



ICFCHT-SFCHT 2023

Towards Sustainable and Net Zero Carbon Future

P R O G R A M M E B O O K

Organized by:



UNIVERSITI
KEBANGSAAN
MALAYSIA
*The National University
of Malaysia*

In Collaboration with:



Malaysian
Association
Hydrogen
Energy



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WELCOMING MESSAGE



Message from the Vice-Chancellor

Assalamualaikum wbt and Greetings,

I would like to express my heartfelt appreciation to the Fuel Cell Institute (SELFUEL), Malaysian Association of Hydrogen Energy (MAHE), National Research and Innovation Agency (BRIN), and Indonesia Fuel Cell and Hydrogen Energy (IFHE) for successfully organizing the 8th International Conference on the Fuel Cell & Hydrogen Technology (ICFCHT) in conjunction with the 3rd Symposium on Fuel Cell & Hydrogen Technology (ICFCHT-SFCHT 2023). A special note of gratitude also goes to PETRONAS for their generous sponsorship of this event.

ICFCHT is a biennial international-level conference, and this year, it is being organized in conjunction with our local SFCHT conference. This event provides a platform for academic-industrial professionals to build networking and collaborations in the field of fuel cell technology, hydrogen energy and its sub-field. This time, we're continuing our efforts to drive and promote the local research and industry growth in the fuel cell technology. Our goal is to make progress towards sustainable energy by reducing our impact on the environment.

The ICFCHT-SFCHT 2023 is underway with the theme "Towards Sustainable and Net Zero Carbon Future". The theme is timely as it aligns with the effort to enhance energy security and reduce the impact on the environment, in pursuit of the Sustainable Development Goals 2030 (SDG 2030).

Finally, I hope that the findings and discussions of this event will be able to provide a solution to the environmental challenges that we are facing today.

A handwritten signature in black ink, appearing to read 'Mohd Ekhwan', with a long horizontal stroke extending to the right.

YBhg. Prof. Dato' Gs. Ts. Dr. Mohd Ekhwan Hj. Toriman
Vice-Chancellor
Universiti Kebangsaan Malaysia

WELCOMING MESSAGE



Message from the Chairperson of 8th ICFCHT and 3rd SFCHT 2023

Assalamualaikum Warahmatullahi Wabarakatuh and Greetings to all,

Congratulations to the organizing committee and a warm welcome to all the speakers and participants to the 8th International Conference on the Fuel Cell & Hydrogen Technology in conjunction with the 3rd Symposium on Fuel Cell & Hydrogen Technology (ICFCHT-SFCHT 2023). This event is organized to increase the recognition and exposure of fuel cell technology and hydrogen application in Malaysia to the international level. It also aims to serve as a platform for researchers to exchange views and research experience. Your presence has added immeasurable value to this conference, and I look forward to the continued collaboration and progress that will undoubtedly stem from the connections made here.

SELFUEL aspires to be the leading and renowned regional reference higher learning institution in Malaysia for experts and practitioners to exchange experience, views and latest findings on fuel cells technology and hydrogen energy. The institute is constantly seeking opportunities to secure research grants and expanding its industry collaboration to grow its strength in research and development as well in improving the research labs and facilities for product innovations.

Finally, a big applause to my fellow teams of the ICFCHT-SFCHT 2023 committee for making this event a success. To our esteemed sponsors, your commitment to advancing research, innovation, and global cooperation has been a great support to this conference. Well done to each of you. Thank you.


Prof. Ir. Dr. Siti Kartini Kamarudin

Chairperson of 8th International Conference on the Fuel Cell & Hydrogen Technology in conjunction with the 3rd Symposium on Fuel Cell & Hydrogen Technology (ICFCHT-SFCHT 2023)
Director of Fuel Cell Institute
Universiti Kebangsaan Malaysia

COMMITTEE

Organizing Committee

Chairperson	:Prof. Ir. Dr. Siti Kartom Kamarudin
Co-chairpersons	:Prof. Dato' Ir. Dr. Wan Ramli Wan Daud (President of MAHE, Malaysia) Prof. Dr. Eng. Eniya Listiani Dewi (President of IFHE, Indonesia)
Deputy Chairperson	:Assoc. Prof. Dr. Shahbudin Mastar @ Masdar (I) Dr. Sahriah Basri (II)
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Mr. Ryan Yeo Yow Zhong
Mr. Krishan a/l Balachandran
Mr. Irwan Ibrahim

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Assoc. Prof. Dr. Norasikin Ahmad Ludin
Dr. Nurul Akidah Baharuddin
Dr. Khuzaimah Arifin
Mr. Mohd Faizal Md. Nasir
Ms. Nurul Nabila Rosman

Publication

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Dr. Sharifah Najihah Timmiati
Dr. Muhammed Ali Shaikh Abdul Kader Abdul Hameed
Dr. Mohamad Azuwa Mohamed
Dr. Noor Shahirah Shamsul
Dr. Zulfirdaus Zakaria (USM)
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Ms. Yusra Nadzirah Yusoff
Ms. Nor Fatina Raduwan

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Dr. Iswari a/p Letchumanan
Dr. Nurul Noramelya Zulkefli
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Ms. Nik Samila Che Yusoff
Mr. Mohd Asri Yusof
Mr. Arrif Fadzillah Haron
Mr. Mohd Azahar Azahari
Ms. Maryam Jamilah Shabdin
Ms. Tan Sue Ying
Ms. Ainaa Nadhirah Zainon
Ms. 'Afifah Kamal
Ms. Nur Hanisah Hadi
Mr. Muhamad Hafizzul Isyraf Hardi

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Assoc. Prof. Dr. Wan Nor Roslam Wan Isahak
Mr. Zul Fauzi Azlan Mohd
Mr. Mohamad Fareeq Ahmad Fudzi

COMMITTEE

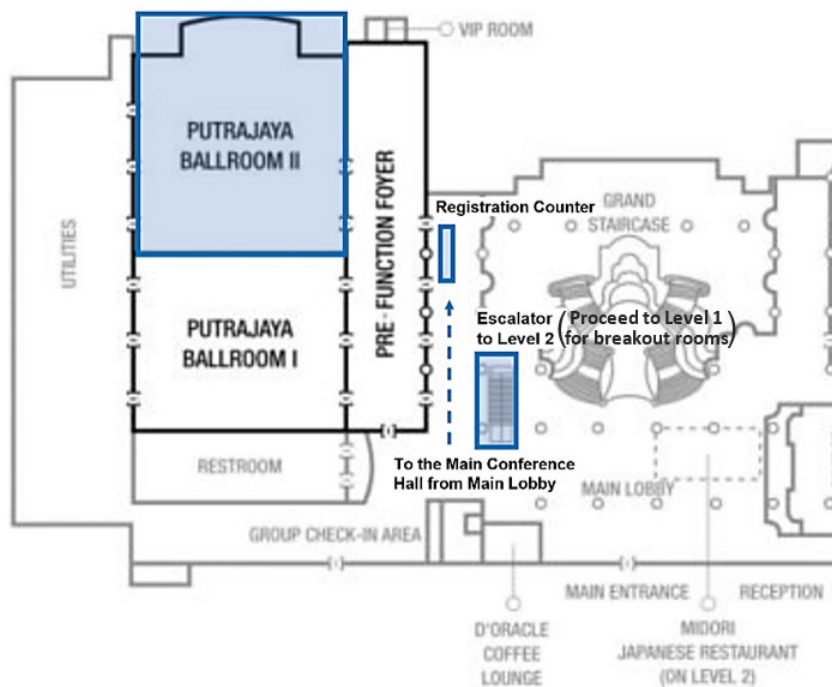
Protocol & Souvenir / Certificate	:Assoc. Prof. Dr. Loma Jeffery Minggu (Leader) Mr. Ahmad Syakir Saad Ms. Hafizatul Izzati Badrul Zaman Ms. Nabilah Yusof Ms. Nur Azlina Adris Ms. Nowilin James Rubinsin Ms. Iesti Hajar Hanapi Ms. Nur Ubaidah Saidin Ms. Nur Ain Masleeza Harun
Gimmick & Dinner	:Dr. Shahirah Shamsul (Leader) Ms. Nur Wardah Norman Ms. Siti Nur Adilah Awang Ms. Nur Hanisah Hadi Ms. Nurulfasihah Azhar Ms. Ng Wei Shi
Research Exhibition	:Mr. Muhamad Ariff Amir Hamzah Mr. Muhammad Akmal Aminudin Ms. Wan Nor Anasuhah Wan Yusoff Ms. Nurul Shahzira Hazri Mr. Muhammad Yusuf 'Izzat Mazian Mr. Adam Mohd Izhan Noor Azam Ms. Siti Nurul Falaein Moridon Ms. Nor Fatin Yana

COMMITTEE

Scientific Committee

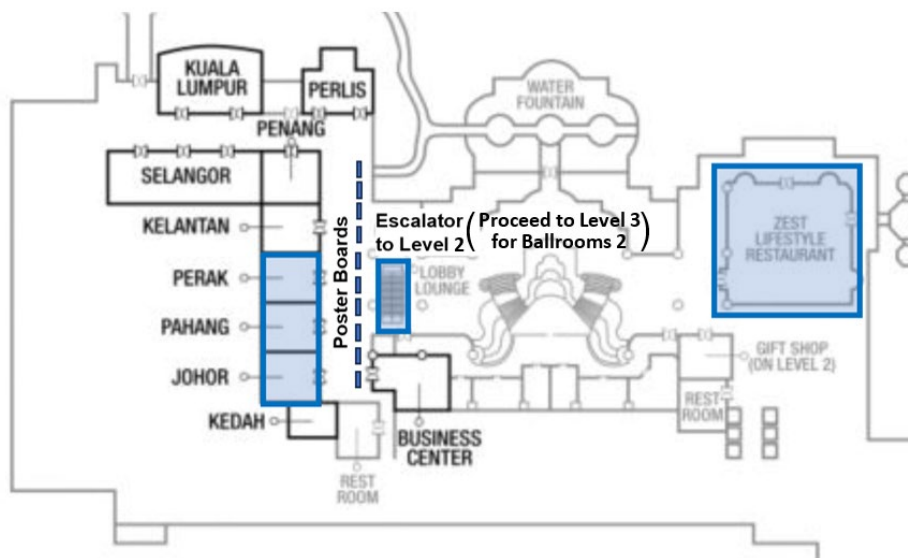
Name	Institution/Country
Prof. Dr. Junji Inukai	University of Yamanashi, Japan
Prof. Dr. Nigel P. Brandon	Imperial College London, United Kingdom
Prof. Dato' Ir. Dr. Wan Ramli Wan Daud	University of Malaya, Malaysia
Prof. Dato' Ts. Dr. Kamaruzzaman Sopian	Universiti Teknologi PETRONAS, Malaysia
Prof. Dr. Andanastuti Muchtar	Universiti Kebangsaan Malaysia, Malaysia
Prof. Dr. Shu Yii Wu	Feng Chia University, R.O.C Taiwan
Prof. Ir. Dr. Siti Kartom Kamarudin	Universiti Kebangsaan Malaysia, Malaysia
Prof. Dr. Jarot Raharjo	National Research & Innovation Agency, Indonesia
Assoc. Prof. Dr. Mohd Shahbudin Mastar @ Masdar	Universiti Kebangsaan Malaysia, Malaysia
Dr. Ifa Puspasari	Universitas Islam Indonesia, Indonesia

CONFERENCE VENUE FLOOR PLAN



MAIN CONFERENCE HALL AND PARALLEL SESSION
Putrajaya Ballroom 2
LEVEL 3

CONFERENCE VENUE FLOOR PLAN



PARALLEL AND POSTER SESSIONS
Johor Room, Pahang Room, and Perak Room
LEVEL 1

PROGRAMME OF ICFCHT-SFCHT2023

Time is GMT + 8 hrs.

5 SEPTEMBER 2023 (TUESDAY)	
07:30 am	REGISTRATION (Welcoming refreshment provided) Venue: Lobby Counter
08:30 am	Arrival of Honoured Guest
08:45 am	Arrival of Yang Berhormat Tuan Chang Lih Kang (Minister of Science, Technology and Innovation)
Opening Ceremony	
09:00 am	National Anthem Negaraku
09:10 am	Welcoming Speech by Vice Chancellor YBhg. Prof. Dato' Gs. Ts. Dr. Mohd Ekhwan Hj. Toriman
09:20 am	Opening Speech for ICFCHT-SFCHT2023 Yang Berhormat Tuan Chang Lih Kang
09:35 am	Gimmicks
09:45 am	Photo Session
09:50 am	Minister's Visit to the Exhibition Site
10:10 am	Break & Poster Session (Venue: Exhibition Area)
Plenary Session	
10:30 am	Plenary Talk 1 Emeritus Prof. Dato' Dr. Halimah Badioze Zaman Director of National Energy Centre (NEC), Universiti Tenaga Nasional (UNITEN), Malaysia Title: Energy Transition and the Promising Outlook of Fuel Cell, Hydrogen and AI Technology Moderator: Prof. Dr. Andanastuti Muchtar

PROGRAMME OF ICFCHT-SFCHT2023

10:50 am	<p>Plenary Talk 2</p> <p>Mr. Osamu Ikeda Managing Director, Chiyoda Corporation Netherlands B.V.</p> <p>Title: LOHC - MCH: The Way to Establish Global Hydrogen Transportation Network</p> <p>Moderator: Prof. Dr. Andanastuti Muchtar</p>
11:10 am	<p>Plenary Talk 3</p> <p>Dr. Rezal Khairi Ahmad Chief Executive Officer, NanoMalaysia Berhad, Malaysia</p> <p>Title: Strategizing Hydrogen Game Plan for Malaysia</p> <p>Moderator: Prof. Ir. Dr. Abu Bakar Sulong</p>
Forum	
11:30 am	<p>Forum (4 Panels)</p> <p>Mr. Ohira Eiji Strategy Architect, New Energy and Industrial Technology Development Organization (NEDO)</p> <p>Mr. Nazri Muslim Head of Hydrogen Technology Program, Group Technology & Commercialization, PETRONAS</p> <p>Dr. Ng Sing Muk General Manager, Sarawak Energy Berhad</p> <p>Ms. Sandra Liz Hon Executive Director, H. Energy Sdn. Bhd.</p> <p>Moderator: Prof. Dr. Mohammad Kassim</p>
01:00 pm	<p>Lunch (Venue: Zest Restaurant)</p>
Plenary Session	
02:00 pm	<p>Plenary Talk 4</p> <p>Mr. Nazmi Syahrin bin Kasmurin Director of Technology Solutions Group, Malaysian Green Technology and Climate Change Corporation (MGTC), Malaysia</p> <p>Title: Energy Transition – Bamboo as Large-Scale Sustainable Supply of Biomass</p> <p>Moderator: Prof. Ir. Dr. Abu Bakar Sulong</p>

PROGRAMME OF ICFCHT-SFCHT2023

Parallel Session 1				
Theme	Fuel Cells for Mobile and Stationary Systems	Hydrogen Technology	Energy Materials for Fuel Cells	Renewable and Sustainable Materials & Processes
Venue	Putrajaya Ballroom 2	Johor	Pahang	Perak
Chairperson	Dr. Wong Wai Yin	Assoc. Prof. Ts. Dr. Lim Kean Long	Dr. Nurul Akidah Baharuddin	Dr. Sharifah Najiha Timmiati
02:35 pm	Keynote Speaker: Prof. Dr. Suk Won Cha	Keynote Speaker: Prof. Dr. Sammy Lap Ip Chan	Keynote Speaker: Prof. Dr. Mohammad Kassim	Keynote Speaker: Datuk Prof. ChM Ts. Dr. Taufiq Yap Yun Hin
02:55 pm	FC01	Keynote Speaker: Assoc. Prof. Dr. Rasyikah Md. Khalid	EM01	RS01
03:10 pm	FC02		EM02	RS02
03:25 pm	FC03	HT01	EM03	RS03
03:40 pm	FC04	HT02	EM04	RS04
03:55 pm	Break			
04:15 pm	FC05	HT03	EM05	RS05
04:30 pm	FC06	HT04	/	RS06
05:15 pm	END OF FIRST DAY			

