The 6th Southeast Asia Collaborative Symposium on Energy Materials (SACSEM 6th)

24-25, Nov. 2020

Institut Teknologi Bandung ITB:
Universiti Kebangsaan Malaysia (UKM),
Universiti Teknologi PETRONAS (UTP)
Universität Duisburg-Essen (CENIDE)
King Mongkut's University of Technology Thonburi (KMUTT)
University of Tsukuba (UT)

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24th November (Japan time)

16:00-16:10		UT	Prof. J. Nakamura	Greeting

Chair: Prof. Dr.-Ing. Niels Benson (CENIDE)

Time	No	Affiliation	Presenter	Title
16:10-16:25	I1	CENIDE	Dr. Tobias Teckentrup	Introduction
16:25-16:40	I2	ITB	Prof. Brian Yuliarto	Introduction
16:40-16:55	I3	KMUTT	Asst. Prof. Kuskana Kubaha	SEEM and Research activities.
16:55-17:10	I4	UTP	AP Dr Fadzil Hassan	Introduction to Institute of Autonomous Systems (IAS)
17:10-17:25	S1	UT	Dominicus Dennis Kwaria	Pinostrobin Prenylation by Prenylbromide and NaH.
17:25-17:40	S2	UKM	Dr. Muhammad Amirul Aizat Mohd Abdah	A Promising Porous Carbon Nanofibers Coated Poly (3, 4-Ethylenedioxythiophene/Manganese Oxide (P-CNFs/PEDOT/MnO_2) for Anode Electrode in Lithium-Ion Battery

17:40-17:55 Short break

Chair: Prof. Dr Hayyiratul Fatimah Mohd Zaid (UTP)

Time	No	Affiliation	Presenter	Title
17:55-18:10	I5	UT	Prof. J. Nakamura and Prof. T. Kanbara	Introduction of Graduate Programs in Materials Innovation and Tsukuba Research Center for Energy Materials Science (TREMS) in University of Tsukuba
18:10-18:25	I6	UKM	Prof. Dato' Dr. Kamaruzzaman Sopian	Introduction: Solar Energy Research Institute (SERI) UKM
18:25-18:40	I7	UTP	Dr. M Shuaib M Saheed	Introduction to the Centre of Innovative Nanomaterials and Nanodevices (COINN)
18:40-18:55	I8	ITB	Prof. Heni Rachmawati	Development of Nanotheranostic at Research Center for Nanosciences and Nanotechnology ITB
18:55-19:10	S3	CENIDE	Sebastian Tigges	One-step synthesis of carbon-supported electrocatalysts
19:10-19:25	S4	KMUTT	MR. Huttakorn Wanichart	Design and build up the low cost electrochromic device cycle lifetime testing apparatus

25th November (Japan time)

Chair: Dr. Arie Wibowo (ITB)

Time	No	Affiliation	Presenter	Title
16:00-16:15	I9	UTP	Dr. Khairulazhar Jumbri	Introduction to the Centre of Research in Ionic Liquids (CORIL)
16:15-16:35	P1	KMUTT	Assoc. Prof. Dr. Surawut Chuangchote	Nano-structured Metal Oxides for Photocatalytic Conversation of Biomass to Fuel and High-value Chemicals
16:35-16:55	P2	CENIDE	Prof. Dr.-Ing. Niels Benson	On the degradation and trap formation in perowskite thin film solar cells
16:55-17:10	S5	UT	Airong Qiagedeer	Highly sensitive humidity sensor based on AIE luminogen-appenended hygroscopic polymer microresonator
17:10-17:25	S6	ITB	Muhammad Rezki	Cu-mof nanosphere with amino functional ligand as biosensing platform for HBsAg detection
17:25-17:40	S7	UKM	Fatihah Najirah binti Jumaah	From Fatty Acid to A Promising Electrolyte: Bio-based Quaternary Ammonium Salt

17:40-17:50 Short break

Chair: Assoc. Prof. Dr. Loh Kee Shyuan (UKM)

Time	No	Affiliation	Presenter	Title
17:50-18:05	S8	UTP	Mohd Faridzuan Majid	Performance of Glycol-based Deep Eutectic Solvent in Extractive Desulfurization System
18:05-18:20	S9	CENIDE	Swen Zerebecki	Defect-engineering of transition metal oxide particles by continuous pulsed laser post-processing for catalysis research
18:20-18:35	S10	ITB	Feraliana	Development of Covid detection using SPR Sensors: A Preliminary Results
18:35-18:55	P3	KMUTT	Asst. Prof. Dr. Nutthapon Wongyao	Overview and time-line on the development of Electrode catalyst for fuel cells and batteries
18:55-19:15	P4	UKM	Assoc. Prof. Dr. Mohd. Yusri Abd Rahman	Nickel Palladium-reduced graphene oxide as cathode for dye-sensitized solar cells
19:15-19:35	P5	UT	Prof. H. Tokoro	Development of pressure-sensitive heat storage materials using a bistable property

19:35-19:45 Short break

Chair: Assis. Prof. Afalla, Jessica Pauline Castillo (UT)

19:45-20:10 Banquet: (Self-introduction)

Award announcement and Closing Remark (Prof. Brian Yuliarto)

SEEM and Research Activities

Kubaha Kuskana
King Mongkut's University of Technology Thonburi, Bangkok, Thailand
School of Energy, Environment and Materials
E-mail: Kuskana.kub@kmutt.ac.th

The School of Energy, Environment and Materials (SEEM), King Mongkut's University of Technology, Thonburi was founded in 1976. It was the first interdisciplinary school in South East Asia that focuses on technology, since it was a science that was needed to help solve the nation's urgent matters in response to the oil crisis in 1973.

