Introduction and Abstract of Plenary and Keynote Speakers (ICEIT 2020)

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Introduction of plenary speaker

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1982; Dr. Eng., Nagoya University, Graduate School of Engineering
1982; Research Associate, National Research Council of CANADA
1984; Assistant Professor, Tokyo Institute of Technology
1988; Associate Professor, Nagoya University
2004; Professor, Nagoya University
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2017; President, National Institute of Technology, Toyota College

Area of Research and Education
Chemical reaction engineering, Chemical engineering,
Applied chemistry, Green and sustainable process,
Engineering education
Early Engineering Education in National Institute of Technology (Kosen) Toyota College

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HIGHLIGHTS

• Early engineering education in NIT(Kosen) college, Japan
• Collaborative education program in Toyota college

ABSTRACT

National Institute of Technology Colleges (Kosen) is a unique Japanese higher educational institute for engineering education founded in 1961. There are 51 NIT colleges across Japan and recently several Kosen colleges were established in Asian countries including Thailand. The colleges accept students from junior high school at age of 16 and give a five years higher engineering education. One department consists of 40 students and one college usually operates 4-5 departments. Therefore only one percent of the same age population have a chance to get early engineering education in a small-size class of Kosen college. These colleges share main core curriculum as well as their original education contents. Inter-college contests such as famous Robot contest, Programming contest, Design competition and so on are highlights of Kosen education.

NIT(Kosen) Toyota College locates in the city of Toyota which is a home of Toyota Motor Corporation. With five engineering departments such as Mechanical, Electrical and Electronic, Information and Computer, Civil, and Architecture, Toyota College provides unique education in collaboration with local corporations such as long term internship. In this lecture, the characteristic early engineering education system of NIT(Kosen) college is summarized and several practical examples among education programs in Toyota College are introduced.

Keywords: Engineering education; NIT(Kosen) College, Japan; Collaborative education program
The 1st International Conference on Engineering and Industrial Technology 2020 (ICEIT 2020) 
11-13 September 2020, Thailand 

Introduction of plenary speaker 

Prof. Dr. Qingyuan WANG 

President of Chengdu University, Sichuan, China. Elsevier highly-cited scholar in China (2014-2019). VHCF6 Chairman of the Sixth International Super High Cycle Fatigue Conference. Ph.D. in the major of Materials and Mechanics, Ecole Centrale Paris, Paris, France. Postdoctoral fellow at Purdue University and JSPS researcher at Kagoshima University. Prof. Qingyuan Wang has served and is still serving in many professional and academic organizations. Prior to Chengdu University, he was Dean of the School of Architecture and Environment at Sichuan University. He is also a significant member of the academic Evaluation Committee of the State Council Academic Degrees Committee in China. As an excellent researcher, he has put his focuses on investigating mechanical problems of new materials and structures, ultra-long life fatigue and reliability, new methods and apparatus for experimental mechanic, etc. Including key and major projects, he has accomplished 8 projects of National Natural Science Foundation, published more than 200 SCI papers, and been cited more than 2000 times from 2014 to 2019. He was the recipient of various awards, such as First Prize of the Ministry of Education Natural Science Award (2006, China), and First Prize of Sichuan Science and Technology Progress Award (natural science category) (2014, China), and Second Prize of National Natural Science (2018, China). He was also one of the winners of the Chinese National Outstanding Youth Fund and Chang Jiang Scholar and Leader of Innovation Team from the Ministry of Education, P.R.C.
Fundamentals of Very High Fatigue and
Its Engineering Application

Qingyuan Wang

ABSTRACT

Mechanical structures of key projects in high-speed rail, aerospace, and automobile industries put forward higher requirements for reliability and long life. The problem of very high cycle fatigue (VHCF) has recently attracted significant attention and special research from scientists and engineers. This lecture summarized our research progress on the development of ultrasonic-accelerated vibrational fatigue testing methods in the loading modes of tension-tension, bending and torsion, which have been successfully coupled with complex environments such as corrosion, vacuum, high pressure and high temperature. Furthermore, the VHCF properties including S-N curves, crack initiation and propagation mechanism at multi-scales and life prediction models based on different physical mechanisms were presented for high strength metallic materials. The research results have been successfully applied to the life assessment of major equipment such as aero engines, gas turbines, bridges, etc.

Keywords: Very high cycle fatigue; ultrasonic fatigue test; fatigue crack initiation; life prediction.
Introduction of plenary speaker

Prof. Dr. Mamoru YAMADA

Thermotolerant fermenting microbes bear the potential to efficiently produce useful materials under stress conditions, including heat stress. We have thus been exploring such microbes in tropical countries that are considered to adapt to high temperature environments, for over 20 years. The number of publications relating to thermotolerant microbes in the world is increasing to more than 200 articles per year, and their potential for industrial applications is further enhanced by combination with abiotec advanced technologies. In my talk, I will introduce high-temperature fermentation with thermotolerant microbes, bioethanol production, the improvement of their stress tolerance and several types of experiments for industrial applications.