PROGRAMME OF ICFCHT-SFCHT2023

6 SEPTEMBER 2023 (WEDNESDAY)	
08:00 am	REGISTRATION Venue: Lobby Counter
Plenary Session	
08:45 am	Plenary Talk 5 Prof. Dr. Eng. Eniya Listiani Dewi President of Indonesia Fuel Cell and Hydrogen Energy (IFHE) Title: Indonesia National Hydrogen Strategy and Roadmaps Moderator: Prof. Ir. Dr. Siti Kartom Kamarudin
09:05 am	Plenary Talk 6 Prof. Dato' Ir. Dr. Wan Ramli Wan Daud President of the Malaysian Association of Hydrogen Energy (MAHE) Title: Malaysia's Perspectives in Embracing Hydrogen Economy Moderator: Prof. Ir. Dr. Siti Kartom Kamarudin
09:25 am	Plenary Talk 7 Ir. Ts. Noraziah Muda Head of Renewable Energy & Green Technology (REGT) Unit, TNB Research Sdn. Bhd., Malaysia Title: Powering Decarbonisation and Transforming Energy Landscapes Towards Net-Zero 2050 Through Hydrogen and Fuel Cell Applications Moderator: Assoc. Prof. Dr. Mohd Shahbudin Mastar @ Masdar
09:45 am	Plenary Talk 8 Mdm. Norhayati Hashim Head of Technology Research and Chief Executive Officer, PETRONAS Research Sdn. Bhd., Malaysia Title: The Roles of Hydrogen Technology in Securing Supply Chain Resilience in Energy Transition Moderator: Assoc. Prof. Dr. Mohd Shahbudin Mastar @ Masdar
10:05 am	Break & Poster Session (Venue: Exhibition Area)

PROGRAMME OF ICFCHT-SFCHT2023

Parallel Session 2				
Theme	Fuel Cells for Mobile and Stationary Systems	Hydrogen Technology	Energy Materials for Fuel Cells	Renewable and Sustainable Materials & Processes
Venue	Putrajaya Ballroom 2	Johor	Pahang	Perak
Chairperson	Dr. Umi Azmah Hasran	Dr. Norazuwana Shaari	Dr. Rozan Mohamad Yunus	Dr. Lim Bee Huah
11:00 am	Keynote Speaker: Prof. Ir. Dr. Siti Kartom Kamarudin	Keynote Speaker: Prof. Dr. Mohammad Ali Abdelkareem	Keynote Speaker: Prof. Dr. Junji Inukai	Keynote Speaker: Prof. Dr. Aishah Abdul Jalil
11:20 am	FC07	HT05	EM07	RS07
11:35 am	FC08	HT06	EM08	RS08
11:50 am	FC09	HT07	EM09	RS09
12:05 pm	FC10	HT08	EM10	RS10
12:20 pm	FC11	/	/	RS11
12:35 pm	P-005	P-007	P-012	P-004
12:40 pm	P-010	P-030	P-024	P-015
12:45 pm	P-018	P-019	P-026	P-017
12:50 pm	P-025	P-021	P-028	P-027
12:55pm	/	/	P-003	/
01:00 pm	Lunch (Venue: Zest Restaurant)			

PROGRAMME OF ICFCHT-SFCHT2023

Parallel Session 3				
Theme	Fuel Cells for Mobile and Stationary Systems	Hydrogen Technology	Energy Materials for Fuel Cells	
Venue	Putrajaya Ballroom 2	Johor	Pahang	
Chairperson	Dr. Muhammed Ali Shaikh Abdul Kader Abdul Hameed	Dr. Khuzaimah Arifin	Dr. Sahriah Basri	
02:00 pm	Keynote Speaker 1: Assoc. Prof. Dr. Abul Kalam Azad	Keynote Speaker: Assoc. Prof. Dr. Rafiziana Md. Kasmani	Keynote Speaker: Assoc. Prof. Dr. Mahendra Rao Somalu	
02:20 pm	FC12	HT10	EM11	
02:35 pm	FC13	HT11	EM12	
02:50 pm	FC14	HT12	EM13	
03:05 pm	FC15	HT13	EM14	
03:20 pm	Break			
Closing Ceremony				
04:00 pm	Closing Speech: Chairperson of ICFCHT-SFCHT2023 YBhg. Prof. Ir. Dr. Siti Kartom Kamarudin			
04:10 pm	Multimedia Presentation of ICFCHT-SFCHT2023			
04:15 pm	Hand Over of Conference to UTM SELFUEL, UTM, MAHE & BRIN			
04:30 pm	Announcement of Best Oral and Poster Presenters			
05:00 pm	Photo Session			
05:15 pm	END			

SPEAKERS

PLENARY SPEAKER 1



Emeritus Prof. Dato' Dr. Halimah Badioze Zaman

Director of National Energy Centre (NEC), Universiti Tenaga Nasional (UNITEN), Malaysia.
Holder of Tan Sri Leo Moggie Distinguished Chair in Energy Informatics.

Biography

Emeritus Professor Dato' Dr. Halimah Badioze Zaman is currently Holder of the Tan Sri Leo Moggie Distinguished Chair in Energy Informatics at the Institute of Informatics and Computing in Energy Informatics (IICE), Universiti Tenaga Nasional (UNITEN) and Director of the National Energy Centre (NEC). Prior to this she has served in various capacities and roles at Universiti Kebangsaan Malaysia (UKM) for 39 years, which includes being one of the Founders of the Faculty of Information Science and Technology (FTSM), founder of the ICT Niche at UKM and was the Founding Director of the first Centre of Excellence in Computer Science at UKM called Institute of Visual Informatics (IVI). She was nominated and elected as fellow of Academy of Sciences Malaysia (ASM) in 2009.

Over the years Emeritus Professor Dato' Dr. Halimah has gained tremendous recognition in the field of Computer Science and Information and Communications Technology by not just amongst the academia but also government & industry, and has played a key role in various collaborations with the government and industry leaders, nationally and globally. It is through these collaborations that she was able to receive multiple accolades for inventions and innovations at both the national and International levels. She has been honoured with the title of Emeritus Professor by Universiti Kebangsaan Malaysia (UKM) for her continuous contributions to research and intellectual knowledge that has benefitted government, industry and society both nationally and globally. Recently, as one of the pioneer women in tech, she was honoured by AirAsia Academy as one of ASEAN'S most inspired icons together with many renowned statesman and experts in various fields.

Title: Energy Transition and the Promising Outlook of Fuel Cell, Hydrogen and AI Technology

Abstract:

The world is in at a crucial crossroad, facing challenges such as climate change, environmental degradation, and the pressing need to reduce greenhouse gas emissions. To mitigate these issues, there has to be a shift away from the heavy reliance on fossil fuels and embrace cleaner, renewable energy sources. This is where fuel cells, hydrogen technology underpinned by the digital landscape (AI), shows a promising outlook. Fuel Cells are a revolutionary technology that produce no harmful emissions, making them attractive and eco-friendly alternative for various applications. Hydrogen on the other hand, often known as "fuel of the future" holds tremendous potential as an energy carrier. It can be produced from diverse sources, and this versatility allows for the integration of Hydrogen into various sectors such as transportation, industry, and power generation. One of the most compelling advantages of hydrogen is its capacity for large-scale energy storage. As nations transition to a more renewable based system, storing access energy becomes crucial to ensuring grid stability. Hydrogen can offer a viable solution to store and deliver clean energy when and where is needed most. Fuel cell too has promising future in the mobility and transportation sector and is beginning to emerge as a game-changer. These technologies combined with advance AI, can result in innovative solutions to improve efficiency, optimise performance and enhance overall sustainability and in the end reducing the carbon footprint significantly. For Energy Transition with

SPEAKERS

the promising fuel cell, Hydrogen and AI outlook to be successful, several challenges need to be addressed in terms of research and innovation, strengthen by strong policies, to make it economically viable. Malaysia for instance, have initiated various initiatives to accelerate Energy Transition generally and renewable energy such as Fuel cell and hydrogen and digitalisation (AI) specifically, through infrastructure and policy initiatives: such as the establishment of the National Energy Centre (NEC), National AI Framework and Roadmap, the Green Technology Master Plan, National Energy Policy (NEP), Malaysia Hydrogen Roadmap, and the latest National Energy Transition Roadmap (NETR). As we embark into this transformative journey towards a greener future, it is a reminder to nations that Energy Transition is not just a choice but a necessity and embracing fuel cell and Hydrogen technology generally and integrating them with AI technology can pave the way for a more innovative, sustainable, resilient and environmentally responsible world.

SPEAKERS

PLENARY SPEAKER 2



Mr. Osamu Ikeda

Managing Director, Chiyoda Corporation Netherlands B.V.

Biography

Osamu has more than 25 years of experience in energy industry as engineer, consultant, business development, and recent 10+ years is focused on technology and business development of hydrogen carrier technology.

Osamu has planned and developed world first global hydrogen supply chain demonstration project by LOHC-MCH technology between Brunei Darussalam and Japan in 2020, and shifted his role to the commercial projects development since 2019. Now in charge of hydrogen business development since 2019 toward commercialization of LOHC-MCH technology in global.

Title: LOHC – MCH: The Way to Establish Global Hydrogen Transportation Network

Abstract:

To establish global hydrogen supply chain network, Ocean transportation will enhance the transpiration infrastructure portfolio, in strong synergy with key infrastructure as hydrogen pipeline. Methylcyclohexane (MCH) is hydrogen carrier that is one of Liquid Organic Hydrogen Carriers (LOHC), using commodity petroleum product, toluene, and has already been proven, realistic solution now, Chiyoda's LOHC-MCH technology, enabling the safe, efficient and commercially viable storage and transportation of hydrogen on a global scale, and is ready for commercialization through R&D, pilot and demonstration.

SPEAKERS

PLENARY SPEAKER 3



Dr. Rezal Khairi Ahmad

Chief Executive Officer, NanoMalaysia Berhad, Malaysia.

Biography

Dr. Rezal Khairi Ahmad is the Chief Executive Officer of NanoMalaysia Bhd. since June 2013. He possesses a PhD. in Nanotechnology, Electronic/Electrical Engineering from London Centre for Nanotechnology, University College London and Master's degree in Electrical Engineering from Tenaga Nasional University. He is an Adjunct Professor of Universiti Teknologi Malaysia. Recently, Dr. Rezal has been designated as the Vice President of Asia Nano Forum for the term 2022-2024. Under his tenure, Dr. Rezal has successfully crafted the company structure and developed the business model and corporate positioning strategy relative to similar-minded government agencies and relevant industries. His current endeavours include Energy Storage, Renewables, Electric Vehicles, Hydrogen Economy and Biomass innovation.

Title: Strategizing Hydrogen Game Plan for Malaysia

Abstract:

As part of the journey towards Net Carbon Zero by 2050, Hydrogen technology is poised to become a game changer for Malaysia's technology and socio-economic advancement by the end of this coming decade. Besides the National Energy Policy and the recently launched National Energy Transition Roadmap, the Hydrogen Economy and Technology Roadmap (HETR) is set to be launched by the 4th Quarter of 2023, detailing the evolving strategic focus with regards to the envisaged hydrogen development for each decade till 2050. The main target is to attain affordable cost of Green Hydrogen so that it is a viable energy source for daily use. A teaser of the roadmap will be presented, whilst NanoMalaysia will provide a brief overview of existing and planned initiatives with regards to Hydrogen's R&D and innovation development that are facilitated via the agency, with a particular focus on its solid-state Hydrogen storage concept and technology.

The strategic positioning of Malaysia's "game plan" is to expedite the development, implementation, awareness, and acceptance of hydrogen technology. NanoMalaysia intends to play a key role in "fast-tracking" the creation of a viable hydrogen ecosystem across the entire hydrogen supply chain – production, storage, transport, and applications - by leveraging capabilities and expertise of both local partners and international ones as well. Additionally, the agency aims to facilitate standardisation of the nation's R&D and codes, while also merging gaps in policies related to hydrogen technology. Malaysia's goal is to be key player of Green Hydrogen in Asia Pacific, while bolstering its own national green growth aspirations, revenue and productivity, labour force, and intellectual capabilities.

SPEAKERS

PLENARY SPEAKER 4



Mr. Nazmi Syahrin bin Kasmurin

Director of Technology Solutions Group, Malaysian Green Technology and Climate Change Corporation (MGTC).

Biography

Prior to joining MGTC, Nazmi has extensive 17 years of experience in the automotive sector as an engineer, project/program manager and product strategy for 3 different companies, before becoming a consultant working on the transformation of the education sector.

Now he is in charge of the Technology Solutions Group of MGTC overlooking the Energy, Mobility and Circular Economy teams. The group is working on projects ranging from energy efficiency, renewable energy, initiatives towards low carbon mobility, and promoting circular economy in Malaysia.

Title: Energy Transition – Bamboo as Large-Scale Sustainable Supply of Biomass

Abstract:

Bamboo is rapid growing plants often regarded as an invading species that can be found abundant in the forest. However, bamboo also have the potential to be a sustainable biomass feedstock alternative. The talk reflects into this potential opportunity that bamboo can provide in shaping the biomass industries and in the long run, helps to increase the renewable energy capacity in Malaysia.

SPEAKERS

PLENARY SPEAKER 5



Professor Dr-Eng. Eniya Listiani Dewi, B.Eng., M.Eng.
President of Indonesia Fuel Cell and Hydrogen Energy (IFHE).
Professor of Electrochemical Process at National Research and Innovation Agency (BRIN), Indonesia.

Biography

Eniya Listiani Dewi was born in Magelang-Indonesia in 1974, she had finished Bachelor of Engineering at Applied Chemistry of Waseda University at 1998, then completed Master and Doctor of Engineering at the Advanced Research Institute for Science and Engineering, Engineering Faculty, Department of Applied Chemistry, Waseda University, Tokyo, Japan, on 2003, as DC1 JSPS special researcher. Since 2004, she works on this current affiliation, the Agency for the Assessment and Application of Technology (BPPT) as senior researcher. She is active as Board Director for International Association Hydrogen Energy (IAHE) from 2013 until now, and she's also a founder and President for Indonesian Fuel Cell and Hydrogen Energy (IFHE), and also running the consortium of fuel cell and hydrogen of Indonesia since 20107. She became the Chairman of Indonesia Polymer Association (HPI) for 2017 until 2023 period. On 2014, She was the Head Division of New and Renewable Technology, then 2014-2015 became Director for Materials Technology Center, and on September 2015 has been pointed as Deputy Chairperson for Agro-industrial Technology and Biotechnology-BPPT until 2018, and Deputy Chairperson for Information, Energy and Materials Technology of BPPT until 2021. She has also experienced as Chief Commissioner of National State Own Company of PT. Garam (Pesero) in 2018-2021. Her interests are on electron transfer phenomenon on the nanocatalyst, hydrocarbon polymer materials, PEM-fuel cell, zinc-air fuel cell batteries as well as hydrogen production from biomass and PEM-electrolyser. She got the full professorship on June 2015. Her activities were awarded from many institutions, such as BJ Habibie Technology Award, Mizuno Award, Koukenkai Award, Asia Excellent Award, Best Indonesia Scientist Award, PII-Engineering Award, Medco-Energy Research Award, Patent Innovation Award, The Habibie Award, Indonesia Satyalancana Wirakarya Award, Indonesian Technology Ambassador, etc. National Research and Innovation Agency (BRIN) is her affiliation since 2021 until now.