The MSc in Energy Technology was the first course offered in 1977. Today, the school offers 12 courses in total, both for Master's degree and PhDs. The courses cover a wide array of subjects including Energy Technology, Energy Management Technology, Material Technology, Integrated Product Design and Manufacturing, Environmental Technology, and Thermal Technology. SEEM's vision is to "be committed to be a leader in the development of interdisciplinary technology for Energy, Environment and Materials."

SEEM has proved to be successful through graduating over 3,000 students and producing cutting-edge research that solves problems in the field of development technology, energy, environment and materials. Moreover, these researches have been crucial for the society and economics. They have helped in pushing for more effective policy drafting on energy, climate change, low carbon economy, eco-friendly material, bio-material, and other alternative materials that are in today's demand.

Throughout the 40 years that SEEM has been growing, it has strived to continually improve its research and academic services. There are currently several outstanding research groups such as the Energy Research Group, the Environment Research Group, and the Material Research Group. Furthermore, SEEM also sees the importance of having strong collaborations in order to create better research and help build a better society for all. Therefore, it has joined hands with organizations within and outside the university; both domestic and international partners.

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Institute of Autonomous Systems (IAS)

Associate Professor Ts. Dr. Mohd Fadzil Hassan[1,2]
[1] *Institute of Autonomous Systems (IAS), Seri Iskandar, Malaysia*
[2] *Faculty of Science & Information Technology, Seri Iskandar, Malaysia*
E-mail: mfadzil_hassan@utp.edu.my

Associate Professor Ts. Dr. Mohd Fadzil Hassan is an alumnus of the Malay College Kuala Kangsar (MCKK) and graduated in 1999 from the Colorado State University, USA with a BSc (cum-laude) in Computer Information Systems. He obtained his MSc in Artificial Intelligence in 2001 and PhD in Informatics in 2007 from the University of Edinburgh, UK. He was the former Dean, Centre for Graduate Studies, Universiti Teknologi PETRONAS (UTP) and currently the Director, Institute of Autonomous Systems, UTP.

The institute of Autonomous Systems (IAS) of Universiti Teknologi PETRONAS was formed to look into research elements of autonomous facilities. Digitalization and cyberspace networking of current and new industries, which can be small start up to large scale manufacturing, opens new facet on data driven research. The institute research focus looks into entire value of chain of facilities of future. From smart sensor to material that made up of current modern devices to new edge wireless transmission for fast and efficient data transfer in order to control intelligently plant of future using smart instruments.

The institute also has the research capability on smart grid integration of renewable/new energy adaptation for smart structure to increase efficiency on energy needs. In order to integrate these above mention hard elements, the institute research also extend to embedded software integration in form of firmware to large scale solutions which include both high performance computing facilities and cloud storage solutions.

Pinostrobin Prenylation by Prenylbromide and NaH

Dennis Kwaria[1] and Yana Maolana Syah[2]
[1] University of Tsukuba, Tsukuba, Japan
[2] Institut Teknologi Bandung, Bandung, Indonesia
E-mail: kwaria.dennis@gmail.com

Prenyl groups can increase biologic activity of phenolic compounds by increasing its lipophlicity.[1][2][3] Prenylated phenolic compounds are commonly discovered in its prenylated than oxyprenylated form, and limited to few plant families. That means, total synthesis and transformation of existed phenolic compounds will be a viable method to acquire prenylated phenolic compound besides isolation. Alkylation on aromatic compounds can be achieved via Friedel-Crafts reaction, Wurtz-Fittig reaction, Mitsunobu reaction followed by rearrangement, nucleophilic substitution, and enzymatic reaction using FoPT1 as biocatalyst.[2][4] Pinostrobin isolated from Temu Kunci (*Kaempferia pandurata*) were reacted with prenyl bromide using NaH as base, yielding 5 products: 6-prenylpinostrobin; 5-oxyprenyl, 6-prenylpinostrobin; 2',6'-dioxyprenyl-4'-methoxychalcone; triprenyl cyclohexene chalcone; and 5-oxyprenylpinostrobin. It was shown by changing reagents consentration and catalyst equivalence to precursor that 6-prenylpinostrobin and 5-oxyprenylpinostrobin formed simultaneously. 6-prenylpinostrobin also transformed into 5-oxyprenyl,6-prenylpinostrobin, while 5-oxyprenylpinostrobin reacted into 2',6'-dioxyprenyl-4'-methoxychalcone and triprenyl cyclohexene chalcone. This experiment shows that 6-prenylpinostrobin can be reacted in one reaction step and formed in early hours of reaction. Thus it's yield can be raised by optimizing early reaction hours.

Keywords: chalcone, flavanone, pinostrobin, prenyl, prenylated phenolic, prenylation, rearrangement

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A Promising Porous Carbon Nanofibers Coated Poly (3, 4-Ethylenedioxythiophene/Manganese Oxide (P-CNFs/PEDOT/MnO_2) for Anode Electrode in Lithium-Ion Battery

Muhammad Amirul Aizat Mohd Abdah[1]*, Kamaruzaman Sopian[1], Azizan Ahmad[2], Yusran Sulaiman[3,4], Mohd Sukor Su'ait[1]

[1]Solar Energy Research Institute, Universiti Kebangsaan Malaysia, 43600, Bangi, Selangor, MALAYSIA

[2]School of Chemical Sciences AND Polymer Research Center (PORCE), Faculty of Science and Technology, Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor, MALAYSIA

[3]Department of Chemistry, Faculty of Science, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia.