Mamoru Yamada graduated from Biochemistry Department, School of Medicine, Yamaguchi University in 1984. He became the Assistant Professor of the same University in 1984, worked in University of California at San Diego from 1985 to 1987, and was promoted to Associate Professor in 1990 and Professor in 2001. He performed Director of Science Research Center from 2009 to 2012, Dean of Faculty of Agriculture from 2012 to 2016 and Director of Research Center for Thermotolerant Microbial Resources from 2019 in Yamaguchi University, and is also Senior Presidential Advisor (International Cooperation for Bioscience) from 2017 in the same University. He organized the Asian Core Program (2008-2012) among Japan, Thai, Lao and Vietnam, which was supported by JSPS and NRCT, the Asian Science & Technology Strategic Cooperation Promotion Program (MEXT-ARDA project) (2010-2012), which was supported by MEXT and ARDA, to develop high-temperature fermentation technologies, and the Core to Core Program (2014-2018) among 7 countries including Japan, Thai, Lao, Vietnam, Germany, Indonesia and United Kingdom, which was supported by JSPS, NRCT, MOST in Vietnam and Core Universities involved in its program.
Plenary Speaker

High-temperature Fermentation with Thermotolerant Microbes for Industrial Applications

Mamoru Yamada*

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HIGHLIGHTS
• High-temperature fermentation (HTF) and its several benefits
• Thermotolerant microbes for HTF and thermal adaptation
• Combination of HTF with abiotec advanced technologies

Bioconversion of biomass to useful materials is strongly recommended under global warming but it is still costly and inefficient. Utilization of biomass thus requires innovative ideas and technologies. As one of the technologies, high-temperature fermentation (HTF) is attracting attention, which is expected to bring several benefits including cooling cost reduction, water saving, hydrolytic enzyme cost reduction, and consequently overall running cost reduction. Moreover, in combination with abiotec advanced technologies, we can establish HTF-based new technologies. However, the development of thermotolerant and efficiently fermenting microbes is essential for HTF.

The global demand for bioethanol is growing rapidly, and a variety of biomass applications require energy-saving and efficient production processes. We have thus screened thermotolerant microbes from tropical environments and developed HTF technology for ethanol production and fermentation processes including temperature-non-controlled fermentation, combination of HTF with distillation under a low pressure (1-4) and combination of HTF with membrane separation. On the other hand, to improve thermotolerance and stress-tolerance for more stable fermentation, the thermal adaptation of isolated thermotolerant microbes was performed and genes responsible for the adaptation were analyzed (5-10).

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2. M. Murata et al., Jpn. Inst. Energy, 94:1154-1162 (2015)
3. M. Nurcholis et al., Appl. Microbiol. Biotechnol. (Review), doi.org/10.1007/s00253-019-10224-3 (2019)
4. T. Kosaka et al., In Fuel Ethanol Production from Sugarcane. ISBN: 978-1-78984-937-0 (print) 978-1-78984-937-7 (online) IntechOpen, pp121-154 (2019)
5. M. Murata et al., PLoS ONE, 6(6): e20063 (2011)
6. W. Soemphol et al., Biosci. Biotechnol. Biochem., 75:1921-1928 (2011)
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9. M. Murata et al., PLoS ONE, doi.org/10.1371/journal.pone.0189487 (2018)
10. T. Kosaka et al., PLoS ONE, doi: 10.1371/journal.pone.0215614 (2019)

Keywords: thermotolerant yeast; high-temperature fermentation; thermotolerance

Acknowledgment

The study was supported by e-Asia joint research program (e-Asia JRP) and by Advanced Low Carbon Technology Research and Development Program (ALCA).
Introduction of plenary speaker

Prof. Dr. Suttichai ASSABURUNGRAT

Dr. Suttichai is a professor at Department of Chemical Engineering, Faculty of Engineering, Chulalongkorn University. He received his B.Eng. degree from Chulalongkorn University, and M.Sc. and Ph.D. degrees from Imperial College London. His research interest is on process intensification with particular focus on multifunctional reactors. He has published more than 290 peer-reviewed journal-proceedings articles and book chapters. He is now working on several projects, for examples, hydrogen production technologies, biodiesel production, biorefinery and CO₂ capture and utilization. He has received a number of awards such as Outstanding Paper Award from Journal of Chemical Engineering of Japan, and Young Scientist and Outstanding Scientist Awards from the Foundation for the Promotion of Science and Technology under the Patronage of His Majesty the King. He is a working committee member of Thai Academy of Science and Technology Foundation.
ABSTRACT