Title: Indonesia National Hydrogen Strategy and Roadmaps

Abstract:

Indonesia has developed a National Hydrogen Strategy Roadmap to meet its Nationally Determined Contributions (NDC) obligations under the Paris Agreement. The roadmap aims to leverage the potential of hydrogen in the country's energy mix, promote an equitable energy transition, and utilize its abundant renewable resources. The roadmap emphasizes the integration of renewable energy sources, particularly solar, wind, hydro, and geothermal power, into Indonesia's hydrogen economy. The strategy focuses on collaboration among governmental organizations, private businesses, academia, and communities to advance hydrogen-based technology and sustainable growth. The roadmap's vision of a hydrogen ecosystem encompasses the entire value chain and prioritizes production efficiency and technological innovation, with calculated that Indonesia shows 32.8 million tons of hydrogen demand in 2060. By embracing cutting-edge technology, Indonesia aims to compete in the global

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hydrogen industry and seize new economic opportunities. The strategy also incorporates a circular economy approach to minimize waste and maximize resource utilization in hydrogen production processes, promoting a sustainable and accountable supply chain. International cooperation is crucial for the success of the roadmap. Indonesia can benefit from collaborating with global leaders in hydrogen technology, facilitating knowledge sharing, technology transfer, and accelerated development. The roadmap also highlights the importance of a just energy transition, ensuring equal access to the benefits of a hydrogen-based economy. It aims to empower vulnerable groups, generate green jobs, and improve the livelihoods of local populations, particularly in rural and underserved areas. Indonesia envisions the use of hydrogen in key sectors such as transportation, manufacturing, and energy production, positioning itself as a regional hydrogen hub. To ensure a reliable hydrogen supply across the country of Indonesia, the roadmap emphasizes the development of a robust hydrogen utilization in power generation, chemical industries, including transportation infrastructure, refuelling stations and pipelines, including stationary. The strategy emphasizes the importance of a just transition, highlighting the need to ensure that vulnerable groups are not left behind in the shift towards a hydrogen-based economy. The report also notes that Indonesia's choices will have a significant bearing on the world's energy markets and on international efforts to reach collective climate goals in 2060.

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PLENARY SPEAKER 6



Prof. Dato' Ir. Dr. Wan Ramli Wan Daud, FASc FTWAS FICHEM CEng Peng
Founding President of the Malaysian Association of Hydrogen Energy (MAHE).
Principal Research Fellow, Department of Chemical Engineering, Faculty of Engineering,
Universiti Malaya (UM), Malaysia.

Biography

Prof. Dato' Ir. Dr. Wan Ramli Wan Daud is Principal Research Fellow, University of Malaya (2022-2024). He was previously UKM-Petronas Professor of Sustainable Hydrogen Energy at Universiti Kebangsaan Malaysia (December 2019- 2021), Founding Director of the Fuel Cell Institute, Universiti Kebangsaan Malaysia (2007-2013), Professor of Chemical Engineering at Department of Chemical & Process Engineering, Faculty of Engineering & Built Environment, Universiti Kebangsaan Malaysia (1996-2021) and Principal Research Fellow at the Fuel Cell Institute, Universiti Kebangsaan Malaysia (2007-2021). He is a Fellow of the Academy of Sciences Malaysia (2012-), Fellow of The World Academy of Sciences (2022-) and Fellow of The Institution of Chemical Engineers (2007-). He is Founding President of the Malaysian Association of Hydrogen Energy (MAHE) (2018-2024) and the President of the Malaysian Academy of Islamic Science (ASASI) (2010-2024).

He was born on 27 December 1955 in Bukit Mertajam, Pulau Pinang, Malaysia. He went to school at Sekolah Kebangsaan Jalan Conolly, Ipoh (1962-1964), Sekolah Kebangsaan Taiping (1965-1967), Sekolah Dato' Abdul Razak, Tanjong Malim and Seremban (1968-1973) and Leederville Technical College, Perth, Western Australia (1974). He obtained BEng degree (First Class Hon.) in chemical engineering from University of Monash, Victoria, Australia in 1978 and PhD degree in chemical engineering from University of Cambridge, United Kingdom in 1984. He won the prestigious Merdeka Award 2016, the top Malaysian science award on 23 September 2016 for outstanding scholastic achievement for research and development work in advancing the technology of fuel cells and hydrogen energy. He also won the Anugerah Tokoh Akademik Bahasa Melayu (Malay Language Academic Figure Award) 2020 for advancing the use of Bahasa Melayu in teaching and research in engineering at public universities in Malaysia.

He was listed as one of the World's Most Influential Scientific Minds in the top 1% of World scientists and Highly Cited Researcher in engineering seven times from 2015 – 2022 by Clarivate Analytics. He strongly advocates the Hydrogen Economy in Malaysia as the founding President of Malaysian Association of Hydrogen Energy (MAHE). He led the development of the first Roadmap for Hydrogen Energy and Fuel Cells for Malaysia 2006 and the Hydrogen Economy and Technology Roadmap 2023.

His main research areas are green hydrogen energy such as water splitting by photoelectrochemical cell (PEC), proton exchange membrane water electrolysis (PEMWE) and microbial electrolysis cell (MEC); fuel cells technology such as proton exchange membrane fuel cells (PEMFC), solid oxide fuel cells (SOFC), microbial fuel cells (MFC) and direct methanol fuel cells (DMFC); sustainable industrial drying technology such as solar, spray, drum, and fluidized bed dryers; and history and philosophy of Malay & Islamic technology. He was granted 30 patents on fuel cells, hydrogen energy production and solar dryers. He published 414 articles in international journals, 401 articles in proceedings of international conferences and 235 articles in proceedings of national conferences. He is cited in WOS 13,552 times with H-index 60; in SCOPUS 15,425 times with H-index 65, and in Google Scholar 22,588 times with H-index 74. He was invited to present 54 international plenary keynote and 10

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invited papers on hydrogen energy and fuel cells in China, Iceland, India, Indonesia, Iran, Japan, Malaysia, Netherlands, Philippines, Russia, Singapore, and Thailand. He was also invited to present 30 national plenary keynote papers.

Title: Malaysia's Perspectives in Embracing Hydrogen Economy

Abstract:

Carbon dioxide emission from fossil fuel use causes global warming and climate change. COP21 Paris Agreement (2015) called for carbon emission reduction to keep temperature rise below 1.5 °C by increasing energy efficiency, decarbonizing industries and diversifying into low carbon renewable energy (RE) such as biomass, biofuel, solar, wind and green hydrogen energy. COP26 (2021) called for net zero carbon emission by 2050. Malaysia plans to increase carbon emission intensity reduction to 55% by 2030 based on 2005 level by increasing RE capacity to 40% by 2035. Malaysia commitment in COP21 (INDC) and COP26 (2021) for net zero carbon emission by cutting carbon emission intensity by 55% of 2005 level by 2030 will not be met by current policies of making RE, the fifth fuel 40% of the national energy mix for electricity generation sector using large scale solar and energy efficiency; and biodiesel vehicles and electric vehicle (EV) using green electricity for the transportation sector. The gap could be closed by introducing green hydrogen energy into the energy policy as the sixth fuel in electricity generation and as a third green fuel for fuel cell vehicles (FCV) alongside biodiesel and EV. Green hydrogen energy is a sustainable low or zero carbon emission energy. It is clean, safe, reliable, and affordable. Green hydrogen produced by water electrolysis using locally available renewable energy (RE) such as solar energy (SE) and wind energy (WE) is a secure energy carrier that could be used to produce energy at point of use and water only, which is recycled. The Hydrogen Economy is thus a circular economy that is driven by locally available renewable energy and emitting net zero carbon. In order to achieve Net Zero by 2050, Malaysia plans to increase solar energy and reduce fossil energy such as coal and natural gas (National Energy Transition Roadmap (NETR) 2023) and to introduce green hydrogen energy (Hydrogen Economy and Technology Roadmap (HETR) 2023). The HETR will be driven by Malaysian indigenous World class talents and innovations in hydrogen energy and fuel cells in Malaysia that were developed since 1995, funded by both Ministries of Science, Technology & Innovation (MOSTI) and of Higher Education (MOHE) and by private companies such as TNB, Petronas and UMW to name a few. The Sarawak State Government had built the first integrated hydrogen production from hydro power and storage complex in South East Asia with a hydrogen refueling station for fuel cell buses and cars. The Sarawak government is planning to introduce the world's first hydrogen-powered smart tram, the Autonomous Rapid Transit (ART) vehicle in 2025. Recently NanoMalaysia, Petronas, UMW dan MGTC is collaborating on the second Mobile Hydrogen Refueling Station. Sarawak and Petronas are also planning to export green hydrogen to Japan, Korea and China. Petronas through its wholly owned company Gentari Sdn Bhd is to generate green electricity using large scale solar, to supply green electricity through the national grid to EV and green hydrogen generated in situ using Petronas own electrolyzer technology developed with UKM, to FCVs domestically as well as in India. TNB is planning to start co-firing of 20% hydrogen in gas turbine combined cycle power plants and co-firing of 20% ammonia in coal thermal plants to reduce their emission. The strategic geographic position of Malaysia on the main sea lanes provide opportunity for ammonia produced from hydrogen as bunkering fuels for ships passing through the area. The hydrogen economy that will be developed by both the ETR and HETR have enormous potential to kickstart Malaysia's economy after the pandemic by creating a new sustainable industry and technology for the economy, providing it with energy security, preventing early onset of climate change, which otherwise would affect the economy negatively, and cleaning its environment for its citizen to enjoy a healthy and prosperous life now and in the future.

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PLENARY SPEAKER 7



Ir. Ts. Noraziah Muda

Head of Renewable Energy & Green Technology (REGT) Unit, TNB Research Sdn. Bhd.

Biography

Ir. Ts. Noraziah Muda @ Omar is the Head of Renewable Energy and Green Technology Unit, TNB Research, the research subsidiary of Tenaga Nasional Berhad, TNB. Her responsibilities include leading and driving the overall strategy for R&D and services in the field of renewable and green technologies which provide overall decarbonization solutions from power generation up to interconnection to TNB Network.

She holds a Bachelor of Engineering (Hons) in Chemical Process Engineering with Fuel Technology from the University of Sheffield, UK. Additionally, she completed an MSc. in Process Engineering from the University of Putra, Malaysia. She is registered with the Board of Engineer Malaysia and hold the title of Professional Technologist (Green Technology) from the Malaysian Board of Technologist. She is also s an ASEAN Chartered Professional Engineer (ACPE). Additionally, she has honed her skills as a Transformation Architect through the Leadership program at McKinsey Academy under TNB Generation Leadership Program.

Her main expertise is on the green energy transition including Carbon Capture, Utilization and Storage (CCUS), where she works on the exploration of technologies to capture carbon dioxide from its sources, and conversion of the captured CO₂ from into useful commodities, in conformance to the Circular Economy framework. She also explored on the techno-economic viability of CO₂ sequestration technology for thermal power plants in Malaysia.

Her other areas of proficiency are on renewable energy and green hydrogen production and use. She has been highly involved in the research and development of renewable energy projects, such as grid-connected floating solar PV system design, PV system performance and reliability improvement, emerging solar PV technology, waste to energy and low-speed wind technology, hydrogen powered EV charging station and others. Her works have been published in numerous technical publications.

She is the technical committee of many working committees under Jabatan Standard Malaysia, MOSTI, SwCorp and TNB. She is also the technical reviewer of local and international journals and currently serves as an external examiner and Industrial Advisor for Higher Learning Institutes in Malaysia.

Title: Powering Decarbonisation and Transforming Energy Landscapes Towards Net-Zero 2050 Through Hydrogen and Fuel Cell Applications

Abstract:

As the world races against time to achieve the ambitious net-zero emissions target by 2050, the vital role of hydrogen and fuel cell applications in driving decarbonization and transforming the energy landscape has gained

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unprecedented prominence. The dynamic interaction between innovative hydrogen production methods, efficient storage solutions, and effective utilization strategies must be addressed holistically to accelerate the role of hydrogen and fuel cells as clean energy vectors.

This topic discusses the significance of decarbonization, the need for transitioning to net-zero emissions, and the role of hydrogen and fuel cells in achieving this goal. An overview of hydrogen production methods, including how the green hydrogen landscape can be developed in Malaysia, will be presented along with its opportunities, challenges, and potential solutions. Insights into the potential trajectory of hydrogen and fuel cell technologies, their integration into energy systems, and the role they might play in achieving net-zero emissions by 2050 will also be presented.

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PLENARY SPEAKER 8



Mdm. Norhayati Hashim

Head of Technology Research and Chief Executive Officer, PETRONAS Research Sdn. Bhd., Malaysia.

Biography

With over 28 years of experience within Oil & Gas, Norhayati displays both a strong technical background and talent to lead, allowing her to be both agile and to deliver with pace. One of her most compelling traits is her ability to lead with empathy as a driving force to encourage scientists of all ages to break the glass ceiling. She is the embodiment of a true leader with both her paternal instinct to nurture her staff, and her strength and prowess to guide PETRONAS research to become a world renowned, multinational research institute.

After finishing her bachelor's degree in Chemical Engineering from Case Western Reserve University, Ohio, USA in 1993, she joined ExxonMobil as project process engineer and subsequently joined PETRONAS in 2004. Since then, she rose swiftly through the ranks, and has held various portfolios and leadership positions before being hand-picked- to lead the technology as Head of Technology Research and CEO of PETRONAS Research Sdn. Bhd, only the second woman to hold the position ever since the establishment of PETRONAS Research back in 1975. As the custodian of PETRONAS Research, she oversees a plethora of research and deployment programs ranging from highly contaminated field management, formulation engineering, advance materials and sustainability initiatives.

The skill to lead with empathy and empowerment is a rare diamond amongst the coals, and Norhayati is an epitome of this. The nurtured trust and respect built between her, and her scientists is reflected in the multiple accolades bestowed on PETRONAS Research in the past 2 years. Since 2021, over 20 scientists have been awarded external accreditations, including chartered engineers, chartered chemists, and chartered technologists. Our scientists have been recognized for both International and local awards. She is definitely a firm believer in technology as differentiator, taking ownership of technologies and seize the opportunity for technologies to make a difference to PETRONAS. As the women representative in leadership, she is a strong advocate for inclusivity and equity, making significant contributions and shaping the future of the industry.

Title: The Roles of Hydrogen Technology in Securing Supply Chain Resilience in Energy Transition

Abstract:

As the world shifts towards more sustainable and low-carbon energy sources, hydrogen has emerged as a versatile and potentially clean energy carrier that can help address various challenges related to supply chain resilience. However, realizing the potential of hydrogen technology requires careful consideration of its supply chain dynamics. In the context of the energy transition, ensuring supply chain resilience is crucial for uninterrupted energy supply, economic stability, and the successful execution of decarbonization strategies.

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PETRONAS, as the national oil and gas company through our technology capability, has led multifaceted advancement in hydrogen technology. We ensure that our technology addresses the gaps in the hydrogen value chain to realize an affordable and competitive hydrogen economy to support our National Energy Transition Roadmap, and PETRONAS' corporate agenda of Moving Forward Together (MFT 30.0). By carefully addressing the gaps, we anticipate it would be able to secure the supply chain resilience during this crucial energy transition.

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Mr. Eiji Ohira

Strategy Architect, New Energy and Industrial Technology Development Organization (NEDO)

Eiji Ohira is the Strategy Architect of the New Energy and Industrial Technology Development Organization (NEDO)'s Fuel Cell and Hydrogen Technology Office. In this capacity, he has been responsible the overall strategy, execution and coordination of NEDO's research, development and demonstration project on fuel cell and hydrogen since 2013. He has also coordinated fuel cell and hydrogen activities with international stakeholders, through International Energy Agency's Technology Collaboration Program (IEA Hydrogen TCP (Vice Chair), Advanced Fuel Cell TCP), and International Partnership for Hydrogen and Fuel Cells in the Economy (IPHE). He joined the NEDO in 1992, just after graduation from the Tokyo University of Science. He served as a visiting scholar at the Massachusetts Institute of Technology in 1997–1998. Before taking up the current position in April 2013, he served in several positions, including Representative at NEDO Asian Representative Office, Director of the Energy Storage Technology Division.



Mr. Nazri Muslim

Head of Hydrogen Technology Program, Group Technology & Commercialization, PETRONAS

Mr Nazri Muslim has had an illustrious career in both technical and management domains spanning more than two decades. It began in 1996, when he joined a petrochemical plant as a process engineer before moving on to PETRONAS in 2001. He delivered several critical projects such as the base oil pilot study, new technology for contaminants removal using ionic liquids (IL) and new growth areas of bio-based speciality chemicals for various stakeholders within PETRONAS businesses. He is now the Head of the Hydrogen Technology Program and is responsible for leading the team to deliver hydrogen technologies from R&D towards field deployment and commercialization. His role includes steering and strategizing technology development for the hydrogen value chain through fostering international and local partnerships with both academics to industries to drive innovation with pace.