[4]Functional Devices Laboratory, Institute of Advanced Technology, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia.

E-mail: amirulaizat@ukm.edu.my

Poly (3, 4-ethylenedioxythiophene)/manganese oxide coated on porous carbon nanofibers (P-CNFs/PEDOT/MnO_2) has been successfully developed as an advanced anode material via electrospinning, carbonization and electrodeposition. The structural and morphological characterization of the P-CNFs/PEDOT/MnO_2 electrode shows that the crosslinked and rough surface on P-CNFs could provide enough active sites for Li^+ storage while PEDOT nanoparticles and irregular block shape of MnO_2 were randomly oriented on P-CNFs surface, endowing an extended electron-conducting pathway and buffer the volumetric changes upon cycling of insertion/extraction, respectively. Benefiting from the above advantages, the resultant P-CNFs/PEDOT/MnO_2 electrode displayed enhanced electrochemical performances with highest discharged capacity (1477.20 mAh/g) and improved cycling stability after 20 cycles. The inclusion of PEDOT in the electrode was also found to reduce the electrochemical reaction resistance as it facilitated the electron transfer at the interface of electrode and electrolyte. Thus, the superior electrochemical features of P-CNFs/PEDOT/MnO_2 electrode offer a great potential to be the most promising candidate anode for LIBs.

Introduction of Graduate Programs in Materials Innovation

Junji Nakamura

Chair of Master's and Doctoral Programs in Materials Innovation,
Graduate School of Pure and Applied Sciences, University of Tsukuba, 1-1-1 Tennodai, Tsukuba,Ibaraki, 305-8573, Japan
E-mail: nakamura@ims.tsukuba.ac.jp

Master's and Doctoral Programs in Materials Innovation are dedicated to foster international elite and to promote high-quality researches by letting excellent students from overseas meet top-level researchers in Tsukuba area. We understand that many highly talented students at top universities in the region of Southeast Asia hope to study in graduate school in Japanese universities if they have a chance to be supported financially. On the other hand, researchers in Tsukuba such as NIMS, AIST, and KEK need talented young human resources with high-abilities and enthusiasm. Their research facilities are excellent and fully equipped. The encounter of excellent students and first-class researchers should contribute science & technology significantly not only in Japan but also ASEAN countries. Our study-program is trying to provide scholarships as much as possible. The main content of our educational program is innovation of energy and environmental materials such as solar cells, fuel cells, thermoelectric materials, magnetic materials, optical function materials, catalysts, and bio-materials. The educational program consists of three pillars; i) material designs by quantum-mechanics, physical chemistry, and organic chemistry, ii) material analyses by spectroscopy using synchrotron radiation facilities, high-resolution electron microscopy, and scanning probe microscopy, and iii) fabrication of devices and synthesis of functional materials. All lectures and seminars are performed in English. The feature of this course also includes participation of companies who have been active in business and are interested in friendship among Southeast Asia countries. Seminars to introduce one's own research will be held regularly in the presence of company people followed by Get-together party, where participants can communicate personally and company people can observe the growth of students in this program. The relationship between Japan and ASEAN countries will be increasingly important issues hereafter. This program makes a significant contribution to the development of human resources and revitalization of Japanese academia scene.

Introduction of Tsukuba Research Center for Energy Materials Science (TREMS) in University of Tsukuba

Takaki Kanbara

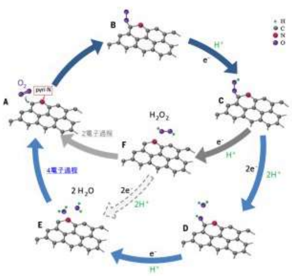
Tsukuba Research Center for Energy Materials Science (TREMS), Graduate School of Pure and Applied Sciences, University of Tsukuba, 1-1-1 Tennodai, Tsukuba,Ibaraki, 305-8573, Japan

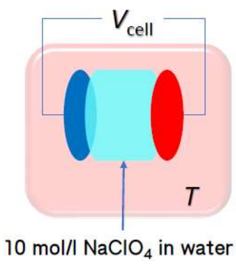
E-mail: kanbara@ims.tsukuba.ac.jp

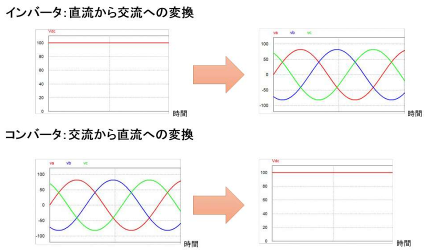
Tsukuba Research Center for Energy Materials Science (TREMS) is a research center which is founded in Faculty of Pure and Applied Sciences in University of Tsukuba. TREMS aims to create energy materials science for development of new sustainable materials and devices such as fuel cells, thermo-electric devices, and power electronics devices.

TREMS was rebuilt from Tsukuba Research Center for Interdisciplinary Materials Science (TIMS) in 2017; TIMS was established to commemorate the achievements of Prof. Hideki Shirakawa, who was awarded the Nobel Prize in Chemistry in 2000.

TREMS consists of three divisions, Molecular Designing of Materials Division, Energy Materials Division, and Electrical Energy Control Division; each division has an innovative project for development of new sustainable materials and devices. The center also has Integrated Fundamental Science Research Group to create innovations on the basis of interdisciplinary research and scientific principles. To achieve the innovative projects, we promote collaborative research.