Thailand is attempting to drive the country under the Bio – Circular – Green (BCG) economy model which offers a sustainable growth based on its immense wealth of natural and bio-resources and less dependence on fossil-based resources. Transforming the existing fossil-based economy to the BCG economy requires great effort, interaction and collaboration between different players on various levels. Although it provides a new opportunity for industry, research, policy and financing stakeholders to work together to design new values for the country, the successful implementation of this concept nowadays is still rare as it requires many key elements for achievement such as advanced and multidisciplinary technologies, talented human resource, and strong public and private partnership. BCGeTEC was recently established aiming at supporting this transformation to BCG economy. Based on our strong academic and research background on chemical engineering, BCGeTEC focuses on collaborative research and innovation between different disciplines and institutions nationally and internationally. It also aims at extending from fundamental research in laboratory to industrial scale to achieve high impact to the economy. In addition, BCGeTEC supports the human resource development through training and education. Our Objectives and Key Results (OKR) as well as activities will be introduced.
Dr. Armando T. Quitain is currently a Professor at the Center for International Education, Kumamoto University (Kumamoto, Japan). His research interests are centered around development of green technologies based on microwave carbocatalysis and supercritical fluids as applied to biomass conversion. He is currently the Lead Principal Investigator of the e-ASIA Joint Research Project on Alternative Energy (Bioenergy): “Development of Algal Bioenergy Systems for Green and Sustainable ASEAN Region”, which aims to convert algal biomass into biofuels and biochemicals. He is also collaborating with Kyoto University for Japan-ASEAN Science and Technology Innovation Platform (JASTIP) program to strengthen research collaboration among Japan and ASEAN universities. As a Japan Society for the Promotion of Science (JSPS) Scientist for Joint International Research, he is also collaborating with top researchers from Germany and Spain on CO₂ utilization and conversion technologies. All these research activities are in accord with the UN Sustainable Development Goals, which forms the “blueprint for a better and more sustainable future for all.”

Student mobility is also in his portfolio, developing exchange programs (outbound and inbound) to cultivate “global mindset” to future global STI leaders that will promote sustainability in the region and beyond.

He has been exploring many challenges that Japan could offer for over 24 years to date.
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11-13 September 2020, Thailand

Plenary Speaker

Globalizing Kumamoto University’s Advanced Green Technologies for Biomass Utilization

Armando T. Quitain

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Asian Region

Potential of Biomass Energy in the World

Source: AST Biomass Energy (2009)

Biomass

- Sustainable energy from biomass

- Carbon neutral feedstock for fuels and chemicals production

21st Century Asia

(Asia as a World Economy)

Asian Biomass Potential

Overdependence of chemical industries on nonrenewable fossil fuels such as crude oil or natural gas could further exacerbate global warming due to increasing amount of CO2 gas emissions, which add up to those already in the atmospheric cycle. Biomass-based chemicals and fuels have been proposed as alternatives which can be produced from the lignocellulosic components and their derivatives.

Kumamoto University’s Advanced Green Technologies

Supercritical Fluid

Microwave

Carbocatalysis

Tunable Physical Properties

1. Selective Heating
   - Direct heating of polar compounds, thus increasing reaction rate
   - High yield/low purity, energy efficient
2. Internal Heating
   - Heat flow (inside-out)
3. Rapid Heating
   - Quick start of reaction
   - Quick stop

The synergy of microwave and surface functionalized carbon-based catalyst (GO) can significantly accelerate the reaction.

Globalizing the Technologies

Mixed CO2-H2O Synergy

Microwave Carbocatalysis

Cross-Cultural and Multidisciplinary Approach

Acknowledgment

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KIDA Laboratory
https://www.kida-ed-kumamoto.com/sip-page

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Introduction of plenary speaker

ChM. Dr. LIM JUN WEI

ChM. Dr. LIM JUN WEI (AMIChemE, MRSC) was conferred with the Bachelor of Science (Hons) degree in Chemistry from Universiti Sains Malaysia in year 2009. He later received his Ph.D. qualification in Environmental Chemistry from the same university in year 2013. Currently, he is affiliated with the Department of Fundamental and Applied Sciences, Universiti Teknologi PETRONAS, serving as the Senior Lecturer and Cluster Leader of Applied Chemistry program. His major research interests are insect-based biological compounds, bioremediation of solid wastes and wastewaters and microbial biofuels. Accordingly, he has published more than 100 research papers inclusive of book chapters of late. In terms of professional associations, he is the Associate Member of Institution of Chemical Engineers (AMIChemE) and Member of The Royal Society of Chemistry (MRSC) at international level and Professional Chemist registered with Institut Kimia Malaysia at national level. He is also one of the Graduate Technologists under the Malaysia Board of Technologist. Besides, he has joined the Editorial Board Members of Chemical Science and Biomolecular Engineering under Boffin Access and Archives of Biochemical Engineering under Somato Publications.
ABSTRACT