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Dr. Ng Sing Muk

General Manager, Research & Development Department, Sarawak Energy Berhad, Malaysia

Dr. Ng Sing Muk is currently heading the Research and Development Department for Sarawak Energy, a vertically integrated power utility and energy development company that serves the state of Sarawak, Malaysia. He is driving technological innovation by focusing on key areas such as distributed energy resources, emerging robotic innovation, environmental sciences, and chemical testing advancement. He is working with a team of diverse background to develop new technologies through design thinking strategy to match local context needs, while emphasising sustainability and best practices. Dr Ng has represented the company to various working groups at the national and regional levels. His technical research interests are in the field of sensors and remote monitoring, where he develops novel sensing materials and nanomaterials, integrates portable sensor devices, and correlates an array of sensing signals into new applications. He is also passionate about translating research into practical applications, cultivating disruptive innovations, and developing strategies to thrive in the age of technological disruption.



Ms. Sandra Liz Hon

Executive Director, H2 Energy Sdn. Bhd.

Ms. Hon has been serving as the Executive Director of H2 Energy Sdn. Bhd. since its founding in 2017. H2 Energy is an integrated green solution provider for Offgrid facilities and communities. Ms. Hon is an avid proponent of green energy and passionately advocates the continued development and adoption of green hydrogen technology at forums, conferences, and industry events. Ms. Hon holds an MBA from the University of Strathclyde.

Forum Moderator



Prof. Dr. Mohammad Kassim

Deputy vice-chancellor (Academic & International Affairs), Universiti Kebangsaan Malaysia (UKM), Malaysia

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KEYNOTE SPEAKER 1



Prof. Dr. Suk Won Cha

Department of Mechanical Engineering, Seoul National University, South Korea.

Biography

Since 2005, Prof. Suk Won Cha has been an assistant, associate and full professor in the Department of Mechanical Engineering at Seoul National University. He served as the Associate Dean at the College of Engineering from 2013 to 2015 and the Associate Dean of Office of International Affairs at Seoul National University from 2019 to 2021. He is currently the President of Advanced Institute of Convergence Technology at Seoul National University.

Prof. Cha studied engineering at Seoul National University for B.S. degree and at Stanford University for M.S. and Ph.D. degree. For the past decades, Prof. Cha investigated advanced electrochemical cells from materials to system level. He pioneered innovative vacuum fabrication process for electrolyte/electrode materials, optimal energy management strategy of such systems, publishing more than two hundred papers. Also, Prof. Cha is well-recognized as a co-author of "Fuel Cell Fundamentals (Wiley and Sons)" – the world-wide bestseller in fuel cells research.

Prof. Cha served as an organizer, committee and board member of numerous conferences such as World Chemistry Congress (IUPAC), and International Electric Vehicle Symposium and Exhibition, Asian Solid Oxide Fuel Cells Symposium and Exhibition, Thin Films Meetings and so on. Currently, Prof. Cha serves as a vice president of Thin Films Society, an editor of International Journal of Automotive Technology and also the editor-in-chief of International Journal of Precision Engineering and Manufacturing – Green Technology.

As a recognition of his contribution to academic society, Prof. Cha is the recipient of several awards including Fuel Cells Research Award from The Korean Electrochemical Society, Academic Excellence Award from The Korean Society of Automotive Engineers, Highly Commended Paper of the Year from International Journal of Precision Engineering and Manufacturing – Green Technology and Springer Award for Most Cited Author of the Year from International Journal of Automotive Technology.

Title: Fabrication of Thin Film Solid Oxide Fuel Cells for Low Temperature Operation by Physical Vapor Deposition

Abstract:

Various thin film processes have a great potential on material fabrications in solid oxide cells. Crystalline thin films improve the performance of solid oxide cells and reduces the electrochemical overvoltage. Thin film electrolyte, for example, can reduce ionic conductivity; thin film catalyst of highly ordered nanostructure improves catalytic activity; and the ordered pore structure in thin films facilitates gas diffusion. In this paper, we report the use of physical

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vapor deposition (PVD) to fabricate such structures – cermet anode, fluorite electrolyte, and perovskite cathode. Layers of these films form a successful solid oxide fuel cell.

As a representative thin film process, we explain the use of co-sputtering method to achieve such goals. This method realized the complex thin film structure required for each fuel cell component at the nano level and enabled the use of four to seven types of multi-component materials at the same time. Our research group has developed these processes to control the key physical properties such as crystallinity, density, pore structure and stoichiometry. A successfully fabricated cell demonstrates one of the best performances in terms of power density. Specifically, we present two of the most recent applications: A reversible solid oxide fuel cell with a crystalline YSZ electrolyte and LSCF-GDC oxygen electrode for oxygen evolution reaction, and a multiscale metal-supported thin film solid oxide fuel cells developed by a simple and low-temperature deposition processes. Both applications exhibit one of the best performances in terms of power density near 500 degree Celsius.

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KEYNOTE SPEAKER 2



Prof. Dr. Sammy Lap Ip Chan

School of Materials Science and Engineering, The University of New South Wales, Australia.
Department of Chemical and Materials Engineering, National Central University, Taiwan.

Biography

Professor Sammy Chan is presently a professor at the National Central University (NCU), Taiwan, and an honorary professor at the University of New South Wales (UNSW), Australia. Prof Chan started his career in Materials Engineering in England, where he received an Honours BSc (Eng.) degree in Metallurgy from Imperial College, and a PhD from the University of Cambridge. He held professorial positions at different universities, including National Taiwan University in Taiwan and University of New South Wales in Australia. Chan's expertise lies in the areas of materials design, energy materials, corrosion engineering and materials failure analysis. He publishes extensively in these areas and has authored and co-authored over 150 papers in international journals and conferences, and several book chapters on energy materials. Chan is a Fellow of Institute of Materials (UK), Australian Institute of Energy and Materials Research Society (Taiwan). Chan serves as a Discipline Expert (Materials Science), Engineers Australia. He is also a Chartered Scientist and a Chartered Engineer. Chan has been listed among the top 2% of the Stanford University World's Ranking of all researchers (2021 and Career). He is a recipient of Outstanding Teaching/Research Staff Award, NCU in both 2021 and 2022. Chan is a devoted educator and received numerous teaching awards, including the Best Teaching Award, UNSW Faculty of Science; the prestigious UNSW Vice-Chancellor's Award for Teaching Excellence, and Best Teaching Award from NCU. Professor Chan is the co-editor-in-chief of Materials Chemistry and Physics (Journal Impactor Factor = 4.7).

Title: High Entropy Alloys tailored made for Hydrogen Storage Applications

Abstract:

Alloys composed of five or more distinct elements are categorized as high entropy alloys (HEAs). The intriguing variety inherent in these alloys can give rise to unforeseen properties arising from intricate interactions among the diverse elements. Through meticulous fine-tuning of the types and proportions of elements within the HEAs, it is possible to achieve enhanced mechanical and chemical properties, setting them apart from conventional alloys that typically consist of only two or three primary elements. In recent years, works have been carried out on HEAs with three or more elements with high affinities to hydrogen, such as titanium (Ti), zirconium (Zr), tantalum (Ta) and niobium (Nb). It has been found that these alloys have considerable hydrogen storage capacity (>2 wt.%), low hydrogen storage pressure, high resistance to corrosion and thermal stability. These properties allow the HEAs to be utilized for hydrogen storage and release operations in a wider range of temperatures and environments. In addition to the amount and type of hydrogen-affinity elements present in the HEAs, lattice strain (δ) and valence electron concentration (VEC) are considered to have considerable influence on the hydrogen storage properties of these alloys. The effects of these factors will be discussed in the presentation. We have designed cost-effective TiZrTaSiSnCo HEAs for use in hydrogen storage applications. These HEAs have higher δ and VEC as compared with previously researched HEAs in the literature. Our HEAs could absorb approximately 1.33 wt.% of hydrogen at 1 bar and 400 °C. The hydrogen storage capacity at 50 bar reached 2.2 wt.%, which is comparable with the more expensive TiZrVNbHf HEA. These results, together with a few suggested research directions on the hydrogen storage of HEA, will be discussed in details in the presentation.

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KEYNOTE SPEAKER 3



Assoc. Prof. Dr. Rasyikah Md. Khalid

Deputy Dean, Research & Innovation, Faculty of Law, Universiti Kebangsaan Malaysia (UKM), Malaysia.

Biography

Rasyikah M Khalid is an Associate Professor at the Faculty of Law UKM and an associate fellow of Fuel Cell Institute UKM. She obtained her PhD from UKM, Master of Law (LL.M) from Universiti Malaya and her Bachelor of Law (LL.B) from the University of Sheffield, United Kingdom. In 2012 she completed three postgraduate courses in Building Resilience to Climate Change (BRCC) from the United Nations University (UNU) Tokyo and was appointed as a teaching assistant for the online BRCC courses in UKM. She was a visiting researcher at the UNESCO Centre for Water Law, Policy and Science at the University of Dundee Scotland. With various types of training, she has equipped herself to be an interdisciplinary researcher. She is currently a certified mediator at the Malaysian Mediator Centre, an important skill that she uses to solve environmental dispute cases. She has been consulted by agencies, including the World Bank Group and the Economic Planning Unit of Malaysia, and mass media on matters pertaining to environmental issues in the country. She is a Board member of the International Sustainable Development Research Society (ISDRS). Her research includes environmental law, energy law, climate change and development law.

Title: “Just Transition toward De-Carbonization.”

Abstract:

The Paris Agreement calls for the decarbonization of the global economy in order to limit global temperature rise to well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit it to 1.5 degrees Celsius. It sets a framework for countries to regularly report on their emissions reductions and progress toward meeting their climate targets. It calls for the transition towards decarbonization, to shift from using fossil fuels to cleaner, renewable energy sources. This, however, raises questions if the transition to a low-carbon economy is fair and equitable to all stakeholders. Fundamental liberties of the workers and communities that are currently dependent on fossil fuel industries should not be left behind as the transition takes place. The transition must also consider the social and environmental injustices that have been associated with the fossil fuel industry, such as pollution, health impacts, and displacement of the marginalized. An in-depth evaluation of just transition is desired to guarantee the fundamental liberties of all stakeholders toward decarbonization.

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KEYNOTE SPEAKER 4



Prof. Dr. Mohammad Kassim

Department of Chemical Sciences, Faculty of Science and Technology (FST), Universiti Kebangsaan Malaysia (UKM), Malaysia.

Biography

Prof. Dr. Mohammad bin Kassim is an esteemed academician and researcher affiliated with Universiti Kebangsaan Malaysia, with a Ph.D. in Inorganic and Coordination Chemistry from the University of Bristol, UK. His research journey has been enriched with several international faculty appointments, including Visiting Professor roles at the Faculty of Pure and Applied Sciences, University of Tsukuba, Japan (2019); Department of Precision Science and Technology, Graduate School of Engineering, Osaka University, Japan (2018); and Gifu University, Japan (2017). He has supervised 3 postdoctoral researchers, 30 doctoral students, and 36 Master's students. Prof. Mohammad's research interests and specialization include but not limited to Coordination Chemistry, molecular inorganic electrochemistry, molecular optoelectronics, photoelectrochemistry, conversion of CO₂ to fuel, and X-ray Crystallography.

Title: Sustainable Green Hydrogen Production for Malaysian Hydrogen Economy

Abstract:

Energy security and climate change are interconnected issues faced by nations worldwide. About 80-90% of global energy is derived from depleting fossil fuel sources, which contribute significantly to greenhouse gas emissions that drive climate change. Malaysia, a signatory of the COP 21 Paris Agreement, has committed to reducing the greenhouse gas emissions by 45% by 2030. To achieve this goal, adopting an alternative energy source such as hydrogen and fuel cell technology are necessary for achieving the target. Hydrogen serves as a clean energy carrier for fuel cells, generating electricity and producing only water as a byproduct. A major challenge in this technology is a cost-efficient hydrogen production. Due to the extremely limited availability of natural hydrogen gas on earth, producing green hydrogen from water via renewable resources is imperative. Solar energy, which is abundance and available universally, is a preferable choice of renewable energy for water splitting. Solar Hydrogen group at Universiti Kebangsaan Malaysia has been exploring various solar-driven water-splitting materials and techniques since 2002. This communication focuses on the conventional method that combine photovoltaic (PV) with electrolyzer systems, and photoelectrochemical (PEC) approach inspired by natural photosynthesis. Observations from literatures and our studies suggested that PEC water splitting is more desirable for green hydrogen production and hence, upscaling of this system is necessary to support efforts to employ solar hydrogen as one of the sources for a sustainable green hydrogen production to meet the demand for hydrogen economy in Malaysia.

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KEYNOTE SPEAKER 5



Prof. Datuk ChM. Ts. Dr. Taufiq Yap Yun Hin, PJN, PGDK, FASc, FMIC, FRSC, CChem., AMIChemE, MMSET
Head of Catalysis Science and Technology Research Centre, Faculty of Science, Universiti Putra Malaysia (UPM), Malaysia.

Biography

Professor Taufiq Yap Yun Hin was born in Kota Kinabalu, Sabah on 14th January 1968. He earned his BSc (Hons) and MSc in 1992 and 1994, respectively at Universiti Putra Malaysia. He then went on to earn his PhD (1997) in heterogeneous catalysis at University of Manchester Institute of Science and Technology (UMIST), United Kingdom.

Professor Taufiq-Yap started his career as a tutor in July 1993 and then lecturer at the Department of Chemistry, Universiti Putra Malaysia (UPM) since August 1997. He was promoted to Associate Professor on 1st May 2002 and to full professor on 1st October 2007. He was the founding Head of Catalysis Science and Technology Research Centre (PutraCAT) from 1st Sept 2008 until Sept 2014. Professor Taufiq-Yap was appointed as Vice Chancellor of Universiti Malaysia Sabah from July 2019 – July 2022. His research interest lies in the catalytic production of bioenergy from biomass and wastes. He published more than 470 Scopus indexed scientific publications includes various reviews on biodiesel and hydrogen production. Throughout his career, Professor Taufiq-Yap has been the recipient of the following Awards and Distinctions: National Young Scientist Award (2002); The Outstanding Young Malaysian Award (2008), Top Research Scientist Malaysia (2013), Malaysia's Research STAR Award (2018) and listed as World's Top 2% Scientist by Stanford University, USA. He received the highest award Gold Medal for Excellent in Chemistry 2022. Professor Taufiq-Yap was appointed as Fellow of Academy Science of Malaysia (2015), Fellow, Malaysia Institute of Chemistry (2009) and Fellow, Royal Society of Chemistry, United Kingdom (2008); He is currently the Visiting Professor of Henan Agriculture University, China (2020-2025).

Title: Sustainable Biohydrogen from Biomass

Abstract:

Hydrogen (H₂) is a one of the utmost competent alternative clean fuels in the transition to net-zero emissions for the future which can be used for transportation and stationary power generation. H₂ is the alternative to fossil fuels in terms of the green economy, attributed to its merits, such as availability, renewability, and high energy content (approximately three times higher than gasoline) and produces no direct emissions of pollutants or greenhouse gases. One of the advantages is that H₂ can be stored/transported in different valuable forms i.e. solid, liquid and compressed gas. Among the most renewable energies, one of the most important energy sources near future for hydrogen production is biomass. There are two main routes for biomass-based hydrogen production, namely thermo-chemical and bio-chemical. Three methods that included as thermo-chemical routes are pyrolysis, gasification and supercritical water gasification whereas biological conversion methods consist of fermentative hydrogen production, photosynthesis and biological water gas shift reactions. Biomass gasification is a possible alternative to the direct use of fuel energy. Biomass, a CO₂ neutral source of renewable fuel, can contribute to the demand for heat, electricity and synthesis gas. Biomass derived hydrogen can be classified as carbon neutral

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because the CO₂ released during hydrogen (syngas) production is consumed by further biomass generation. The major constituents of biomass are cellulose, hemicelluloses, lignin, inorganic extractives, and inorganic minerals. Lignocellulosic biomasses include agricultural crop waste, forest residues, aquatic plants, energy crops residues etc and are about 50% of the all biomasses. Lignocellulosic biomass is the most promising renewable feedstocks for production of biofuels and chemicals. Currently, lignocellulosic biomass resources deserve major interest to produce bio-oil, bioethanol, synthesis gas, hydrogen and chemical.