Center of Innovative Nanostructures and Nanodevices (COINN): An Introduction

Mohamed Shuaib Mohamed Saheed,[1,2]

[1] *Center of Innovative Nanostructures and Nanodevices (COINN), Seri Iskandar, Malaysia*

[2] *Faculty of Engineering, Universiti Teknologi PETRONAS, Seri Iskandar, Malaysia*

E-mail: shuaib.saheed@utp.edu.my

Center of Innovative Nanostructures and Nanodevices (COINN) was established in 2009 and within short time, has become a nationally recognized center of excellence (COE) by Ministry of Science, Technology & Innovation (MOSTI) of Malaysia. COINN's mission is to produce diverse, well characterized, high-quality, reliable, and stable nanomaterials, nanostructures and nanodevices having specific properties and attributes which are reproducible and manufacturable through clearly defined, safe and cost-effective processes and assembly methods. This is ably supported by researchers from multidisciplinary backgrounds with a specific focus of developing nano-enabled technologies in the domain of healthcare, energy, and environment. COINN is currently headed by Dr Mohamed Shuaib. His research interests are mainly in the development and study of carbon-based nanomaterials such as CNT, graphene, MXene, and its hybrids for various applications in sensors (strain, gas, bio-), water remediation (oil, dye, heavy metals, organic solvents absorption/adsorption), and coatings (modelling and experimental work in anti-erosion).

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Development of Nanotheranostic at Research Center for Nanosciences and Nanotechnology - ITB

Heni Rachmawati
School of Pharmacy, Research Center for Nanosciences and Nanotechnology
Bandung Institute of Technology
h_rachmawati@fa.itb.ac.id

Theranostics is a term derived from a combination of the words therapeutics and diagnostics. In this emerging field of medicine, drugs and/or techniques are uniquely combined to simultaneously or sequentially diagnose and treat medical conditions. The concept of theranostics is the combination of both therapeutics and diagnostics in one package for image-guided therapy and also for defining the treatment outcome at an early stage, for instance in the treatment of cancer. To address that purpose, various nanomaterials are promising to employ in these two modalities. Currently, we are initiating to develop nanotheranostic-related project at our research center using curcumin as a raw material for quantum dot, aimed for covid 19 therapeutic approach. A great property of curcumin, a bioactive compound derived from tropical plant, enabling this material for nanotheranostic agent. Other potential of bioactive compounds will also be discussed in this presentation.

One-step Synthesis of Carbon-supported Electrocatalysts

Sebastian Tigges,[1] Nicolas Wöhrl,[1] Ivan Radev,[2]
Ulrich Hagemann,[1,3] Markus Heidelmann,[1,3] Saskia Heumann,[4]
Stanislav Gorelkov,[2] Stephan Schulz,[5] and Axel Lorke[1]

[1] *Faculty of Physics and CENIDE, University of Duisburg-Essen, Germany*

[2] *The hydrogen and fuel cell center (ZBT GmbH), Duisburg, Germany*

[3] *Interdisciplinary Center for Analytics on the Nanoscale, University of Duisburg-Essen, Germany*

[4] *Max Planck Institute for Chemical Energy Conversion, Mülheim a.d.R., Germany*

[5] *Faculty of Chemistry and CENIDE, University of Duisburg-Essen, Germany*

E-mail: sebastian.tigges@uni-due.de

The global fuel cell market size reached a value of USD 4.5 billion in 2018 and is projected to reach a value of US$ 9.5 Billion by 2024, registering a compound annual growth rate of 13.2% during 2019-2024[1]. One important focus of research in this field is the improvement of cost-efficiency through the development of new material systems and synthesis techniques to supply fuel cells for the broader market. However, cost, durability, and reliability are also parameters that decide about the market viability of fuel cells. Similarly, hydrogen must be produced cost-efficiently by water splitting in vast quantities to meet the future needs of the consumer. For fuel cells and water splitting alike, the long-term stability of the electrocatalysts during operation has yet to be sufficiently addressed. Here, we present a novel, one-step approach to synthesize a metal/C hybrid material for application in electrocatalysis by plasma-enhanced chemical vapor deposition from a single-source precursor (see Figure 1 below). Metal loading, degree of oxidation, and particle size distribution of the catalyst can be controlled. Exceptionally monodisperse size distributions of the metal nanoparticles are achieved. Due to the one-step nature of the process, the metal nanoparticles are incorporated into the supporting carbon, which improves long-term stability. By using different precursors, the versatile process can be easily adapted to deposit several metal/C-hybrids or bimetallic alloys for a variety of potential applications. Recent progress in the production of alloy/C-hybrids and the functionalization of the carbon support is discussed briefly.

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Design and build up the low-cost electrochromic device cycle lifetime testing apparatus

Huttakorn Wanichart,[1] Jarinya Yosthisud,[1] and Chumphon Luangchaisri[1]

[1]*Department of Physics, Faculty of science, King Mongkut's University of Technology Thonburi, Bangkok, Thailand.*

E-mail: huttakorn.fffeeyy@mail.kmutt.ac.th

The low-cost Electrochromic device cycle lifetime testing apparatus was designed and built up using a photo resistor (GL5528) and laser diode module (KY-008) as a light sensor and light source respectively. Photo resistor and laser diode were connected to the Arduino board and used LabVIEW programming to control and measure the light transmittance of the Electrochromic devices. The samples were tested inside the inspection box under a dark environment to prevent background light that can generate the noise signal when measuring the transmittance. The samples were prepared by DC-magnetron sputtering technique under the same conditions. The Electrochromic device consists of the multi-layers of thin film's structure (Glass/ITO/Ni_xO_y/Li^+ 0.5M/WO_3/ITO/Glass) which the same thickness of ITO, NiO and WO_3 is 150 nm. After that, the effect of applied potential on the cycle lifetime of Electrochromic device was studied. The samples were tested with the different applied potential of 1, 1.5, and 2 Volts. After testing the life cycle time of the samples with the homemade apparatus, it could be used to characterize the cycle lifetime and deterioration characteristics of the Electrochromic device automatically. The results showed that when comparing the discoloration, the higher the potential could make the sample achieved the greater intensity. However, the color state could reverse more than 200 cycles for 1 Volt, while at 1.5 and 2 Volts, the color state could reverse by 183 and 109 cycles, respectively.