The rapid progress of civilization has inevitably resulted in pervasive environmental pollutions. Off late, various anthropogenic pollutants have been directly or indirectly discharged into the soil, water and air mediums with the quantities depending on the extent of socioeconomic developments. To reciprocate in cushioning the untoward impacts on the environment, also myriad treatment approaches have been employed to remove, if not to degrade the pollutants until reaching the innocuous level. Unconsciously, some of the adopted physicochemical approaches may generate secondary pollutants or intermediates which are more debilitating to the environment. Viewing from the sustainability perspective, the imprudent options may as well entail intensive energy requirements which are not cost-effective in the long run. Ideally, the Green Chemistry mode of remediations via bioconversion has been extensively explored in proffering insights and novel solutions that will help addressing the pressing concerns associated to the environmental pollutions. However, the common trade-off incurred by the bioconversion such as long bioremediation time need has limited its feasibilities for real applications; albeit having a cost advantage. Therefore, it is of great interest to delve into spurring the metabolisms of targeted macroorganisms/microorganisms employed to execute the bioconversion processes. The pollutants in the form of wastes are anticipated to be bioconverted into the innocuous by-products with portions being assimilated to produce new biomass for growing mediators’ cells. In closing the loop, the generated biomass should be further exploited for the production of valuable products, advocating the wastes to valuable resources model. While the research focus in recent years is all about green and environment, the future trend for bioremediation paves smoother path by the sustainable bioconversion.
Introduction of plenary speaker

Prof. Dr. Piyasan PRASERTHDAM

Professor Piyasan Praserthdam is a professor at the Department of Chemical Engineering, Faculty of Engineering, Chulalongkorn University, Thailand. In 2019 Professor Piyasan served as the President of the Catalysis and Reaction Engineering Association, Thailand. He also served as the Dean of the Faculty of Engineering and Industrial technology during 2001-2002. In addition, he is the first president of the Thai Institute of Chemical Engineering and Applied Chemistry (TIChe).

About his research, he focuses on heterogeneous catalysis applied in industries and also catalyst deactivation. He published more than 400 international peer-reviewed articles and 3 patents and have been awarded the Thailand outstanding scientist award in 2009. In industry aspect, he has been a consultant in various chemical engineering related companies and has been working together with the Thai company in the development of new catalysts research with more than 15 million US of funding from industries.

Internationally, Prof. Piyasan is the Chairman of the 8th Asia Pacific Congress in Catalysis with more than 600 researchers attended.
Plenary Speaker

ENTECH Moving Forward: Outside-in and Inside-out Approach

Piyasan PRASERTHDAM

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ABSTRACT

Here we present three principles for effective materials and energy utilization based on the modified second law of thermodynamics: (1) If the potential of the system changes, the potential of the surrounding will change in opposite direction, (2) The process that has largest change in potential will be the best one, and (3) The product from the smallest change in potential will be the highest value. These new criteria are realized through the parameter called the potential index (θ*) assigned to explain natural processes in the world and identify preferable processes used instead of the typical efficiency parameter. In addition, the term integrates the knowledge of mechanical, electrical and chemical engineering by describing satisfactory transformation processes that are well-known in mechanical and electrical engineering, and also the increasing potential processes familiar in chemical engineering. Interestingly, such principles can also be applied for the management of ENTECH, Silpakorn University
Introduction of plenary speaker

Assoc. Prof. Dr. Anongnat SOMWANGTHANAROJ

Anongnat is an Associate Professor at the Department of Chemical Engineering, Faculty of Engineering, Chulalongkorn University, Thailand. She obtained a doctorate degree in Macromolecular Science and Engineering Program, University of Michigan, Ann Arbor, USA in 2003. Her research interests are in the field of polymer engineering, plastic packaging, bioplastic, adhesive for electronics, battery and plastic recycle. She has served as as Associate Dean in Research Affairs since July 2016. From her research, she has co-found Garden Fresh spin-off startup in November 2018. Garden Fresh offers the biodegradable plastic bags that can extend shelf life of fresh produce.

She has been active in research work since 2004 and until now she has been granted 33 projects from both domestic and international funding agencies and industries. She published 44 articles in international journals. Two US patents have been grants and 7 Thai patents are being in the process. She also serves as a reviewer for both international journals & conferences as well as domestic and international funding. She has served as an Associate Member, Thai Academy of Science and Technology Foundation since 2010 and as a reviewer board, Polymers, MDPI since early 2020.

She has received several awards including

- Gold medal, 47th International Exhibition of Invention of Geneva, Switzerland, April 2019
- The runner-up in the MIT Enterprise Forum, IDE Competition 2018, The Innovation-Driven Entrepreneurship (IDE) Center
- The runner-up in the Thailand Research Fund’s Leaders in Innovation Fellowships “Final Business Model Pitch,” Leaders in Innovation Fellowship (LIF) programme by TRF and Newton Fund
- Outstanding Research Utilization of social and/or industry Award, Ratchadaphiseksomphot Endowment Fund of Chulalongkorn University, 2014
- Invention award, National Research Council of Thailand, “Bioplastic packaging bags for extending shelf life of fresh produces and dried fruits,” 2015
- Fellow in Materials Science, L’Oreal for Woman in Science 2009, L’Oreal Thailand and United Nations Education, Scientific and Cultural Organization (UNESCO) in the topic “Development of PLA/clay nanocomposite films to use in film packaging application,” 2009
- The first runner up, PTT Chem Green Innovation Award, “Using polymer/clay nanocomposite as packaging film,” December 12, 2008
- Royal Thai Scholarship, Ministry of Education, Royal Thai Government, 1997–2003
- Xerox Corporation Award in recognition of academic excellence, 2002
Coverall and N95 Mask Innovation & Production’s Journey in Thailand during COVID-19 Pandemic