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Prof. Ir. Dr. Siti Kartom Kamarudin

Director, Fuel Cell Institute (SELFUEL), Universiti Kebangsaan Malaysia (UKM).

Biography

Prof. Ir. Dr. Siti Kartom Kamarudin is a distinguished figure in the field of Hydrogen and Fuel Cell Technology. With a rich educational background and extensive professional affiliations, she has made significant contributions to the world of academia and research.

Prof. Siti Kartom obtained her Doctor of Philosophy in Process System Engineering (2004). As an accomplished researcher, Prof. Siti Kartom's interests encompass Process System Engineering, Fuel Cell Technology, Catalyst and Membrane Technology for Fuel Cell and Hydrogen Production, as well as Biofuel Production. Her contributions to these domains have been vast, with over 250 publications in high-impact journals. Her impressive H-index of 51 and a citation count exceeding 10,000 reflect the depth of her impact on the scientific community.

Prof. Siti Kartom's prowess extends beyond publications. She has authored and edited research and teaching books, chapters in books, and numerous popular writings, which underline her recognition within the global research community.

Her dedication to research excellence has garnered her numerous awards and accolades. She was honored as a Highly Cited Researcher in 2020, a recognition bestowed on the top 1% cited researchers worldwide. Prof. Siti Kartom's distinction extended to her appointment as World Top 2% Scientist by Stanford University in 2020. The Malaysia Highly Cited Researchers Virtual Award in 2021 further solidified her position in the research arena.

Prof. Siti Kartom's leadership has been pivotal in driving research initiatives. She served as the Director of the Fuel Cell Institute from 2017 to 2022, and prior to that, as its Deputy Director from 2014 to 2017. Her leadership extended to her role as Head of Program for Excellent Research Consortium under KPT from 2020 to 2022. Furthermore, her expertise led her to serve on the editorial board of the Engineering Journal of UKM.

Her professional associations highlight her commitment to her field. As a Professional Engineer with Practicing Certificate, a member of The Malaysian Association of Hydrogen Energy, an Associate Member of IChemE UK, and a corporate member of the Institution of Chemical Engineers Malaysia, she's left an indelible mark on the engineering landscape.

In her capacity as an academic, researcher, and leader, Prof. Ir. Dr. Siti Kartom Kamarudin continues to inspire and drive the advancement of Hydrogen and Fuel Cell Technology, leaving an enduring legacy in the realm of scientific exploration and technological innovation.

SPEAKERS

Title: Green Synthesis of Metal and Metal Oxide Nanoparticles via Plant Extracts for Fuel Cell Application

Abstract:

Biological approach to synthesizing materials via environmentally friendly green chemistry-based techniques involving natural materials such as plants, bacteria, fungi, seaweed, polysaccharides, biodegradable polymers, plant-derived materials and algae has been employed as an alternative method for the synthesis of metal and metal oxide nanoparticles. With increasing enthusiasm for efficient green chemistry, biosynthetic routes for fabricating nanoparticles have aroused much interest because they are environmentally benign, simple, economic, and clean technology; they do not involve hazardous chemicals, and they have zero contaminants and by-products. Of these bio-entities, plant extracts have received great attention due to their ability to reduce and stabilize metal nanoparticles in a single-step synthesis using their distinct natural traits. Due to their diverse and complex compositions, natural organic phytoconstituent biomolecules existing in plant extracts such as alkaloids, flavonoids, saponins, steroids, terpenoids and tannins act as reducing and stabilizing agents. This work presents the potential metal and metal oxide nanoparticles, such as those containing silver, gold, palladium, platinum, zinc oxide, iron, titanium and ceria uses of green synthesis methods using plant extracts for fuel Cell application. The challenges, limiting factors and future direction of the plant-based synthesis of metal nanoparticles are also highlighted.

SPEAKERS

KEYNOTE SPEAKER 7



Prof. Dr. Mohammad Ali Abdelkareem

Sustainable and Renewable Energy Engineering Department, University of Sharjah, U.A.E.

Biography

Dr. Mohammad spent 7 years in one of the pioneer labs in Japan in the field of electrochemical energy devices, i.e., fuel cells. During his PhD study, Dr Mohammad developed a novel electrode structure for Direct Methanol Fuel Cell (DMFC), thereby; the methanol concentration which can be used efficiently in DMFC has been increased from 7 to 100 weight%. Dr. Mohammad enrolled in various postdoctoral fellowships in Japan for the development of the electrodes of the direct methanol fuel cells. Dr. Mohammad back to Egypt at the end of 2012, where he secured international and national funds through them he built up two pioneer labs in the field of the Solid Oxide Fuel Cells and Microbial Fuel Cells. Right now, he is professor in sustainable and renewable energy engineering department, university of Sharjah, UAE. He is working on the development of the different renewable energy resources, thermofluids, and electrochemical devices that can be used in wastewater treatment and water desalination. Professor Mohammad has secured several national and international research funds with more than 800,000 USD for the development of the various electrochemical energy conversion storage devices. Professor Mohammad published more than 300 manuscripts in ISI indexed journals.

Title: Recent Progress in the Application of Fuel Cells and Challenges Facing the Green Hydrogen Production

Abstract:

Fossil fuel plays a significant role in global warming, and thus a renewable and sustainable clean energy source should be used. Moreover, the development of environmentally friendly energy conversion devices such as fuel cells will contribute positively in controlling global warming. The main challenges facing the wide spread of the fuel cells are the high cost of the Pt catalyst as well as the problems related to the production and storage of pure hydrogen. Recently significant progress has been made regarding the development of fuel cells in various applications as well as green hydrogen production. This work covers the progress done in green hydrogen focusing on the main challenges facing its mass production as well as the potential of the fuel cells application in residential and transportation sectors.

SPEAKERS

KEYNOTE SPEAKER 8



Prof. Dr. Junji Inukai

Professor, Clean Energy Research Center, Division of Fuel Cell Research, University of Yamanashi, Japan.

Biography

Professor Junji Inukai earned his BSc in 1987, MSc in 1989, and PhD in 1992 in Chemistry from University of Tokyo, Japan. He is currently a Full Professor at Clean Energy Research Center and Hydrogen and Fuel Cell Nanomaterials Center, University of Yamanashi, Japan. His research interest covers fuel cell materials and analyses, clean energy, instrument development, surface electrochemistry, and surface chemistry. He has commercialized two analytical instruments for Shimadzu Corp., Japan for monitoring oxygen partial pressure inside fuel cells: FC-O₂ Monitor FCM-405H-Oxy commercialized in 2009 and FC-3D Monitor FCM-3D-Oxy in 2016. In addition to that, he is also the owner of 5 Japanese patents on fuel cells and novel analytical methods. He has received numerous awards, which are Research Encouragement Award from Tokin Foundation of Science & Technology Promotion for "Atom/Molecular Analyses of Structure and Reactivity at Solid/Liquid Interfaces, Presentation Award by Surface Finishing Society of Japan for "Structure Analysis of BTA Adlayers on Cu Single-Crystal Surfaces in Solution", Journal Award by Surface Science Society of Japan for "Electrode Surfaces Studied by Ultrahigh Vacuum-Electrochemistry Combined System", and ACS Editors' Choice by American Chemical Society for "Atomically Flat Pt Skin and Striking Enrichment of Co in Underlying Alloy at Pt 3 Co(111) Single Crystal with Unprecedented Activity for the Oxygen Reduction Reaction". Notably, in 2021, he received Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science and Technology, Japan. He is also active member in various Academic/Professional organizations: Chemical Society of Japan, Electrochemical Society of Japan, Japan Society of Vacuum and Surface Science, Catalyst Society of Japan, Surface Finishing Society of Japan, Japanese Society for Synchrotron Radiation Research, Japanese Society for Neutron Science, International Electrochemical Society, Electrochemical Society, and La Societe Franco-Japonaise des Techniques Industrielles. His publications have amounted to 110 original papers, 12 books, 29 reviews and interpretive articles.

Title: Materials Needed for Proton Exchange Membrane Fuel Cells Operated at Temperatures Higher than 100°C

Abstract:

Proton exchange membrane fuel cells (PEMFCs) are used mainly for houses and automobiles. For small cars, batteries can be efficient, while for trucks and buses, fuel cells are expected to be the main players. For PEMFCs for large, heavy-duty automobiles, one of the focused points is developing PEMFCs operated at temperatures higher than 100°C, or hopefully at 120°C.

For the catalyst, conventional Pt-alloy catalysts would not be used because of the dissolution of additional metals at high temperature. Carbon supports should be modified against corrosion, or new material supports are expected. Fluorocarbon polymers, such as Nafion, are difficult to be used at high temperatures without radical scavengers. Hydrocarbon membranes are expected to be employed in the future.

The present situation of the development of those materials are discussed.

SPEAKERS

KEYNOTE SPEAKER 9



Prof. Dr. Aishah Abdul Jalil

Director, Centre of Hydrogen Energy, Universiti Teknologi Malaysia (UTM), Malaysia.

Biography

Professor Dr. Aishah Abdul Jalil received her Bachelor of Engineering (1993, Industrial Chemistry), Master of Engineering (1995, Chemical and Environmental Engineering) and Ph.D. (2002, Molecular Chemistry) from Japan. Currently, she is a Director of Center of Hydrogen Energy and very active earnestly involved in research focussing on design and synthesis of catalysts and advanced materials for various applications in energy and environmental catalysis, petrochemical reactions, water splitting, wastewater treatment, fine chemistry, as well as drug delivery system. At present, by implementing Chemistry for green applications, she has managed to publish more than 250 scientific papers in high impact international and local journals. As a favourite lecturer, more than 30 Ph.D., 50 Masters and 140 undergraduate students were graduated under her supervision, while many more are still ongoing.

Title: Global Energy Transformation Towards a More Environmentally Sustainable Future

Abstract:

Global energy production is predominantly dependent upon fossil fuels and their consistent utilization not only results in their rapid depletion but also adversely affects the environment. The combustion of fossil fuels not only emits long-lived CO₂ leading to global warming, but also short-lived toxic pollutants such as SO_x and NO_x that cause serious health problems and ecosystem pollution. Thus, global decarbonisation in the transportation, industry and electricity generation sectors is crucially needed to mitigate anthropogenic climate change. In this context, a quick switch from the fossil-based economy to a net-zero emission economy specifically from alternative renewable energy sources such as solar, wind, tidal, biomass, etc. which are greener and sustainable has been a growing interest from scholars and industries with versatile production routes. Accelerating the deployment of renewables to fossil energy requires complementary energy storage and energy carrier strategies. Recently, hydrogen became widely acknowledged as a promising energy carrier due to its high energy density (2.75 times higher than hydrocarbons), high energy conversion efficiency, non-carbon dioxide emissions and wide range of sources. The EU announced its Hydrogen Strategy last year, Japan renewed its commitment to Hydrogen energy, while South Korea and Australia announced multimillion-dollar investments in the hydrogen industry. ASEAN energy market still dominated by fossil fuels and all the renewable energy initiatives especially towards hydrogen economy are lagging behind schedule, this might be due to an abundance of natural resources in the current scenario and high renewable energy costs. The cost-effective production methods, policies, research and development and hydrogen infrastructure development are still under investigation.

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KEYNOTE SPEAKER 10



Assoc. Prof. Dr. Abul Kalam Azad
Universiti Brunei Darussalam, Brunei Darussalam.

Biography

Assoc. Prof. Dr. Abul Kalam Azad is a highly accomplished academic and researcher at Universiti Brunei Darussalam, renowned for his significant contributions to the fields of Energy, Materials, Fuel cells, Biomass, and Photocatalysts. His relentless pursuit of knowledge and commitment to excellence has positioned him at the forefront of his field. His professional journey spans over three decades, during which he held esteemed positions in academia and research institutions.

As an Associate Professor in the Department of Chemical and Process Engineering at Universiti Brunei Darussalam, he has made invaluable contributions to his field. Previously, he served as a Senior Research Fellow at the University of St Andrews and as a Postdoctoral Research Fellow in Inorganic Chemistry at Uppsala University. Assoc. Prof. Dr. Azad's interests lie in renewable and alternative energy. His publications in renowned journals, including 185 SCOPUS-indexed peer-reviewed papers, 1 book, and 7 book chapters, have earned him a reputation as one of the top 2% scientists in the world in Energy (since 2019). His research has garnered extensive citations, with Google Scholar recording 6590 citations (h-index: 38, i-10 index: 94) and SCOPUS showing 5088 citations (h-index: 36).

His expertise has led him to participate in approximately 45 international conferences, where he presented plenary, keynote, invited talks, and numerous poster contributions. Moreover, he is a respected reviewer for over 25 reputed international journals. His dedication to fostering future scholars is evident through his supervision of 10 Ph.D. students, 1 MPhil student, 8 master's students, and over 25 final-year undergraduate students. Currently, he serves as the main supervisor for 5 Ph.D. students.

The exemplary work of Assoc. Prof. Dr. Abul Kalam Azad has earned him prestigious awards and honors, highlighting his exceptional contributions to academia. His unwavering commitment to academic excellence and his passion for research and community development distinguish him as an exemplary academician. His contributions to the field of Energy have solidified his position as a respected figure, inspiring and shaping the next generation of researchers.

Title: Ammonia Fuel Cell: Prospect to Decarbonize Future Energy

Abstract:

Ammonia, a molecule that is gaining more interest as a fueling vector, has been considered as a candidate to power transport, produce energy, and support heating applications for decades. Using ammonia like hydrogen directly in a fuel-cell system provides high power density. The use of an ammonia-fed solid oxide fuel cell (SOFC)

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is the most efficient method of generating power. In terms of CO₂ emission, ammonia is a good indirect hydrogen storage material because it does not contain carbon and therefore will not release CO₂ when used as fuel in a fuel cell or gas turbine. Compared with other fuel cells, the ammonia-fed SOFC has many advantages. The availability of NH₃ is one of the main reasons for the high output. However, the characteristics of the molecule always made it a chemical with low, if any, benefit once compared to conventional fossil fuels. Still, the current need to decarbonize our economy makes the search for new methods crucial to use chemicals, such as ammonia, that can be produced and employed without incurring in the emission of carbon oxides. Therefore, current efforts in this field are leading scientists, industries, and governments to seriously invest efforts in the development of holistic solutions capable of making ammonia a viable fuel for the transition toward a clean future.

In this presentation, I will present a comparative study of the working principles, analyses, applications, advantages, and disadvantages of various technologies available for ammonia fuel cells. I will discuss about the importance of ammonia as an energy vector, moving through all the steps in the production, distribution, utilization, safety, legal considerations, and economic aspects of the use of such a molecule to support the future energy mix. Fundamentals of combustion and practical cases for the recovery of energy of ammonia are also addressed, thus providing a complete view of what potentially could become a vector of crucial importance to the mitigation of carbon emissions. I will also discuss the holistic perspective of ammonia as a chemical that presents benefits and constraints for storing energy from sustainable sources. State-of-the-art knowledge provided by academics actively engaged with the topic at various fronts also enables a clear vision of the progress in each of the branches of ammonia as an energy carrier. Further, the fundamental boundaries of the use of the molecule are expanded to real technical issues for all potential technologies capable of using it for energy purposes, legal barriers that will be faced to achieve its deployment, safety and environmental considerations that impose a critical aspect for acceptance and wellbeing, and economic implications for the use of ammonia across all aspects approached for the production and implementation of this chemical as a fueling source. The principles, research, practicalities, and future views of a transition toward a future where ammonia will be a major energy player will be discussed. The suitability of ammonia as a fuel for the next generation of fuel cells, including direct ammonia-fed SOFCs, the development of different types of fuel cells using ammonia as a fuel, and the potential applications of ammonia-fed fuel cells will also be discussed.