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Centre of Research in Ionic Liquids (CORIL)

Khairulazhar Jumbri,[1,2]
[1] *Institute of Contaminant Management Seri Iskandar, Malaysia*
2 Faculty of Science & Information Technology, Seri Iskandar, Malaysia
E-mail: khairulazhar.jumbri@utp.edu.my

Dr. Khairulazhar Jumbri received his B.Sc (Petroleum Chemistry), with Honours and M.Sc. In Biocatalysis from the Universiti Putra Malaysia. He obtained his PhD in 2015 from the same university in the field of Physical Chemistry including Computational Chemistry, where he studied the behavior of biomolecules especially nucleic acids in ionic liquids by using both experimental and computational techniques. He is an associate member of the Royal Society of Chemistry (RSC), UK. Recently, Dr. Khairulazhar Jumbri has been shortlisted by the Academy of Science Malaysia (ASM) as one of the Malaysian candidates to attend the 67th Lindau Nobel Laureate Meeting. He has published several papers in recognized journals such as Physical Chemistry Chemical Physic (RSC), PloS ONE and Journal of Molecular Liquids (Elsevier).

Centre of Research in Ionic Liquids (CORIL) focuses on green initiatives and is geared towards sustainable techniques using ionic liquids. The centre's research comprises of fuel upgrading, biomass, CO_2 capture and green processes using ionic liquids. The centre also looks at ionic liquids toxicology and have built a library database for this. We aspire to become a Centre of Excellence (COE) that houses all ionic liquids activities.

Nano-structured Metal Oxides for Photocatalytic Conversation of Biomass to Fuel and High-value Chemicals

Surawut Chuangchote

Department of Tool and Materials Engineering, Faculty of Engineering, King Mongkut's University of Technology Thonburi, Bangkok, Thailand

E-mail: surawut.chu@kmutt.ac.th

Bioresource conversion has attracted much attention as one of promising platforms to produce renewable energy and chemicals in the future. Biomass consist of hydrocarbon compounds like fossil fuels, but its chemical compositions are different. Hydrocarbon compounds in biomass have been used as intermediate platforms molecules to produce fuels and chemicals. In addition, its components have been widely applied in fabrication of bio-based materials for energy storage device and solar energy conversion, such as batteries, supercapacitors, and solar cells. Photocatalysis is one of the most promising technologies, that uses light with catalysts to convert various bioresources to high value chemicals and fuels. TiO_2 is one of the most important metal oxide photocatalysts, that is used in many photocatalytic applications. It has been reported to be nanostructured in various forms, such as nanoparticles, nanorods, nanofilms, nanofibers, etc. Zero-dimensional nanomaterials have high surface area; while one-dimensional nanostructures, such as nanofibers, nanorods and nanotubes, have great basic properties, such as great electron transfer, low charge recombination, and easy recycling abilities. In this contribution, zero- and one-dimensional nanostructured TiO_2 were fabricated by solution processes. Important parameters of the fabrication processes were optimized to produce TiO_2 nanostructures with good properties, including small crystal phase, high crystallinity, and high surface area. Obtained zero- and one-dimensional TiO_2 nanostructures were characterized by scanning electron microscopy (SEM), transmission electron microscopy (TEM), BET-surface area technique, X-ray diffraction (XRD), UV-vis spectroscopy, and PL spectroscopy. Obtained TiO_2 nanostructures were utilized as photocatalysts for conversions of lignin, glucose, and water to high value chemicals and fuels (e.g. hydrogen). The modifications of TiO_2 materials were carried out for improvement of the ability of visible light absorption and increasing efficiency of catalysts for enhancing high photocatalytic activity.

A Highly Sensitive Humidity Sensor Based on AIE luminogen-appended Hygroscopic Polymer Microresonator

Airong Qiagedeer,[1] Hiroshi Yamagishi,[1] Minami Sakamoto,[2] Hanako Hasebe,[2] Fumitaka Ishiwari,[2] Takanori Fukushima,[2] and Yohei Yamamoto[1]

[1] *Department of Materials Science, Faculty of Pure and Applied Sciences, University of Tsukuba*

[2] *Laboratory for Chemistry and Life Science, Tokyo Institute of Technology*

E-mail: yamamoto@ims.tsukuba.ac.jp

Whispering gallery mode (WGM) optical resonators confine light via total internal reflection at the outermost surface of the resonator. This efficient light confinement strongly enhances light–matter interaction especially at the periphery of the resonator. Therefore, their unique spectral feature which strongly dependent on the size, geometry and refractive index of the resonator can be applied to highly sensitive chemical and physical sensing. Humidity is one of the major targets in the field of sensors because water molecules often affect the high precision manufacturing processes or chemical synthesis/purification processes. High precision and contact-free configuration of the WGM optical humidity sensors are particularly advantageous for this purpose. However, existing contact-free WGM humidity sensors often suffer from poor luminescence intensity and poor chemical robustness toward moisture uptake. To overcome these problems, here we newly design a hygroscopic polymer appended with aggregation-induced emission (AIE) luminogen and prove its excellent performance as a WGM humidity sensor. The newly synthesized polymer (PAA-TPE) is composed of poly(acrylic acid) and AIE luminescent branches. PAA-TPE microspheres, formed by sluggish self-assembly in solution, work as WGM resonators and exhibit peak shift when increasing or decreasing the surrounding humidity with a sensitivity as high as 255 pm/%RH, which is the highest value among the reported contact-free optical sensors. The sensitivity toward humidity is kept intact even after several cycles of absorption and desorption of water vapor.