Anongnat Somwangthanaroj

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ABSTRACT

During COVID-19 pandemic in Thailand, we have found out that we did not have both factory and testing lab for the PPE. Fortunately, the governmental science service sector and the university have both practical professionals and sufficient equipment so we can adapt the available machines to perform several important tests to make sure that both N95 mask and coverall PPE meets the standards to protect our medics who are frontline in this situation. In addition, for the isolation gown and coverall PPE, we have all component in the supply chains starting from plastic production, film and laminated film factory and garment factories and all private sectors work closely for a greater good. However, there is still one more challenge, N95 mask production. From upstream (plastic production) midstream (meltblown nonwoven fabric production) and downstream (N95 mask fabrication line), at present, we have only one N95 mask production factory in Thailand which just began commissioning in late July 2020. We still have work to do to make sure that our medical staff will have high quality protective equipment.
The 1st International Conference on Engineering and Industrial Technology 2020 (ICEIT 2020)
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Introduction of plenary speaker

Dr. Prapapong VANGTOOK

Education: Doctor of Engineering (Energy Technology): Asian Institute of Technology (AIT), Pathumthani, Thailand, 2005.
Master of Mechanical Engineering: King Mongkut’s Institute of Technology North Bangkok (KMITNB), Bangkok, Thailand, 1997.
Bachelor of Mechanical Engineering: Kasetsart University, Bangkok, Thailand, 1994.

Employment/Experience:
Present Engineer Level 10, Research and Innovation Division, Electricity Generating Authority of Thailand (EGAT), Nonthaburi, 11130 Thailand
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Speaker
• Sharing session on good practice of inter-stakeholder collaboration – government sector’s perspective, the 27th annual meeting of renewable energy sub-sector network, Asean Centre for Energy (ACE), 2020
• Thailand wind energy industry: The outlook in Future Energy Show Thailand at IMPACT Convention Centre, 2019

Training
• Join The 11th International Warsaw Invention Show (IWIS), Poland 2017
• Join The 8th International Exhibition of Inventions – Kunshan (IEIK), China 2014
• Technical site visited, Electric Supply Industry Technology, Smart grid Technology, High Voltage Power Laboratory and Research and Technology, France, Switzerland, Germany and, Netherland 2011
• Topic is Renewable Energy and Energy Efficiency by the ITEC (Indian Technical and Economic Cooperation programme), TERI (The Energy and Resources Institute), New Delhi, India 2010
• INSA (Institut National des Sciences Applique’es de Lyon), France 2002

International Paper Published
• Thermal comfort assessment and application of radiant cooling: A case study, Building and Environment, Vol.43, No.7, pp. 1188 – 1196 R.A.Memon, S.Chirarattananon and P.Vangtook, 2008
• Application of radiant cooling as passive cooling option in hot humid climate. Building and Environment, Vol.42, No.2, pp. 543-556 P.Vangtook and S.Chirarattananon, 2007
• An experimental investigation of application of radiant cooling in hot humid climate. Energy and Buildings, Vol.38, Issue 4, pp. 273 - 285 P.Vangtook and S.Chirarattananon, 2006
• Thermal comfort assessment in two tropical regions and radiant cooling as a passive cooling option, network for comfort and energy use in buildings, windsor conference, S.Chirarattananon, N.N.Htan, R.A.Memon, and P.Vangtook, 2006

Association Committee
• Committee: Electricity Supply Industry Association of Thailand (TESIA), 2009 – 2014
• Committee: Electricity Supply Industry Association of Thailand (TESIA), 2020 – 2022
ABSTRACT

The research and development department of Electricity Generating Authority of Thailand (EGAT) were established in 1987. Between 1987 - 2006, only EGAT staffs were the participants for the research to solve the work problem. From 2006 to the present, EGAT fund, for EGAT employees and other institutions, has set at least 3% of the net profit annually which also has continuously supported the research and development projects to promote the electrical innovation for prosperity in Thailand. The scopes of work are the generation system, transmission system, power plant development and renewable energy, power business, social and environment, and fuel. To improve Thai people’s living quality, the research will be emphasized on six main purposes as following:

- To replace import of electrical power technologies, materials, and equipment.
- To contribute for peak cuts or improved energy efficiency.
- To develop new energy alternatives for electricity generation.
- To improve efficiency and/or lower production cost.
- To prevent and mitigate environmental and social impacts caused by power operations and associated activities.
- To support social research for the quality development of community life around EGAT’s power plants

The Benefit of the innovation from the research that EGAT provide sponsorship is one of the most important strategy of the strategic plan to drive EGAT to be the national leader. At the present, EGAT has given financial support over 450 projects to support the innovation and development of technology in electric generating and environment conservation, sustainable energy, and social responsibility.
KEYNOTE SPEAKERS
Introduction to Keynote Speaker

Prof. Dr. Tetsuya KIDA

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Educational Backgrounds
1994, B. Eng., Kyushu University, Japan
1996, Ms. Eng., Kyushu University
2001, Ph.D., Kyushu University (supervisor: Prof. Noboru Yamazoe)

Field of Research
Synthesis of inorganic nanomaterials such as quantum dots, oxide nanostructures, and graphene oxide, and their applications for energy devices, gas sensing, gas separation, etc.