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KEYNOTE SPEAKER 11



Assoc. Prof. Dr. Rafiziana Md. Kasmani

Department of Energy Engineering, Faculty of Chemical and Energy Engineering, Universiti Teknologi Malaysia (UTM), Malaysia.

Biography

Rafiziana is a senior lecturer at the Department of Energy Engineering, Faculty of Chemical and Energy Engineering, Universiti Teknologi Malaysia (UTM). Completed her PhD in 2009 at University of Leeds, UK, specializing in vented explosions.

The main research focus is on fire engineering, gas and dust explosion by studying a series of methodologies for classifying flame acceleration and potential detonation hazard in chemical process industrial, including mixtures of different sensitivity. She managed to secure research grant with a total of more than RM2 million to date and published over 100 papers at the international and national levels in refereed journals and proceedings. For supervision, 5 PhD and more than 10 Masters has successfully graduated under her supervision with total current students of 2 PhD and 1 Masters. She also secured AUN-SEED Short-term Research Program in Japan (SRJP) JFY 2015 in University of Tokyo and a recipient of Fulbright Malaysian Scholar Program for 2017/2018 in University of Maryland, USA for six (6) months and selected as one of the recipient of Erasmus+ Mobility Staff Program in 2017 in Universidad Politécnica de Madrid (UPM).

Through her experiences and expertise in Fire and Explosion engineering, Rafiziana has the opportunity to participate as a speaker in a variety of related courses, conferences and workshops and was invited as a keynote speaker at several international conference platforms. She also frequently served as technical reviewer to prestige international journals that has allowed for a broad resource base on which to build her career as educator and researcher.

Title: Risk Evaluation of Hydrogen Storage and Transportation as Energy Carrier

Abstract:

Safe practices in the production, storage, distribution, and use of hydrogen are essential for the widespread acceptance of hydrogen and fuel cell technologies as transition to enhanced global sustainable development by facilitating the safe introduction and commercialisation of hydrogen as an energy carrier of the future. A catastrophic failure in any hydrogen project could damage public perception of hydrogen and fuel cells, focusing on the risk of hydrogen leakage on the storage vessels and related devices, specifically the compressor and the dispenser. In this work, different cases of hydrogen leakage and combustion are evaluated for high pressure storage vessels with respect to different application situations, based on the prototype buggy car developed by Universiti Kebangsaan Malaysia (UKM) and global layout of hydrogen refuelling stations. The investigation covered the hydrogen refuelling station dispensing system, including bulk hydrogen storage, compressors, buffer storage and dispensers; and Fuel Cell Energy Vehicles (FCEVs) storage used in ground support vehicles (e.g., cars and buses).

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Highlight on the common safety gaps and vulnerabilities in FCEVs and safety separation distance in refuelling station system are elaborated, considering the prescriptive and performance-based approach in accordance with consensus international regulation, codes and standard (RCS). Based on these elements and an accidentology, a risk analysis has been conducted in order to identify all accidental situations that could occur. These preliminary outcomes of this study may be useful as a prerequisite input for the creation of standards and regulation related to the hydrogen-based technology, additional to National Automotive Policy (NAP) 2014. The safety vulnerabilities separation distance available between RCSs, the mitigation of associated risks, and assurances that effective safety communications plans are in place are also explored.

SPEAKERS

KEYNOTE SPEAKER 12



Assoc. Prof. Dr. Mahendra Rao Somalu

Fuel Cell Institute, Universiti Kebangsaan Malaysia (UKM), Malaysia.

Biography

Assoc. Prof. Dr. Mahendra Rao Somalu is currently a Senior Research Fellow at the Fuel Cell Institute, Universiti Kebangsaan Malaysia (UKM). He received his PhD from Imperial College London in 2012. Since 2013, he has been an active Associate Member of the Institution of Chemical Engineers (IChemE), and since 2017, he has been a Member of the Malaysian Association of Hydrogen Energy (MAHE) and a Member of the Malaysian Association of Solid State Science (MASS) since 2019. He has received several awards, including the Best Researcher Award in 6th Edition of International Research Awards in New Science Inventions (NESIN Award 2023), Gold Award in the 4th International Malaysia-Indonesia-Thailand Symposium on Innovation and Creativity 2021 (SIC 2021), Anugerah Bitara Penerbitan (Excellent Publication Award) in the science category from UKM in 2018, Silver Award in the 3rd International Innovation, Design, and Articulation (i-IDEA 2016), and Gold Award in the Invention, Innovation & Design Exposition 2015 (iideX2015). His article entitled "Structural and Electrochemical Properties of Lanthanum Silicate Apatites $\text{La}_{10}\text{Si}_{6-x}\text{O}_{0.2}\text{Al}_x\text{Zn}_{0.2}\text{O}_{27-5}$ for Solid Oxide Fuel Cells (SOFCs)" was chosen as the Article of the Year 2021 by Hindawi and was published in the International Journal of Chemical Engineering. With over 15 years of experience in the development of high-temperature fuel cell technology, nanomaterials, biomass gasification, and hydrogen energy, he has published more than 140 scientific articles in various high-impact journals and has been invited to speak as a keynote and invited speaker at various national and international conferences.

Title: Current Progress in Solid Oxide Fuel Cell Technologies

Abstract:

Solid oxide fuel cells (SOFCs) are electrochemical devices that efficiently convert the chemical energy of a fuel into electricity at high temperatures between 500 and 1000 °C. They are particularly well-suited for combined heat and power (CHP) generation due to their ability to utilize the high-grade heat exhaust for other heating purposes, resulting in overall CHP system efficiencies of up to 90%. SOFCs consist of key components, including the anode, electrolyte, and cathode, which must meet specific requirements such as conductivity, chemical stability, porosity, and catalytic activity. The electrolyte needs to be highly dense with excellent ionic conductivity, while the electrodes must possess porous structures and mixed ionic and electronic conductivity properties. Compared to conventional power generation systems, SOFCs offer several advantages. They can significantly reduce CO₂ emissions by approximately 50%, minimize transmission losses associated with centralized power plants, and facilitate on-site electricity production. According to a report by Maximize Market Research Pvt. Ltd., the global SOFC market is projected to grow from USD 1.53 billion in 2021 to USD 7.98 billion by 2027, with a compound annual growth rate (CAGR) of 31.7% during the forecast period. This growth is driven by increasing demand for clean energy, a focus on carbon emission reduction, and the expanding use of SOFCs in various industries. Currently, North America is

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the largest market for SOFCs, followed by the Asia-Pacific region, which is expected to experience the highest CAGR in the forecast period. The Asia-Pacific region's growth can be attributed to government initiatives promoting the adoption of SOFCs and the rising demand for clean energy. Key players in the global SOFC market, such as Bloom Energy, Sunfire, Solid Power, Ceres Power Holdings, and Convion, are actively involved in research and development, partnerships, and acquisitions to enhance their market presence and develop advanced SOFC technologies. However, the widespread adoption of SOFCs faces several challenges that must be addressed. These challenges include cost reduction, as the current technology can be expensive, and improving the durability and reliability of SOFC systems. Overcoming these hurdles will be crucial to successfully integrating SOFCs into the energy landscape and reaping their full benefits.

PRESENTATIONS LIST

PARALLEL SESSIONS

SESSION THEME	
FC	Fuel Cells for Mobile and Stationary Systems
HT	Hydrogen Technology
EM	Energy Materials for Fuel Cells
RS	Renewable and Sustainable Materials & Processes

Presentation ID reference (based on Abstract ID)

Abstract ID	Presentation ID	Abstract ID	Presentation ID
C-001	HT04	C-036	HT10
C-002	EM14	C-037	FC04
C-003	FC05	C-038	FC12
C-004	HT05	C-039	FC06
C-005	RS05	C-041	RS03
C-006	FC07	C-042	EM07
C-007	HT11	C-043	RS01
C-008	RS04	C-044	FC10
C-009	RS09	C-046	FC11
C-011	FC03	C-050	HT13
C-013	FC15	C-052	EM11
C-014	HT03	C-054	RS02
C-018	HT07	C-056	EM02
C-019	HT02	C-058	EM09
C-020	FC01	C-060	EM13
C-021	HT01	C-062	EM08
C-022	FC08	C-063	RS08
C-023	RS07	C-064	EM10
C-024	HT12	C-065	HT06
C-025	HT08	C-066	FC02
C-026	EM01	C-068	EM04
C-027	FC13	C-069	RS10
C-028	EM05	C-070	FC09
C-029	EM03	C-071	RS06
C-033	FC14	C-072	RS11
C-035	EM12		

PRESENTATIONS LIST

PARALLEL SESSION 1

5th September 2023, Day 1

SESSION: 2:35 pm – 4:45 pm (MYT)

THEME: Fuel Cells for Mobile and Stationary Systems		
VENUE: Putrajaya Ballroom 2		
Time	Presentation ID	Presentation Detail
2:35 PM	Keynote-1	Physical Vapor Depositions for Fabrication of Thin Film Low Temperature Solid Oxide Fuel Cells <i>Prof. Dr. Suk Won Cha</i> (Seoul National University, South Korea)
2:55 PM	FC01	Mathematical Verification of $\text{Ba}_{0.5}\text{Sr}_{0.5}\text{Co}_{0.8}\text{Fe}_{0.2}\text{O}_{3-\delta}$-$\text{Sm}_{0.2}\text{Ce}_{0.8}\text{O}_{1.9}$ Carbonate Perovskite Interconnect Coating Electric Conductivity for Solid Oxide Fuel Cell <i>Tan Kang Huai, Umira Asyikin Yusop, Nurul Farhana Abd Rahman, Hamimah Abd Rahman, Mohd Faizal Tukimon, Zolhafizi Jaide, Mohammad Saifulddin Mohd Azami</i> (Tunku Abdul Rahman University of Management and Technology)
3:10 PM	FC02	Study of High-Performance Magnesium-Air Fuel Cell using Corrosion Inhibitor <i>Nurul Shahzira Hazri, Sahriah Basri, Azran Mohd Zainoodin, Mismisuraya Meor Ahmad, Siti Kartom Kamarudin</i> (Universiti Kebangsaan Malaysia)
3:25 PM	FC03	Analysis of the Change in Performance of Nafion through Hot Press Treatment <i>Leong Kok Seng, Mohd Shahbudin Masdar, Choo Thye Foo, Wong Wai Yin, Loh Kee Shyuan, Nur Ubaidah Saidin, Omar Syah Jehan Elham</i> (Politeknik Tun Syed Nasir Syed Ismail)
3:40 PM	FC04	Process Simulation and Economic Evaluation of 500 kW Polymer Exchange Membrane (PEM) Electrolysis System <i>Adam Mohd Izhan Noor Azam, Tan Kiant Leong, Teuku Husaini, Mohd Shahbudin Masdar, Edy Herianto Majlan, Noor Shahirah Shamsul, Siti Nur Amira Shaffee</i> (PETRONAS Research Sdn. Bhd.)
3:55 PM	Break	
4:15 PM	FC05	Effects of Flow Field and Distribution Zone Design with Elliptical Baffles on Fluid Distribution <i>C.T Aisyah Sarijuni, Bee Huah Lim, Edy Herianto Majlan, Masli Irwan Rosli</i> (Universiti Kebangsaan Malaysia)
4:30 PM	FC06	Prelusive Study on Phase Formation and Chemical Stability of $\text{Sr}_{1-x}\text{Ba}_x\text{Ce}_{0.7}\text{Y}_{0.2}\text{Zr}_{0.1}\text{O}_{3-\delta}$ ($x = 0-1$) As Proton-conducting Solid Oxide Fuel Cell Electrolyte <i>Nur Wardah Norman, Ahmad Faiq Omar, Mahendra Rao Somalu, Andanastuti Muchtar, Nurul Akidah Baharuddin, Muhammed Ali S.A., Abul Kalam Azad</i> (Universiti Kebangsaan Malaysia)

PRESENTATIONS LIST

THEME: Hydrogen Technology

VENUE: Johor

Time	Presentation ID	Presentation Detail
2:35 PM	Keynote-2	High Entropy Alloys Tailored Made for Hydrogen Storage Applications <i>Prof. Dr. Sammy Lap Ip Chan</i> (The University of New South Wales, Australia)
2:55 PM	Keynote-3	Just Transition toward De-Carbonization <i>Assoc. Prof. Dr. Rasyikah Md. Khalid</i> (Universiti Kebangsaan Malaysia, Malaysia)
3:25 PM	HT01	An Overview of Hydrogen Potential in Decarbonization towards Green Steel Ecosystem <i>Abu Bakar Sulong, Kean Long Lim, Kee Shyuan Loh, Sofiah Md Auziar</i> (Universiti Kebangsaan Malaysia)
3:40 PM	HT02	The Innovation of Flow Field Configuration for Proton Exchange Membrane (PEM) Fuel Cell and Electrolyser <i>Nur Azimah Abd Samad, Siti Nur Amira Shaffee, Maung Myo Thant</i> (PETRONAS Research Sdn. Bhd.)
3:55 PM	Break	
4:15 PM	HT03	Effect of Different Fibrous Silica Metal Oxide Photoanodes for Enhanced Photoelectrochemical Water Splitting <i>Muhammad Hakimi Sawal, Aishah Abdul Jalil, Nur Farahain Khusnun, Nurul Sahida Hassan</i> (Universiti Teknologi Malaysia)
4:30 PM	HT04	Annealing Effect on the Structural and Photoelectrochemical Performance of MoS₂/Ni₃S₂/ZnO/Graphene/Nickel Foam <i>Nurul Nabila Rosman, Rozan Mohamad Yunus, Lorna Jeffery Minggu, Khuzaimah Ariffin, Norasikin Ahmad Ludin</i> (Universiti Kebangsaan Malaysia)

THEME: Energy Materials for Fuel Cells

VENUE: Pahang

Time	Presentation ID	Presentation Detail
2:35 PM	Keynote-4	Challenge and Solution in Sustainable Solar Hydrogen Production for a Malaysian Hydrogen Economy <i>Prof. Dr. Mohammad Kassim</i> (Universiti Kebangsaan Malaysia, Malaysia)

PRESENTATIONS LIST

2:55 PM	EM01	Elucidating the Impact of Temperature, Heating Duration, Doping and Co-Doping towards the Synthesis of Photocatalytic Active TiO₂ with Tunable Optical Properties <i>Nur Syahidatul Insyirah Mohd Foad, Faridah Abu Bakar</i> (Universiti Tun Hussein Onn Malaysia)
3:10 PM	EM02	NiS And Mo₂C as Co-catalyst of TiO₂ Nanotube Photoelectrode to Enhance Photoelectrochemical Water Splitting Performance <i>Siti Nurul Falaehin Moridon, Khuzaimah Arifin, Mohamad Azuwa Mohamed, Loma Jeffery Minggu, Rozan Mohamad Yunus, Mohammad B. Kassim</i> (Universiti Kebangsaan Malaysia)
3:25 PM	EM03	Modification of Gas Diffusion Electrode using Polyaniline and Polypyrrole for Microbial Electrosynthesis-A Comparative Study <i>Krishan Balachandran, Ryan Yow Zhong Yeo, Mimi Hani Abu Bakar, Ang Wei Lun, Mohd Nur Ikmal Salehmin, Lim Swee Su</i> (Universiti Kebangsaan Malaysia)
3:40 PM	EM04	Influence of the Current Collector on the Structural and Electrochemical Properties of The LiNi_{0.5}Ru_{0.5}O₂ Electrode <i>Wan Nor Anasuhah Wan Yusoff, Nurul Akidah Baharuddin, Mahendra Rao Somalu, Nigel P. Brandon, Lai Jian Wei</i> (Universiti Kebangsaan Malaysia)
3:55 PM	Break	
4:15 PM	EM05	Microstructure Analysis of Laser Micro Welding for Thin Plate Stainless Steel (SUS430) in the Application of Metal-Supported Solid Oxide Fuel Cell (MS-SOFC) <i>Mohd Faizal Tukimon, Hamimah Abd.Rahman, Shahrin Hisham Amimordin, Ahmad Najmuddin Bin Zambri, Aiman Mohd Halil, and Mohd Harizan Zul</i> (Universiti Tun Hussein Onn Malaysia)