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A labelled free electrochemical immunosensor based Cu-MOF nano sphere with amino functional ligand as biosensing platform for Hepatitis B Surface Antigen Detection

Muhammad Rezki [1], Brian Yuliarto [1, 2, a)]

[1] *Advanced Functional Materials (AFM) Laboratory, Department of Engineering Physics, Faculty of Industrial Technology, Institut Teknologi Bandung, Jl. Ganesha 10 Bandung 40132*
[2] *Research Center for Nanoscience and Nanotechnology (RCNN), Institut Teknologi Bandung, Jl. Ganesha 10 Bandung 40132*

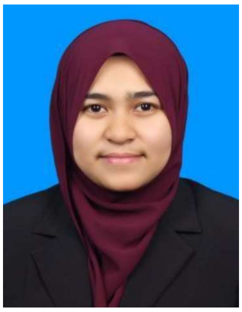
[a)] Corresponding author: brian@tf.itb.ac.id

ABSTRACT

A labelled free electrochemical immunosensor based Cooper Metal Organic Frameworks was constructed for the detection of Hepatitis B surface Antigen (HBsAg), The immobilization of antibody on electrode surface was successfully achieved using covalent interaction between carboxyl group of antibody and amino functional ligand in Cu-MOF via EDC/NHS coupling. The optimum amount of PVP and TEA successfully resulting nanosphere structure of Cu-MOF and displayed excellent electrocatalytic activity toward the analyte probe. The Cu-MOF nanosphere with amino functional ligand not only act as nanocarrier for antibody immobilization but also acts as electroactive material for electrochemical signal reporting. The electrochemical sensing performance was characterized by using Cyclic Voltammetry (CV), Electrochemical Impedance Spectroscopy (EIS), and Differential Pulse Voltammetry (DPV). The obtained current response proportionally decreases with the increase of HBsAg concentration, thus the quantitively HBsAg detection can easily achieved. This strategy successfully resulting wide linear range detection of HBsAg from 1 ng/ml to 500 ng/ml within Limit of Detection of 1 ng/ml. This approach is low cost, simple, and potentially to be applied in clinical analysis.

Keywords: Immunosensor, HBsAg, Cu-MOF, covalent immobilization, electrochemical detection

From Fatty Acid to A Promising Electrolyte: Bio-based Quaternary Ammonium Salt



F.N. Jumaah[1], N. N. Mobarak[2], N.H. Hassan[2], S.A.M. Noor[3], N.A. Ludin[1], K.H. Badri[2], A. Ahmad[1,2], M. Yoshizawa-Fujita[4], M.S. Su'ait[1]

[1]Solar Energy Research Institute (SERI), Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor, Malaysia
[2]Department of Chemistry, Faculty of Science & Technology, Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor, Malaysia
[3]Centre for Defence Foundation Studies, National Defence University of Malaysia, 57000, Kuala Lumpur, Malaysia
[4]Department of Materials & Life Sciences, Sophia University, 7-1 Kioi-cho, Chiyoda-ku, Tokyo 102-8554, Japan
corresponding author: mohdsukor@ukm.edu.my

Quaternary ammonium ion is one of the cations used in preparing ionic liquids, which commonly constructed from petrochemical products. Due to the resource depletion issue and the intense usage of QAS in various application, we explored the functionality of renewable materials which is fatty acid extracted from vegetable oil in synthesising bio-based quaternary ammonium salt (QAS). Lauric acid which is the major fatty acid component in coconut and palm kernel oil's composition was utilized and reacted with tris(3-aminopropyl)amine to obtain fatty amide. The quaternarization step was then proceed to produce QAS by reacting fatty amide with alkyl halide. The chemical structural and thermal properties of fatty amide and QAS were characterized using Fourier transform infrared (FTIR), nuclear magnetic resonance (NMR) spectroscopy and differential scanning calorimetry (DSC). Besides, the measurement of ionic conductivity was done in order to determine the electrochemical properties of bio-based QAS. The presence of significant peaks at 3294 cm^{-1}, 1639 cm^{-1} and 1546 cm^{-1} representing the peaks for N-H stretching, carbonyl amide stretching, and N-H bending, respectively from the FTIR analysis proved that fatty amide was successfully synthesized. The chemical structure of fatty amide and QAS is further confirmed by NMR spectrum. The DSC thermogram showed that QAS has a few solid-solid transitions which suggest to behave as ionic liquid crystal. The ionic conductivity of QAS obtained were 1.83×10^{-6} S cm^{-1} at 0 °C and increased to 8.15×10^{-5} S cm^{-1} at 60 °C. The potential bio-based QAS was further tested as electrolyte in dye-sensitized solar cell (DSSC) application. Interestingly, it showed a promising performance with the power conversion efficiency of 1.0%.

