156
Vichuda Sattayarut 351
Vimbai Irene Machimbirike 153
Visittapong Yordsri 351
Vorapol Assawasongkram 227
Vuthichai Ervithayasuporn 222
Wachira Jaengkhao 148
Wachiraya Senkunha 229
Walailak Puetpaiboon 406
Walaiphan Chuwongpanich 115
Waleed Alahmad 217
Wallapat Phongtang 136
Wandee Udomuksorn 169
Wanich Limwanich 277
Wanichaya Mekprasart 296
Wanlaya Klinthong 182, 184, 191
Wannee Thepsing 205
Wannisa Kudeesuk 122
Wanrada Suwannakran 322
Wansadaj Jaroenram 165

Wansika Kiatpathomchai86, 87, 88, 164, 165, 377
Wanta Yingyong 141
Wantana Klysubun 90
Wanussanun Chaisuriya 391
Warabhorn Boonyarat 244
Waraluck Chaichompoo 251
Warapond Wanna 148
Waraporn Khueanwises 285
Warin Rangubpit 257
Warinthorn Chavasiri 253
Warintorn Wedprasert 383
Wasusit Somsoros 114
Watanalai Panbangred 134
Watchara Duangnga 307
Watchara Kaewsuwan 207
Watcharapol Pathomsakulwong 141
Watcharapon Prasitwatcharakorn 241
Watee Kongbuntad 174
Weerachai Saijuntha 174
Weerachon phoohinkong 309
Weeradej Meeinkuirt 342
Weerapan Srichan 346
Weeraphat Pon-On 329
Weerawat Dangpong 284
Werachon Cheukamud 149
Weradaj Sukaead 116
Wesarach Samoechip 289
Wetchasart Polyiam 113, 194, 195
Wilairat Cheewasedtham 208, 209, 210
Wilaiwan Chotigeat 119, 155, 156
Wilaiwan Leenakul 322
Wimonsiri Kaewsamer 94
Winadda Wongwiriyapan 351
Winita Punyodom 277
Winya Dungkaew395, 396, 399, 400, 402, 404
Winya Dungkeaw 398
Winyu Boonprasert 98
Wipa Suginta 129
Wipada Senanon 300, 323
Wipark Anutrasakda 225
Wipawan pukumpuang 170
Wiphawan Aunkhongthong 187, 188
Wiphawan Khobthong 278
Wisanu Maneerat 94, 247, 250
Wisanu Pecharapa 296, 309, 311
Wissuta Boonta 224
Witchaya Kanburom 327
Wittaya Tawong 89
Witthawat Piampowdee 266
Worakamon Nudnara 339
Worawit Choomak 305
Worawit Mawongwan 145, 146
Wutthinan Thongyod 256
Wuttichai Roschat 343, 344, 345
Wuttichai Srinonate 311
Yaowapa Sukpondma 156
Yasmina Marin Felix 202
Yingyos Avihingsanon 164
Yong Zhou 129
Yoothana Thanmongkhon 352
Yothin Kumsang 141
Yuki Shirosaki 226
Yupa Wattanakanjana 406
Yupakanit Puangwerakul 91
Yuwaporn Ketkaew 238
Zin Mar Htun 141
Zoltán Sebestyén 352
Zsuzsanna Czégény 352



สมาคมวิทยาศาสตร์แห่งประเทศไทยในพระบรมราชูปถัมภ์

http://www.scisoc.or.th/stt/