Biography
2001-2003: Postdoctoral Fellow, Postdoctoral Fellow, National Institute of Advanced Industrial Science and Technology, Japan
2003-2006: Assistant Professor, Department of Chemistry and Applied Chemistry, Saga University, Japan
2006-2013: Associate Professor, Department of Energy and Materials Sciences, Kyushu University, Japan
2010-2011 (13 months): Visiting Scholar, Materials Sciences Division, Lawrence Berkeley National Laboratory, USA
2013-present: Professor, Division of Materials Science, Faculty of Advanced Science and Technology, Kumamoto University, Japan
2016-2016 (1 month): Visiting Professor, Department of Chemical Engineering, Chulalongkorn University, Bangkok, Thailand
2017-2017 (6 months): Visiting Professor, Institute for Chemical Investigation of Catalonia (ICIQ – Institut Català d’Investigació Química), Tarragona, Spain.

Latest publications
1. N.L. Hamidah, M. Shintani, A.S.A. Fauzi, G.K. Putri, S. Kitamura, K. Hatakeyama, A.T. Quitain, M. Sasaki, T. Kida, Graphene Oxide Membranes with Cerium-Enhanced Proton Conductivity for Water Vapor Electrolysis, ACS Applied Nano Materials, 3, 5, 4292–4304 (2020).
2. A.D. Pramata, K. Suematsu, A.T. Quitain, M. Sasaki, T. Kida, Synthesis of Highly Luminescent SnO2 Nanocrystals: Analysis of their Defect-Related Photoluminescence Using Polyoxometalates as Quenchers, Adv. Funct. Mater., 28, 1704620 (2018).
3. T. Kida, Y. Kuwaki, A. Miyamoto, N.L. Hamidah, K. Hatakeyama, A.T. Quitain, M. Sasaki, A. Urakawa, Water Vapor Electrolysis with Proton-Conducting Graphene Oxide Nanosheets, ACS Sustainable Chem. Eng., 6, 11753-11758 (2018).
Energy Applications of Graphene Oxide Nanosheet Membranes

Tetsuya Kida*

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HIGHLIGHTS

• A fast proton conductor based on graphene oxide (GO) is developed.
• Stacked GO nanosheet membranes sandwiched with electrocatalysts efficiently electrolyze water vapor into hydrogen with a 100% Faradaic efficiency.
• Mixed conducting GO membranes selectively separate hydrogen from mixed gases without electrical power.

ABSTRACT

A two-dimensional nanosheet of graphene oxide (GO) has attracted a great deal of attention due to its potential versatile applications. GO contains only earth abundant, non-toxic element of carbon. It can be synthesized from graphite by simple chemical processes including oxidation and exfoliation. These advantages make GO promising alternative to rare and expensive materials that are used for some applications. One of the novel properties of GO is its high proton conductivity, allowing GO to be used as proton exchange membranes for fuel cells. The proton conductivities arise from proton hopping at oxygen functional groups originally anchored to the GO surface. Epoxy groups are regarded as major proton hopping sites on graphene oxide. We also reported that the proton conductivities can be tuned by changing the oxygen content in GO. The partial reduction makes GO a mixed conducting material that shows protonic and electronic conductivities. Using GO’s high proton conductivity that is comparable to Nafion, we are attempting to develop new carbon-based electrochemical devices such as water electrolysis devices, hydrogen sensors, and hydrogen separation devices, as schematically shown in Fig.1.

The membrane showed a good proton conductivity at room temperature, as revealed by concentration-cell measurements and complex impedance spectroscopy. The proton conduction in the GO membrane was confirmed by proton pumping experiments. The membrane was applied for water vapor electrolysis at room temperature. The GO device showed good hydrogen and oxygen evolution rates that are close to the theoretical values. The membrane with Pt/C also showed good sensitivity to hydrogen. The results successfully demonstrate the promising capability of GO as alternative to Nafion in producing hydrogen from water vapor by electrolysis and detecting hydrogen in air.

Keywords: Graphene oxide; proton conductor; water vapor electrolysis; separation membrane

Fig.1 Developed applications of graphene oxide.
Introduction to Keynote Speaker

Li Jian

Li Jian is a professor in the school of mechanical engineering, Chengdu University, China and he previously served as the dean of the school of mechanical engineering.

Professor Li Jian's main research focuses on the modern design of mechanical transmission mechanism, mechanical CAD/CAM, and integrated manufacturing technology, etc. In recent years, he studied different types of spatial cam mechanisms and established a unified mathematical model of spatial cam mechanisms cam, NC machining cutter path, machining error analysis, and surface contact stress analysis in 3D space. The research goal is to form a CAD/CAM system capable of designing and manufacturing digital cam mechanisms for engineering application. He has presided over or participated in numerous scientific research projects including a few funded with the National Natural Science Foundation of China, and his research have been applied in the industrial fields widely.