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Performance of Glycol-based Deep Eutectic Solvent in Extractive Desulfurization System

Mohd Faridzuan Majid,[1] Hayyiratul Fatimah Mohd Zaid,[2] and Chong Fai Kait[1]

[1] *Fundamental and Applied Sciences Department, Universiti Teknologi PETRONAS, Seri Iskandar, Perak, Malaysia*

[2] *Chemical Engineering Department, Universiti Teknologi PETRONAS, Seri Iskandar, Perak, Malaysia*

E-mail: hayyiratul.mzaid@utp.edu.my

The release of sulfur dioxide from fuel combustion is now becoming an environmental and human health concern. To encounter this, hydrodesulfurization (HDS) is implemented to produce low sulfur fuel oil, however it requires harsh operation conditions and hard to remove steric sulfur such as dibenzothiophene. Extractive desulfurization (EDS) is one of the alternative processes that have been explored to remove sulfur via extraction. Many researchers used organic solvent and ionic liquid as extractant in EDS, however it is unfeasible for industrial application due to the pricy solvent and high toxicity. Therefore, deep eutectic solvent (DES) was introduced as alternative solvent which is easy to synthesis and environmental-friendly. In this work, glycerol, ethylene glycol, tetraethylene glycol and poly(ethylene glycol) were mixed with tetrabutylammonium chloride to form EDS extractant. The thermal characterization, extractant formation, viscosity, density and DES performance in EDS was studied. Thermal analysis study revealed that higher ethoxy chains DES has higher thermal stability while fourier transformation infrared spectroscopy confirmed the formation of DES. Moreover, the density and viscosity of DES can be modified by changing the ratio of glycols. High extraction efficiency can be obtained using longer glycol chain at minimum ratio. Tetrabutylammonium chloride:poly(ethylene glycol) (1:2) was screened as the promising solvent with 93.89% sulfur removal within three extractions cycles. Response surface methodology was applied to study the sensitivity of operating parameters. Statistical analysis shows that DES volume was the most significant factor, followed by extraction temperature and PEG ratio. Removal of DBT can reached as high as 79.01% at 298 K, PEG ratio of 1 and DES volume ratio of 1. The present findings could provide valuable insight on the development of pragmatic EDS technology as a substitute to previous HDS process.

Laser-induced Restructuring and Defect Formation in Spinel Nanoparticles for Catalysis Research

Swen Zerebecki[1], E. Budiyanto[2], S. Saddeler[3], S. Salamon[4], H. Tüysüz[2], S. Schulz[3], H. Wende[4], S. Barcikowski[1], S. Reichenberger[1]

[1]Technical Chemistry I, Faculty of Chemistry, University of Duisburg-Essen and Center for Nanointegration Duisburg-Essen (CENIDE), 45141 Essen, Germany

[2]Max-Planck-Institute for Coal Research, 45470 Mülheim an der Ruhr, Germany

[3] AK Schulz, Inorganic Chemistry, Faculty of Chemistry, University of Duisburg-Essen

[4] AG Wende, Faculty of Physics, University of Duisburg-Essen

E-mail: swen.zerebecki@uni-due.de

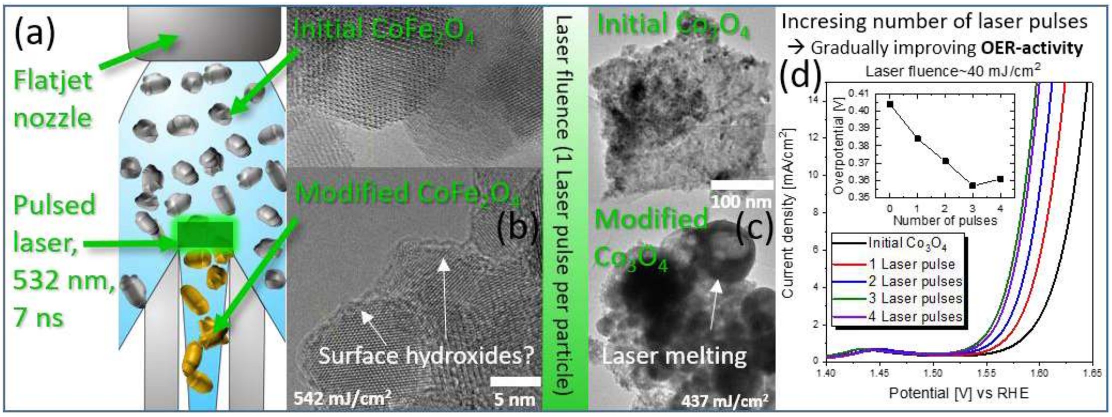

Figure 1: Pulsed Laser Post Processing of $CoFe_2O_4$ and Co_3O_4 for oxidation catalysis.

Understanding real structure-activity/selectivity correlations is a keystone in catalysis research for the development of tailored catalysts [1]. Pulsed Laser Post Processing (PLPP) has recently been applied as a promising tool to tune nanomaterials regarding e.g. optical and electro-chemical properties, phase composition, particle size, or defect density [2–5]. Modifying spinel nanoparticles with PLPP improves their catalytic activity regarding the electrochemical oxygen evolution reaction (Fig. 1d). Additionally, the implementation of a liquid flat-jet setup for a homogeneous excitation of colloidal particles by pulsed lasers in a continuous flow process is presented (Fig. 1 a).