THEME: Renewable and Sustainable Materials & Processes

VENUE: Perak

Time	Presentation ID	Presentation Detail
2:35 PM	Keynote-5	Sustainable Biohydrogen from Biomass <i>Datuk Prof. ChM Ts. Dr. Taufiq Yap Yun Hin</i> (Universiti Putra Malaysia, Malaysia)
2:55 PM	RS01	Wet Torrefaction of Palm Oil Mill Effluent as an Emerging Technology for Biohydrogen Production: An Optimization Study <i>Kai Ling Yu, Bidattul Syirat Zainal, Hassan Mohamed, Pin Jern Ker, Halimah Badioze Zaman</i> (Universiti Tenaga Nasional)

PRESENTATIONS LIST

3:10 PM	RS02	Anaerobic Mono-Digestion of Chicken Manure: Performance Analysis and Optimization for Biogas Yield <u>Bidattul S. Zainal</u> , Hassan Mohamed, Amir I. Adnan, Kai L. Yu, Mohd F. Zulkornain, Nur A. Aziz, Halimah Badioze Zaman, Khairul A. A. Rahman <i>(Universiti Tenaga Nasional)</i>
3:25 PM	RS03	Game-Based Learning for Fuel Cell Education in Malaysia <u>Nur Fadhliah Abdul Jalil</u> , Umi Azmah Hasran, Siti Fadzliah Mat Noor, Muhammad Helmi Norman <i>(Universiti Kebangsaan Malaysia)</i>
3:40 PM	RS04	The Roles of rGO In Enhancing ZnOFe₂O₃ Performances for the Glucose Oxidation Evaluation <u>Nur Afifah Mat Razali</u> , <u>Norilhamiah Yahya</u> , Nabila A. Karim, Siti Kartom Kamarudin <i>(Universiti Kuala Lumpur)</i>
3:55 PM	Break	
4:15 PM	RS05	Rheology Properties in Composite Filament Making <u>Nurul Syazwani Sahari</u> , Nisa Naima Khalid, <u>Nabilah Afiqah Mohd Radzuan</u> , Abu Bakar Sulong, Nishata Royan a/p Rajendran Royan <i>(Universiti Kebangsaan Malaysia)</i>
4:30 PM	RS06	Advances in Microbial Electrochemical Technologies for Sustainable Wastewater Treatment, Desalination, Hydrogen Production, and Biosensors: From Laboratory Insights to Field Applications <u>Swee Su Lim</u> , Mimi Hani Abu Bakar, Siti Kartom Kamarudin, Wei Lun Ang, Mohd Nur Ikmal Salehmin <i>(Universiti Kebangsaan Malaysia)</i>

PRESENTATIONS LIST

PARALLEL SESSION 2 & POSTER PITCHING

6th September 2023, Day 2

SESSION: 11:00 am - 1:00 pm (MYT)

THEME: Fuel Cells for Mobile and Stationary Systems		
VENUE: Putrajaya Ballroom 2		
Time	Presentation ID	Presentation Detail
11:00 AM	Keynote-6	The Potential of Bio-Platinum as Catalyst for Direct Methanol Fuel Cell <i>Prof. Ir. Dr. Siti Kartom Kamarudin</i> (Universiti Kebangsaan Malaysia, Malaysia)
11:20 AM	FC07	Fabrication and Characterization of Sulfonated Poly (Ether Ether Ketone) Based Polymer Electrolyte Membrane with Self-healing Property <i>Tai Mae Hwa, Thiam Hui San, Tee Shiau Foon, Lim Yun Seng</i> (Universiti Tunku Abdul Rahman)
11:35 AM	FC08	Preliminary Investigation in Microbial Electrochemical Sensor Bioanodes: A Correlational Study Between Biofilm Behavior and Signal Produced <i>Ryan Yow Zhong Yeo, Muhammad Farhan Hil Me, Swee Su Lim, Wei Lun Ang</i> (Universiti Kebangsaan Malaysia)
11:50 AM	FC09	Influence of Ionomer Concentration and Membrane Thickness in MEA for Alkaline Fuel Cells <i>Nur Ubaidah Saidin, Omar Syah Jehan, Kok Seng Leong, Wei Shi Ng, Thye Foo Choo, Wai Yin Wong, Kee Shuan Loh, Rozan Mohamad Yunus</i> (Universiti Kebangsaan Malaysia)
12:05 PM	FC10	A Novel Combined-mode Design for a MEMS-based Micro Passive Direct Methanol Fuel Cell <i>Umi Azmah Hasran, Siti Kartom Kamarudin, Burhanuddin Yeop Majlis</i> (Universiti Kebangsaan Malaysia)
12:20 PM	FC11	An Integrated Heat Recovery System Design for Fuel Cell Buggy with Hydrogen Preheating and Thermoelectric Generator <i>Muhammad H. Hamdan, Wan A. N. W. Mohamed, Muhammad A. Aminudin, Siti K. Kamarudin, Irmie A. Zakaria, Baljit Singh</i> (Universiti Teknologi MARA Shah Alam)
12:35 PM	P-005	Optimization of URPEMFC Bipolar Plate Surface Coating through the Understanding of Corrosion Mechanism <i>Hock Chin Low, Bee Huah Lim, Mohd Shahbudin Masdar, Masli Irwan Rosli</i> (Universiti Kebangsaan Malaysia)
12:40 PM	P-010	Progress and Prospects of Solid Oxide Electrolyzer Cells for Hydrogen Production: Opportunities and Challenges <i>Muhammed Ali S.A, Yathavan Subramanian, Nurul Akidah Baharuddin, Mahendra Rao Somalu, Andanastuti Muchtar</i> (Universiti Kebangsaan Malaysia)

PRESENTATIONS LIST

12:45 PM	P-018	Lightweight PEMFC Bipolar Plate to Address the Costly Fuel Cell Issue: An Overview on Material Selection <i>Nurul Noramelya Zulkefli, Adam Mohd Izhan Noor Azam, Mohd Shahbudin Masdar, Leong Kok Seng, Muhammad Yusuf 'izzat Mazian, I. H. Hanapi, Nur Ubaidah Saidin, Azran Mohd Zainoodin, Edy Herianto Majlan</i> (Universiti Kebangsaan Malaysia)
12:50 PM	P-025	Performance Analysis of 2kW Hydrogen Fuel Cell Used in Lightweight Vehicle <i>Muhammad Akmal Aminudin, Siti Kartom Kamarudin, Muhammad Hadrami Hamdan</i> (Universiti Kebangsaan Malaysia)

THEME: Hydrogen Technology		
VENUE: Johor		
Time	Presentation ID	Presentation Detail
11:00 AM	Keynote-7	Hydrogen Production from Wastewater and Saline Water: Recent Progress and Challenges <i>Prof. Dr. Mohammad Ali Abdelkareem</i> (University of Sharjah, U.A.E.)
11:20 AM	HT05	From Noble Metals to Nickel-Iron-Based Oxides (NiFeOx) Electrocatalyst: A Review of Emerging Electrocatalyst for Oxygen Evolution Reaction (OER) Under Alkaline Conditions <i>Maryam Jamilah Shabdin, Nor Azillah Fatimah Othman, Wai Yin Wong, Kean Long Lim</i> (Universiti Kebangsaan Malaysia)
11:35 AM	HT06	Noble Metal Catalysts for Hydrogenation and Dehydrogenation of Liquid Organic Hydrogen Carriers (LOHCs): A Review <i>Afifah Kamal, Sharifah Najiha Timmiati, Kean Long Lim</i> (Universiti Kebangsaan Malaysia)
11:50 AM	HT07	Gasification Reaction on CeO₂ (111) and Effects on the Structural and Electronic Properties of Adsorption Molecules <i>Nowlin James Rubinsin, Nabila A. Karim, Sharifah Najiha Timmiati, Kean Long Lim, Wan Nor Roslam Wan Isahak</i> (Universiti Kebangsaan Malaysia)
12:05 PM	HT08	Improved Performance of Copper Based Photoelectrode with Underlayer for Photoelectrochemical Water Splitting <i>Nur Azlina Adris, Lorna Jeffery Minggu, Rozan Mohamad Yunus, Khuzaimah Arifin, Mohamad Azuwa Mohamed, Mohammad B. Kassim</i> (Universiti Kebangsaan Malaysia)
12:20 PM	/	
12:35 PM	P-007	Catalytic Hydrogenolysis of Sorbitol Over Chromium Alumina Catalyst <i>Zulaikha Athirah Alexzman, Nur Hazirah Rozali Annuar</i> (Universiti Teknologi MARA Johor)

PRESENTATIONS LIST

12:40 PM	P-030	Exploring the Influence of Sintering Temperature on the Characteristics of Ni-BCZY Composite Anode for Application of Protonic Ceramic Fuel Cells <i>Nur Hanisah Haji, Mahendra Rao Somalu, Abdullah Abdul Samat, Wan Nor Anasuhah Wan Yusoff, Andanastuti Muchtar, Nurul Akidah Baharuddin, Muhammed Ali S. A., Jarot Raharjo, Deni Shidqi Khaerudini, Abdalla M. Abdalla, Abul Kalam Azad (Universiti Kebangsaan Malaysia)</i>
12:45 PM	P-019	Hydrogen Production via Electrolysis Unit: Mathematical Modelling and Simulation on Parametric Towards PEM Electrolysis Performance <i>Adam Mohd Izhan Noor Azam, Nurul Noramelya Zulkefli, Mohd Shahbudin Mastar @ Masdar, Muhammad Yusuf 'Izzat Mazian, Azran Mohd Zainoodin, Edy Herianto Majlan (Universiti Kebangsaan Malaysia)</i>
12:50 PM	P-021	Effect of Post-Synthetic Modification of UiO-66-NH₂ In Polybenzimidazole Membrane towards Electrolyte Retention and Thermal Stability <i>Bo Wu, Ming Meng Pang, Wai Yin Wong, Li Wan Yoon, Se Yong Eh Nourm (Taylor's University)</i>

THEME: Energy Materials for Fuel Cells

VENUE: Pahang

Time	Presentation ID	Presentation Detail
11:00 AM	Keynote-8	Materials Needed for Proton Exchange Membrane Fuel Cells Operated at Temperatures Higher Than 100°C <i>Prof. Dr. Junji Inukai (University of Yamanashi, Japan)</i>
11:20 AM	EM07	Effect of Calcination Temperature on the Structural and Electrochemical Behaviour of Li-Based Cathode for Intermediate-Temperature SOFC Application <i>Sumami Mansur, Nurul Akidah Baharuddin, Wan Nor Anasuhah Wan Yusoff, Azreen Junaida Abd Aziz (Universiti Kebangsaan Malaysia)</i>
11:35 AM	EM08	In-situ C-doped g-C₃N₄ Grafted on C, N Co-Doped ZnO Micro-Flowers with Enhanced Photocatalytic Degradation of Bisphenol A and Hydrogen Generation <i>Mohamad Azuwa Mohamed, Lorna Jeffery Minggu, Mohammad B. Kassim (Universiti Kebangsaan Malaysia)</i>
11:50 AM	EM09	Microwave-Assisted Synthesis of PtSn Nanoparticles: Effect of Reaction Times on Morphology, Structural and Catalytic Activities for DMFC Applications <i>Najihah Rammely, Mahayatun Dayana Johan Ooi, Yushamdan Yusof, Nur Amirah Liyana Razak, Aqilah Nurizzati Kasim (Universiti Sains Malaysia)</i>

PRESENTATIONS LIST

12:05 PM	EM10	Photoelectrochemical Properties Enhancement of Hydroxyapatite by Morphological Alteration Strategy: Impact of Surfactant <u>Nur Nabihah Sazali</u> , Mohamad Azuwa Mohamed, Siti Fairus Mohd Yusoff, Siti Nurul Falaein Moridon, Nur Shamimie Nadzwini Hasnan, Nomastasha Azida Anuar, Nurul Atikah Nordin (Universiti Kebangsaan Malaysia)
12:35 PM	P-012	Impact of 2-Methylimidazole Concentration on Fe-ZIF-8 Catalyst for Oxygen Reduction in Acidic Medium <u>Sue Ying Tan</u> , Norhamizah Hazirah Ahmad Junaidi, Wai Yin Wong, Kee Shyuan Loh (Universiti Kebangsaan Malaysia)
12:40 PM	P-024	Synthesis and Characterization of Biomass-Derived Graphene Oxide and Titanium Dioxide TiO₂ as Potential Materials for Development of Microporous Layer (MPL) in Direct Methanol Fuel Cells <u>Muhamad Ariff Amir Hamzah</u> , Siti Kartom Kamarudin, Norazuwana Shaari, Roshasnoryza Hazan, Siti Sarah Zulkifli (Universiti Kebangsaan Malaysia)
12:45 PM	P-026	Nanotextured Cobalt in Bifunctional Oxygen Electrocatalyst for Renewable Energy Systems: Current Developments and Outlook <u>Iswary Letchumanan</u> , Nabila A. Karim, Rozan Mohamad Yunus, Mohd Shahbudin Mastar @ Masdar (Universiti Kebangsaan Malaysia)
12:50 PM	P-028	Effect of Cu Phase Confinement in Porous Alumina on the Structure-Activity Relationship in Catalytic CO₂ Hydrogenation <u>Nisa Afifah Rusdan</u> , Sharifah Najiha Timmiati, Wan Nor Roslam Wan Isahak, Kean Long Lim (Universiti Kebangsaan Malaysia)
12:55 PM	P-003	Effect of Al³⁺ dan Fe³⁺ Substitutional Doping in Ni-rich NiNi_{0.8}Co_{0.2}O₂ Cathode Material for Li-ion Battery: Preparation, Characterization and Electrochemical Properties <u>Azira Azahidi</u> , N.A.M. Mokhtar, K. Elong, M.F. Kasim (Universiti Teknologi MARA Shah Alam)

THEME: Renewable and Sustainable Materials & Processes		
VENUE: Perak		
Time	Presentation ID	Presentation Detail
11:00 AM	Keynote-9	Global Energy Transformation towards a More Environmentally Sustainable Future <u>Prof. Dr. Aishah Abdul Jalil</u> (Universiti Teknologi Malaysia, Malaysia)

PRESENTATIONS LIST

11:20 AM	RS07	Polylactic Acid / Graphene Nanoplatelets Conductive Polymer Composites: Mechanical, Thermal and Electrical Properties <u>Ming Meng Pang</u> , Kim Ling Cheong, Jiun Hor Low, Kim Yeow Tshai, Seong Chun Koay, Wai Yin Wong, Shiau Ying Ch'ng, Yose Fachmi Buys <i>(Heriot-Watt University Malaysia)</i>
11:35 AM	RS08	Electronic Properties of a Single and Holey Multilayer Graphene <u>Mohd Ezhar Zulkifli</u> , Mohd Faqih Zaini, Nur Azyan Zulkefli, Khalimatul Saadiah Ahmad, Sahriah Basri <i>(Universiti Kebangsaan Malaysia)</i>
11:50 AM	RS09	Synthesis, Characterization and Photocatalytic Activities of Silver Doped Zinc Oxide Nanoparticles towards Photodegradation of Endosulfan <u>Nurhanna Badar</u> , Hanis Mohd Yusoff, Nur Nadiyah Liyana Mohd Zuki, Kelimah Elong <i>(Universiti Malaysia Terengganu)</i>
12:05 PM	RS10	Efficient Microwave Irradiation-Assisted Synthesis of PtSn Bimetallic Alloy for Enhancing Methanol Oxidation Reaction <u>Muhammad Azri Abdul Razak</u> , Mahayatun Dayana Johan Ooi, Yushamdan Yusof, Najihah Rammely <i>(Universiti Sains Malaysia)</i>
12:20 PM	RS11	Formulations of Copper-Tin Oxide Derived Catalysts for Electrochemical CO₂ Reduction in Microbial Electrosynthesis Cells <u>Irwani Ibrahim</u> , Lim Swee Su, Mimi Hani Abu Bakar, Jamaliah Md Jahim, Loh Kee Shyuan <i>(Universiti Kebangsaan Malaysia)</i>
12:35 PM	P-004	Study the Effect of Ti and Al Doping in NMC 111 to Improve Structural Stability and Electrochemical Performance of Li-Ion Batteries <u>Kelimah Elong</u> , Muhd Firdaus Kasim, Nurhanna Badar, Zurina Osman <i>(Universiti Teknologi MARA Shah Alam)</i>
12:40 PM	P-015	Heat Treatment Effect on Nafion Incorporate with Hydroxyapatite for Direct Methanol Fuel Cell Application <u>O.S. J Elham</u> , S.K. Kamarudin, N.U. Saidin, L.K. Seng, M.R. Yusof <i>(Universiti Kebangsaan Malaysia)</i>
12:45 PM	P-017	Analysis of How Operating Parameters Impact Proton Exchange Membrane Fuel Cell (PEMFC) Stack Performance <u>Muhammad Yusuf 'Izzat Mazlan</u> , Adam Mohd Izhan Noor Azam, Nurul Noramelya Zulkefli, Mohd Shahbudin Mastar @ Masdar, Azran Mohd Zainoodin, Edy Herianto Majlan <i>(Universiti Kebangsaan Malaysia)</i>
12:50 PM	P-027	A Short Review on Biomass-Derived Carbon Quantum Dots Photocatalyst for Solar Cells Application <u>Asmawati @ Fatin Najihah Alias</u> , Nur Hazirah Rozali Annuar, Siti Nor Hafiza Mohd Yusoff, Haryana Mohd Hairi <i>(Universiti Teknologi MARA Johor)</i>