Recently, Professor Li Jian organized and completed the engineering education professional accreditation of mechanical design, manufacturing and automation specialty in Chengdu University. In June 2020, the Ministry of Education announced that it had passed the professional accreditation of China's higher education. He has presided over and completed multiple high education reform projects including the curriculum reform project of the Ministry of Education of China.

Professor Li Jian serves as an executive director of Southwest Automation Society of Chinese University. He is a member of China Society of Mechanical Engineering, Sichuan Mechanical Engineering Society of China, and Academic and Degree Evaluation Committee of Chengdu University. He is also an online evaluation expert of National Natural Science Foundation of China, and an expert of science and technology project evaluation in Sichuan, Fujian and Hebei provinces.

He received the B.S. and M.S. from Sichuan University in 1983 and 1998 respectively. He has been awarded the second prize of cultivation achievement by Sichuan provincial government and the famous mentor award of Chengdu University.
The Integrated International Education of Mechanical Engineering based on OBE Methodology

---A case study of the exchange student project between Chengdu University and Silpakorn University

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ABSTRACT

The standard of higher education is an important indication of a country’s development level potential. As engineering disciplines are the driving force of the development of science and technology, it has always played an important role in international education.

In 2017, the Ministry of Education of China put forward the concept of “new engineering”, which requires the National Engineering Colleges and majors to actively optimize the disciplinary layout, promote the integration of multi-disciplines in engineering and expand emerging disciplines. At the same time, it is necessary to learn from international advanced concepts and standards, and clearly point out the development direction of new engineering education. In addition, “new engineering” clearly requires strengthening international exchange and cooperation. To cultivate international talent of engineering education, the mode for undergraduates should be in line with international engineering education, and graduates should have the ability and qualification to participate in international engineering projects. Under the guidance of this mode, the school of mechanical engineering of Chengdu University has been exploring and seeking breakthroughs in the professional certification of mechanical engineering education and successfully received the accreditation in June 2020. Furthermore, under the theoretical guidance of OBE (Outcome Based Education), we have actively carried out a series of multi-angle and multi-level international cooperation with the engineering schools of Claustar University of Technology in Germany, Gyeonggi University of Korea, and Silpakorn University of Thailand which constitutes an advancement on the professional accreditation of international engineering education.

From 17th November, 2019 to 18th December, 2019, the school of mechanical engineering of Chengdu University and Silpakorn University successfully held the first exchange project. In this project, the synthesis capabilities were developed, and both software and hardware skills of mechanical manufacturing were trained accordingly. After this project, the students mastered several software and mechanical manufacturing skills such as the operations of numerical control (NC), 3D prototype, and laser engraving machine. To enhance the multi-field cross capabilities of the students, several skills such as team work and cross-cultural communication skills were deliberately fostered in the sessions. Finally, a woodcut art of the badge for both universities was produced by the students and a complete report including the detailed description of the manufacturing procedures throughout the whole process was provided in Chinese and English.
Introduction to Keynote Speaker

Prof. Dr. Izumi KUMAKIRI

Izumi Kumakiri received her Ph.D. degree from the University of Tokyo, Japan. Then, she worked at two research institutes in Europe, CNRS-France and SINTEF-Norway, for more than 10 years in total. Then she moved to a national university, Yamaguchi University, in Japan in 2011. In Europe, she worked on several international and domestic projects in the fields of carbon capture and storage (CCS), water cleaning and bio-energy by applying nano-functional materials and membranes. At Yamaguchi University, she collaborates with Prof. Yamada, who gives a plenary lecture in this conference, and has been working on the downstream of bio-fuel production.

The worldwide energy demand is growing, but we cannot continue the fossil-fuel based economy no longer. Combustion of fossil-fuel has a huge impact on the climate change and a quick action is required. Therefore, we need to shift from the fossil-fuel based economy to a more sustainable one. Bio-fuel is one of the potential energy sources and Southeast Asian countries have large biomass sources. Fermentation, which Prof. Yamada and others are working on, is a promising rather simple conversion technology of biomass to bio-fuels. However, the concentration of e.g. alcohol after fermentation is very low, e.g. a few percent. For fuel applications, the dilute alcohol solution needs to be concentrated over 99%. The conventional process, distillation, is an energy-demanding process for the concentration. By replacing distillation with more energy-efficient separation process, the advantage of using bio-alcohol will be greater.

In this talk, a new separation and concentration technology, membrane separation, will be introduced. The recent development on micro-porous inorganic membranes, their unique properties and simple operation will be discussed.
Application of Membrane Separation in Bio-ethanol Production

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HIGHLIGHTS
• Integration of fermentation and membrane dehydration is proposed.
• Acid-stable zeolite membranes were developed.
• Zeolite membranes were applied to concentrate bio-ethanol after fermentation.