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DEVELOPMENT OF COVID DETECTION USING SPR SENSORS: A PRELIMINARY RESULTS

Feraliana, Isa Ansori, Brian Yuliarto, Husna Nugrahapraja

Department of Nanocience and Nanotechnology, Institut Technologi Bandung

ABSTRACT

Coronavirus or SARS-CoV 2 is a virus from the Coronaviridae family that has been epidemic throughout the world since the end of 2019. The virus spreads ten times faster through human interaction than SARS-CoV. RNA sequence of Sars CoV 2 has 79,5% similarity with SARS-CoV. A fast and specific detection of SARS-CoV 2 is needed so that patient detection can be done quickly and accurately. One method that can be developed as a sars cov 2 biosensor is aptamers-based biosensors. Aptamers are artificial oligonucleic acid that can specifically bind to target molecules. Aptamers are easily chemically modifiable for increased stability and reduced toxicity. They show comparable affinity for target virus and better thermal stability than monoclonal antibodies. Those advantages make aptamers promising candidates in diagnostic and detection applications. The goal of this research was to use RNA aptamer as the specific recognition element in a portable surface plasmon resonance (SPR) biosensor for detection of SARS-CoV 2 in human. Aptamer RNA 3 SARS-CoV 2 was designed using the SARS-CoV 2 sequence from Gisaid using the in silico method. End of aptamer RNA 3 modified with dithiol. Then, the aptamer was immobilized on the gold nanoparticle sensor surface via Cysteine-dithiol binding. The RNA solution that had been extracted from swab samples, was diluted ten times before being used as a sample. The immobilized aptamer RNA 3 captured Sars CoV 2 in RNA solution, causing an increase in refraction index (RI). Aptamer RNA 3 was found to bind RNA virus of Sars CoV 2 where the positive sample of Sars Cov 2 has refraction index (RI) between 10 r.u – 30 r.u. Then the negative sample of Sars Cov 2 has refraction index (RI) between -5 r.u – 5 r.u.

Keywords: aptamer, RNA, small molecule, sensor, aptasensor, oligonucleotide, detector, biosensor

Overview and Timeline on the Development of Electrode Catalyst for Fuel Cells and Batteries

Nutthapon Wongyao[1]

[1]*Fuel Cells and Hydrogen Research and Engineering Center, PDTI,*
King Mongkut's University of Technology Thonburi,
126 Pracha-Uthit Rd., Bang Mod, Thung Khru, Bangkok 10140, Thailand
E-mail: nutthapon.won@kmutt.ac.th

The electrode materials of fuel cells and batteries are varieties. Look back on time with the analytical process revealed that some of the materials are still being used and grown until nowadays as Zinc (Zn), Manganese (Mn), Carbon (C), Nickel (Ni), Platinum (Pt), etc. Why they have been stilled and What benefit of those metals are questions that what should be focused on and try to understand about them. Besides, the important thing about that is because these materials can change the world in terms of energy technologies. Moreover, each decade shows what innovation happens and how hard the research tries to develop electrical storage and/or to produce the direct current for a good living choice and shift the society forward to the smart things in the civilized city.

NickelPalladium–reduced graphene oxide as cathode for dye-sensitized solar cells

M.Y.A. Rahman[1*], U.A. Kamarulzaman[1], M.S. Su'ait[2], A.A. Umar[1]

[1]*Institute of Microengineering and Nanoelectronics (IMEN),*

Universiti Kebangsaan Malaysia, 43600, Bangi, Selangor, Malaysia

[2]*Solar Energy Research Institute (SERI),*

Universiti Kebangsaan Malaysia, 43600, Bangi, Selangor, Malaysia

E-mail: mohd.yusri@ukm.edu.my

In this work, nickel-palladium (NiPd) alloy-reduced graphene oxide (rGO) composite has been prepared via liquid-phase deposition (LPD) technique and applied as counter electrode (CE) of dye-sensitized solar cell (DSSC). The effect of Ni content on the properties of the composite and the performance of the device utilizing the composite CE has been investigated. The morphology of the composite is described by rumples and white strips distributed on the ITO surface. The device utilizing the CE prepared with the Ni:Pd ratio of 20:1 owns the highest power conversion efficiency (η) of 2.13%. This is due to this device possesses the lowest series resistance (R_s) of 84.6 Ω and the highest incident photon conversion efficiency (*IPCE*) of 11.5%. The findings of this work reveal that NiPd-rGO composite has potential to substitute platinum (Pt) as CE of DSSC since its η is comparable to that of Pt based device.

Development of pressure-sensitive heat storage materials using a bistable property

Hiroko Tokoro,[1] Yusuke Araki,[1] Shin-ichi Ohkoshi[2]

[1] *Department of Materials, Faculty of Pure and Applied Sciences, University of Tsukuba, Tsukuba, Japan*

[2] *School of Science, The University of Tokyo, Tokyo, Japan*

E-mail: tokoro@ims.tsukuba.ac.jp

Phase transition is an attractive issue in the fields of physics, chemistry, and materials science. Phase transition is controlled not only by temperature change but also by external stimulations, such as pressure application, light irradiation, and electric current flow. In the recent years, heat storage material has been drawing one's attention from the viewpoint of saving energy. Usual heat storage materials release heat over time and cannot store the energy for a prolonged period. If a solid material could conserve the accumulated thermal energy and release it only when demanded, then its heat storage application potential is considerably widened.

From this angle, we developed a heat storage bistable material of titanium oxide, that can preserve the heat energy for long periods and can release the preserved heat energy by extremely small pressure applying of 60 MPa.[1] This developed heat storage bistable material of titanium oxide is composed of common elements (titanium and oxygen), it is safe and environmentally friendly. Hence, this heat storage bistable oxide has the potential to be employed as the novel material that can effectively recycle the waste-heat energies, generated in factories and solar power generation system. In this lecture, I will also introduce our recent researches.[2,3]

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