PRESENTATIONS LIST

PARALLEL SESSION 3

6th September 2023, Day 2

SESSION: 2:00 PM - 3:20 pm (MYT)

THEME: Fuel Cells for Mobile and Stationary Systems		
VENUE: <i>Putrajaya Ballroom 2</i>		
Time	Presentation ID	Presentation Detail
2:00 PM	Keynote-10	Ammonia Fuel Cell: Prospect to Decarbonize Future Energy <i>Assoc. Prof. Dr. Abul Kalam Azad</i> (Universiti Brunei Darussalam, Brunei Darussalam)
2:20 PM	FC12	Numerical Investigation of Dynamic Responses of Unitized Regenerative Proton Exchange Membrane Fuel Cell (URPEMFC) during Electrolysis Mode <i>Ahmad Adam Danial Shahril, Bee Huah Lim, Edy Herianto Majlan, Mohd Shahbudin Mastar</i> (Universiti Kebangsaan Malaysia)
2:35 PM	FC13	Influence of Cathode Fabrication Method for Planar Solid Oxide Fuel Cell (SOFC) on Electrochemical Performance Properties: A Review <i>Nurul Farhana Abdul Rahman, Tan Kang Huai, Hamimah Abd.Rahman</i> (Universiti Tun Hussein Onn Malaysia)
2:50 PM	FC14	Rounded Trapezoidal Flow Channels Used in Polymer Electrolyte Fuel Cells: A Parametric Numerical Study <i>Mohammed S. Ismail</i> (University of Hull)
3:05 PM	FC15	Effect of Copper Oxide on The Performance of Ni-Cu-Based Anode in Solid Oxide Fuel Cells Operated on Biogas Fuel <i>Ahmad Faig Omar, Nur Wardah Norman, Mahendra Rao Somalu, Andanastuti Muchtar, Nurul Akidah Baharuddin, S.A. Muhammed Ali, Nigel P. Brandon</i> (Universiti Kebangsaan Malaysia)

THEME: Hydrogen Technology		
VENUE: <i>Johor</i>		
Time	Presentation ID	Presentation Detail
2:00 PM	Keynote-11	Risk Evaluation of Hydrogen Storage and Transportation as Energy Carrier <i>Assoc. Prof. Dr. Rafiziana Md. Kasmani</i> (Universiti Teknologi Malaysia, Malaysia)
2:20 PM	HT10	Electrocatalytic Hydrogen Evolution Reaction of Binder-Free NiMo for Alkaline Water Splitting <i>Raja Rafidah Binti Raja Sulaiman, Wai Yin Wong, Loh Kee Syuan, Rozan</i>

PRESENTATIONS LIST

		<i>Mohammad Yunus, Mohammad Khalid (Universiti Kebangsaan Malaysia)</i>
2:35 PM	HT11	Development of New Hydrogen Storage Material: Metalorganic Hydride (Li-phenoxide) <i>Nor Izzati Nordin, Khai Chen Tan, Teng He, Wei Zhou, Hui Wu, Yong Shen Chua (Universiti Sains Malaysia)</i>
2:50 PM	HT12	Study of Metal-doped X-Ni/CeO₂ (X= Zr, La, Sr) Catalysis Activity for High H₂ Production from Dry Reforming Methane <i>Wan Nabilah Manan, Wan Nor Roslam Wan Isahak, Zahira Yaakob (Universiti Kebangsaan Malaysia)</i>
3:05 PM	HT13	Design and Implementation of Portable Thermoelectric Generator <i>Nicanor B. Fabracuer, Jr, Ryan Pol Ragas, Switzel T. Diaz, Christian Ray Cabije (University of Mindanao)</i>

THEME: Energy Materials for Fuel Cells

VENUE: Pahang

Time	Presentation ID	Presentation Detail
2:00 PM	Keynote-12	Current Progress in Solid Oxide Fuel Cell Technologies <i>Assoc. Prof. Dr. Mahendra Rao Somalu (Universiti Kebangsaan Malaysia, Malaysia)</i>
2:20 PM	EM11	The Effects of Fe-doping towards the Structural Formation of ZIF-8 And ZIF-67 Based Electrocatalysts for Oxygen Reduction <i>Diwya Darshini.R., Kee Shyuan Loh, Wai Yin Wong (Universiti Kebangsaan Malaysia)</i>
2:35 PM	EM12	Surface Modification of MXene with Sulfonic Group and Disulfonic Group <i>Muhamad Hafizzul Isyraf Hardi, Kee Shyuan Loh, Wai Yin Wong, Rozan Mohamad Yunus, Azizan Ahmad (Universiti Kebangsaan Malaysia)</i>
2:50 PM	EM13	Synthesis, Characterization and Electrochemical Performance of Ruddlesden-Popper Layered Perovskite Anode La_{0.6}Sr_{1.4}MnO₄ for the Application of Solid Oxide Fuel Cell <i>Ainaa Nadhirah Zainon, Mahendra Rao Somalu, Audi Majdan Kamarul Bahrain, Andanastuti Muchtar, Nurul Akidah Baharuddin, Muhammed Ali S.A. (Universiti Kebangsaan Malaysia)</i>
3:05 PM	EM14	The Impacts of Carbon Nanofiber-Titanium Dioxide as a Modified Microporous Layer on Direct Methanol Fuel Cell Performance <i>Muhammad Syafiq Alias, Siti Kartom Kamarudin, Azran Mohd Zainoodin, Mohd Shahbudin Masdar (Universiti Kebangsaan Malaysia)</i>

POSTERS LIST

(Poster/Abstract ID marked with Asterisk* are included in the poster pitching Session on Day 2)

Poster /Abstract ID	Presentation Detail
P-003*	Effect of Al³⁺ dan Fe³⁺ Substitutional Doping in No-rich NiNi_{0.8}Co_{0.2}O₂ Cathode Material for Li-ion Battery: Preparation, Characterization and Electrochemical Properties <i>Azira Azahidi, N.A.M. Mokhtar, K. Elong, M.F. Kasim</i> (Universiti Teknologi MARA Shah Alam)
P-004*	Study the Effect of Ti and Al Doping in NMC 111 to Improve Structural Stability and Electrochemical Performance of Li-ion Batteries <i>Kelimah Elong, Muhd Firdaus Kasim, Nurhanna Badar, Zurina Osman</i> Universiti Teknologi MARA Shah Alam
P-005*	Optimization of URPEMFC Bipolar Plate Surface Coating through the Understanding of Corrosion Mechanism <i>Hock Chin Low, Bee Huah Lim, Mohd Shahbudin Masdar, Masli Irwan Rosli</i> Universiti Kebangsaan Malaysia
P-007*	Catalytic Hydrogenolysis of Sorbitol Over Chromium Alumina Catalyst <i>Zulaikha Athirah Alexzman, Nur Hazirah Rozali Annuar</i> Universiti Teknologi MARA Johor
P-010*	Progress and Prospects of Solid Oxide Electrolyzer Cells for Hydrogen Production: Opportunities and Challenges <i>Muhammed Ali S.A, Yathavan Subramanian, Nurul Akidah Baharuddin, Mahendra Rao Somalu, Andanastuti Muchtar</i> Universiti Kebangsaan Malaysia
P-012*	Impact of 2-Methylimidazole Concentration on Fe-ZIF-8 Catalyst for Oxygen Reduction in Acidic Medium <i>Sue Ying Tan, Norhamizah Hazirah Ahmad Junaidi, Wai Yin Wong, Kee Shyuan Loh</i> Universiti Kebangsaan Malaysia
P-015*	Heat Treatment Effect on Nafion Incorporate with Hydroxyapatite for Direct Methanol Fuel Cell Application <i>O.S. J Elham, S.K. Kamarudin, N.U. Saidin, L.K. Seng, M.R. Yusof</i> Universiti Kebangsaan Malaysia
P-017*	Analysis of How Operating Parameters Impact Proton Exchange Membrane Fuel Cell (PEMFC) Stack Performance <i>Muhammad Yusuf 'Izzat Mazian, Adam Mohd Izhan Noor Azam, Nurul Noramelya Zulkefli, Mohd Shahbudin Mastar @ Masdar, Azran Mohd Zainoodin, Edy Herianto Majlan</i> Universiti Kebangsaan Malaysia
P-018*	Lightweight PEMFC Bipolar Plate to Address the Costly Fuel Cell Issue: An Overview on Material Selection <i>Nurul Noramelya Zulkefli, Adam Mohd Izhan Noor Azam, Mohd Shahbudin Masdar, Leong Kok Seng, Muhammad Yusuf 'Izzat Mazian, I. H. Hanapi, Nur Ubaidah Saidin, Azran Mohd Zainoodin, Edy Herianto Majlan</i> Universiti Kebangsaan Malaysia
P-019*	Hydrogen Production Via Electrolysis Unit: Mathematical Modelling and Simulation on Parametric Towards PEM Electrolysis Performance <i>Adam Mohd Izhan Noor Azam, Nurul Noramelya Zulkefli, Mohd Shahbudin Mastar @ Masdar, Muhammad Yusuf 'Izzat Mazian, Azran Mohd Zainoodin, Edy Herianto Majlan</i> Universiti Kebangsaan Malaysia

POSTERS LIST

P-020	Unleashing the Fuel Cell Potential Through the Innovation in Cathode Catalyst Development <i>Norhamizah Hazirah Ahmad Junaidi, <u>Wai Yin Wong</u></i> <i>Universiti Kebangsaan Malaysia</i>
P-021*	Effect of Post-Synthetic Modification of UiO-66-NH₂ in Polybenzimidazole Membrane towards Electrolyte Retention and Thermal Stability <i>Bo Wu, Ming Meng Pang, Wai Yin Wong, Li Wan Yoon, Se Yong Eh Noun</i> <i>Taylor's University</i>
P-022	Recent Application of Core-Shell Nanostructured Catalysts for CO₂ Thermocatalytic Conversion Processes <i>Sharifah Najihah Timmiati, Nisa Afiqah Rusdan, Zahira Yaakob, Wan Nor Roslam Wan Isahak</i> <i>Universiti Kebangsaan Malaysia</i>
P-023	Calcium Carbonate from Chicken Eggshells as Filler in Composite Nafion Membrane for Direct Ethanol Fuel Cell: A Molecular Dynamics Study <i>Nabila A Karim</i> <i>Universiti Kebangsaan Malaysia</i>
P-024*	Synthesis and Characterization of Biomass-Derived Graphene Oxide and Titanium Dioxide TiO₂ as Potential Materials for Development of Microporous Layer (MPL) in Direct Methanol Fuel Cells <i>Muhamad Ariff Amir Hamzah, Siti Kartom Kamarudin, Norazuwana Shaari, Roshasnorlyza Hazan, Siti Sarah Zulkifli</i> <i>Universiti Kebangsaan Malaysia</i>
P-025*	Performance Analysis of 2kW Hydrogen Fuel Cell Used in Lightweight Vehicle <i>Muhammad Akmal Aminudin, Siti Kartom Kamarudin, Muhammad Hadrami Hamdan</i> <i>Universiti Kebangsaan Malaysia</i>
P-026*	Nanotextured Cobalt in Bifunctional Oxygen Electrocatalyst for Renewable Energy Systems: Current Developments and Outlook <i>Iswary Letchumanan, Nabila A. Karim, Rozan Mohamad Yunus, Mohd Shahbudin Mastar @ Masdar</i> <i>Universiti Kebangsaan Malaysia</i>
P-027*	A Short Review on Biomass-Derived Carbon Quantum Dots Photocatalyst for Solar Cells Application <i>Asmawati @ <u>Fatin Najihah Alias</u>, Nur Hazirah Rozali Annuar, Siti Nor Hafiza Mohd Yusoff, Haryana Mohd Hairi</i> <i>Universiti Teknologi MARA Johor</i>
P-028*	Effect of Cu Phase Confinement in Porous Alumina on the Structure-Activity Relationship in Catalytic CO₂ Hydrogenation <i>Nisa Afiqah Rusdan, Sharifah Najihah Timmiati, Wan Nor Roslam Wan Isahak, Kean Long Lim</i> <i>Universiti Kebangsaan Malaysia</i>
P-029	Exploring of Molybdenum Carbide as Electrocatalysts for Oxygen Reduction Reactions (ORR) <i>Mira Asneira, <u>Khuzaimah Arifin</u>, Mohammad B. Kassim</i> <i>Universiti Kebangsaan Malaysia</i>
P-030*	Exploring the Influence of Sintering Temperature on the Characteristics of Ni-BCZY Composite Anode for Application of Protonic Ceramic Fuel Cells <i>Nur Hanisah Hadi, Mahendra Rao Somalu, Abdullah Abdul Samat, Wan Nor Anasuhah Wan Yusoff, Andanastuti Muchtar, Nurul Akidah Baharuddin, Muhammed Ali S. A., Jarot Raharjo, Deni Shidqi Khaerudini, Abdalla M. Abdalla, Abul Kalam Azad</i>

POSTERS LIST

	<i>Universiti Kebangsaan Malaysia</i>
P-031	Effect of Hydrothermal Reaction Temperature on Surface Morphology and Structural Properties of Zinc Oxide on Graphene/Nickel Foam for Photoelectrochemical Water Splitting <u>Rozan Mohamad Yunus</u> , Nur Rabiatul Adawiyah Mohd Shah, Nurul Nabila Rosman, Khuzaimah Arifin, Lorna Jeffery Minggu <i>Universiti Kebangsaan Malaysia</i>
P-032	Decal Method for Catalyst-Coated Membrane Electrode Assemblies in Laboratory-Scale PEM Electrolysers Ammar Bazarah, <u>Edy Herianto Majlan</u> , Teuku Husaini, Mohd Shahbudin Masdar <i>Universiti Kebangsaan Malaysia</i>
P-033	Comparative Analysis of Bipolar Plate Characteristics in PEMFC and PEMWE C.T Aisyah Sarjuni, Ahmad Adam Danial Shahril, Hock Chin Low, <u>Bee Huah Lim</u> <i>Universiti Kebangsaan Malaysia</i>
P-034	Harnessing Microbial Electrochemical Systems for Eco-Friendly Wastewater Treatment and Energy Conversion <u>Mimi Hani Abu Bakar</u> , Lim Swee Su, Nik Samila Che Yusoff, Manal Ismail, Peer Mohamed, Ang Wei Lun, Krishan a/l Balachandran, Irwan Ibrahim, Ryan Yeo Yow Zhong <i>Universiti Kebangsaan Malaysia</i>
P-035	Photoelectrochemical Technology for Solar Fuels: Green Hydrogen, Carbon Dioxide Capture and Ammonia Production <u>Lorna Jeffery Minggu</u> <i>Universiti Kebangsaan Malaysia</i>

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Exhibitors Booth

Company	Details	Package
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