ABSTRACT

Global warming is a challenge requiring international cooperation and collaboration between different research fields. One of the keys to tackle this challenge is to shift from the current fossil-fuel-based economy to a more sustainable economy. Bio-fuels and bio-chemicals are getting more attention, however, the energy consumed in a biomass conversion should be limited from a sustainability perspective.

We propose an on-site bio-conversion process by combining high-temperature fermentation and membrane separation. In this model, concentrated bio-ethanol is transported instead of raw biomass. The high-temperature fermentation does not require a water-cooling system, thus, reducing the energy requirement of the fermentation process. On the contrary, the concentration of bio-ethanol after fermentation is rather low e.g. 5-10% and requires a concentration process after the conversion. Membranes can offer an energy-efficient separation process compared to a conventional distillation. In addition, a membrane system has a simple design, allowing easier operation and maintenance.

Some types of zeolite membranes are commercially available and have been applied industrially to dry solvents. A-type zeolite membranes, the type of membranes commercially available, decomposed and lost their dehydration property when solutions obtained from fermentation were applied. We have developed new types of zeolite membranes, such as MOR and MFI membranes. These new membranes showed stable water-selectivity and successfully concentrated the bio-ethanol over 90%.

Keywords: membrane separation; zeolite; dehydration; bio-ethanol

Acknowledgment

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Introduction to Keynote Speaker

Dr. Cheng received his PhD in Chemical Engineering at The University of New South Wales (Australia). His PhD work is on syngas production from glycerol reforming. He is also an experienced scientist in the area of low temperature fuel cell, having worked in University of Alberta (Canada) for 2 years, developing PBI membrane for hydrocarbon conversion fuel cell. Dr. Cheng was previously a visiting researcher to Sheffield Hallam University (UK) in 2017 and also a visiting professor to the Prince of Songkla University (Thailand).

He is currently an Associate Professor in the Department of Chemical Engineering, College of Engineering. Besides his teaching role, Dr. Cheng leads the Reaction Engineering Group. His research fields are focused on the catalysis, reaction engineering and also waste treatment. Dr. Cheng has co-authored more than 140 journal articles in these fields, with an h-index of 27.

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ABSTRACT

Oil palm is the most cultivated commercial crop in Malaysia. In 2017 alone, Malaysia has produced 21 million metric tonnes of palm oil per annum from a total of about 450 operating mills. This accounts for 39% of world palm oil production and 44% of global palm oil exports. Every tonne of crude palm oil (CPO) produces approximately 2.5 to 3.5 tonnes of palm oil mill effluent (POME). This culminates in the total POME discharge of roughly 74 million metric tonnes. POME is a thick brownish, acidic, foul smelling colloidal wastewater. It is a complex mixture comprising of cellulosic materials, oils and fatty acids as well as lignin, pectin, carotene and phenols. Conventionally, it was treated using an open-ponding method. Nevertheless, this method requires creation of a series of lagoons; unfortunately, this consumes acreage of land which otherwise can be put into more productive usage. In order to treat POME more efficiently, various methods have been investigated such as adsorption, coagulation/flocculation, microbial fuel cells, ultrasonic-assisted membrane anaerobic system (UAMAS), up-flow anaerobic sludge fixed film (UASFF) reactor, modified anaerobic baffled bioreactor (MABB), up-flow anaerobic sludge blanket (UASB) reactors, expanded granular sludge bed (EGSB) reactors, membrane filtration, etc. Each aforementioned technologies exhibit their own unique strengths and also weaknesses. Herein, we explore the use of photocatalytic and also steam reforming methods, for the treatment of POME. The use of these two technologies were examined from the aspects of waste treatment, as well as their potential for producing useful gaseous products, i.e. H₂, CH₄. It is hope that the new knowledge gained from these innovative methods will spur more research activities in finding more effective sustainable ways to treat POME.
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Introduction to Keynote Speaker

Dr. Mati HORPRATHUM

Keynote Speaker

Design and Engineering of Advanced Nanoscale Thin Films by Physical Vapor Deposition and Their Emerging Applications

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ABSTRACT

Nanostructures have recently gained attention due to exhibiting large surface-to-volume ratios and unique properties, which attracted diverse ranges of applications. In this work, we present the emergence of engineering nanostructure-thin films growth via physical vapor deposition (PVD), glancing-angle deposition technique (GLAD) and combinatorial magnetron sputtering technique, developed at Opto-Electrochemical Sensing Research Team (OEC), NECTEC, Thailand, realized through the synergy of experiments, theory and potential in applications. Our proposed fabrication technique was well utilized for the preparations of the novel nanoscale thin films as alternative materials for sensor, optoelectronic and photovoltaic devices. We present morphological and nanostructural properties of various deposited materials and further explore advanced nanoscale thin films which enable controls of optical and electrical characteristics of these nanostructures, leading to improvements towards recent applications, i.e. plasmonic sensors, chemical gas sensors, smart windows, self-cleaning glasses, transparent conductive oxides (TCO), metallic glass materials and their future developments.