



# SYMPOSIUM

## ON FUEL CELL AND HYDROGEN TECHNOLOGY 2021

Virtual Conference October 26 – 27, 2021

# PROGRAM BOOK



**Sustainable energy:  
Towards circular economy  
and climate neutrality**



sponsored by:



Organized by:  
**Fuel Cell Institute**  
Universiti Kebangsaan Malaysia

Co-organized by:  
**The Malaysian Association**  
of Hydrogen Energy



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## KATA ALU-ALUAN / WELCOMING MESSAGE

### Kata Alu-aluan daripada Naib Cancellor



Assalamualaikum w.b.t dan Salam Sejahtera

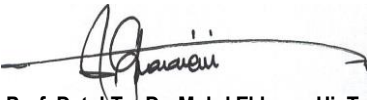
Saya mengucapkan setinggi-tinggi tahniah kepada Institut Sel Fuel (SELFUEL), UKM atas kejayaan menganjurkan *Symposium on Fuel Cell and Hydrogen Technology 2021 (SFCHT2021)* ini.

Institut Sel Fuel (SELFUEL) sebagai salah satu institut kecemerlangan penyelidikan di UKM telah ditubuhkan untuk berperanan bagi menyumbang dan membangunkan penyelidikan berasaskan teknologi sel fuel dan tenaga hidrogen di Malaysia. Saya amat berbangga dengan kejayaan SELFUEL selama ini dalam menerajui kedua-dua bidang ini dan menjadi pusat rujukan pelbagai pihak dari dalam dan luar negara.

Saya juga berbangga kerana SELFUEL telah mengambil inisiatif mengadakan kerjasama strategik dengan Persatuan Tenaga Hidrogen Malaysia (MAHE) bagi menganjurkan simposium ini yang bertemakan "*Sustainable Energy: Towards Circular Economy and Climate Neutrality*". Simposium ini diharap menjadi platform kepada perkongsian pengetahuan bagi para professional, ahli akademik dan industri untuk membina rangkaian serta kolaborasi dalam bidang teknologi sel fuel dan tenaga hidrogen.

Akhir kata, saya berharap rumusan dan hasil pembentangan di simposium ini nanti akan dapat dijadikan sebagai satu resolusi bagi menyahut cabaran untuk menurunkan kadar impak penjaanaan tenaga terhadap persekitaran.

Terima kasih.

A handwritten signature in black ink, which appears to read 'Ekhwan', written over a horizontal line.

**Prof. Dato' Ts. Dr. Mohd Ekhwan Hj. Toriman**

Naib Cancellor

Universiti Kebangsaan Malaysia

## KATA ALU-ALUAN / WELCOMING MESSAGE

### Message from the Vice-Chancellor



Assalamualaikum wbt. and Greetings to all,

I would like to express my gratitude to the organising committee of the Symposium on Fuel Cell and Hydrogen Technology 2021 (SFCHT2021) for their commitment in making this symposium a success.

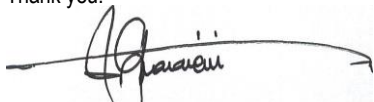
The Fuel Cell Institute (SELFUEL) was established as one of the institutes of excellence research at UKM to contribute and develop research in the field of fuel cell technology and hydrogen energy in Malaysia. I am extremely proud of SELFUEL's accomplishments over the years, as it has pioneered both fields and served as a reference centre on national and international levels.

I am also proud that SELFUEL took the initiative to form a strategic partnership with the Malaysian Hydrogen Energy Association (MAHE) to organise this Symposium titled "Sustainable Energy: Towards Circular Economy and Climate Neutrality. "

The theme is in response to growing concerns about the economic downturn and climate change, and it aims to improve energy security while reducing environmental impact.

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

Thank you.

A handwritten signature in black ink, appearing to read 'Ekhwan', written over a horizontal line.

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

## KATA ALU-ALUAN / WELCOMING MESSAGE

### Kata Alu-aluan daripada Pengarah SELFUEL



Assalamualaikum wbt. dan Salam Sejahtera,

Tahniah diucapkan kepada Jawatankuasa Penganjur di atas penganjuran Symposium on Fuel Cell & Hydrogen Technology 2021 (SFCHT2021) dan ucapan selamat datang dan terima kasih diucapkan kepada semua penceramah dan peserta simposium ini. SFCHT2021 bertujuan untuk menyediakan platform bagi para penyelidik di seluruh dunia untuk bertukar pandangan dan pengalaman penyelidikan. Ia juga bertujuan untuk memperluas rangkaian dan potensi kerjasama antarabangsa di masa depan.

Sejajar dengan pembangunan teknologi tenaga diperbaharui, Institut Sel Fuel (SELFUEL) berharap untuk menjadi Institut rujukan serantau bagi para pakar untuk bertukar pengalaman, pandangan dan penemuan terbaharu berkaitan dengan teknologi sel fuel dan tenaga hidrogen. Institut ini sentiasa menerokai peluang bagi geran penyelidikan dan membangunkan kolaborasi dengan industri bagi dan menaik taraf kemudahan untuk menghasilkan produk yang berinovasi.

Akhir sekali, saya ingin mengucapkan terima kasih kepada semua ahli yang telah memberikan sumbangan secara langsung atau tidak langsung dalam menjayakan simposium.

Terima kasih.

*SitiKartom*

**Prof. Ir. Dr. Siti Kartom Kamarudin**

Pengarah Institut Sel Fuel

Universiti Kebangsaan Malaysia

## KATA ALU-ALUAN / WELCOMING MESSAGE

### Message from the Director of SELFUEL



Assalamualaikum wbt. and Greetings to all,

Congratulation to the organizing committee and a warm welcome to all the speakers and participants to the Symposium on Fuel Cell & Hydrogen Technology 2021 (SFCHT2021). This symposium 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.

SELFUEL aspires to be the leading and renowned regional reference higher learning institution in Malaysia for experts and practitioner to exchange experience, views and latest finding 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 applaud to my fellow teams of the SFCHT2021 committee for making the symposium a success and well done to each of you.

Thank you.

*SitiKartom*

**Prof. Ir. Dr. Siti Kartom Kamarudin**  
Director of Fuel Cell Institute  
Universiti Kebangsaan Malaysia

## KATA ALU-ALUAN / WELCOMING MESSAGE

### Kata Alu-aluan daripada Pengerusi SFCHT2021



Assalamualaikum wbt. dan salam sejahtera,

Jawatankuasa penganjur mengalu-alukan kehadiran penceramah dan pembentang ke Symposium on Fuel Cell & Hydrogen Technology 2021 (SFCHT2021).

SFCHT2021 adalah merupakan simposium kali kedua yang dianjurkan oleh Institut Sel Fuel (SELFUEL) dan Persatuan Tenaga Hidrogen Malaysia (MAHE). Jawatankuasa penganjur mengharapkan simposium ini dapat menjadi platform yang komprehensif kepada para penyelidik dan profesional yang berminat dengan teknologi sel fuel dan tenaga hidrogen. Tajuk yang dibincangkan dalam simposium ini merangkumi dan tidak dihadkan kepada karya asli hasil penyelidikan dan metodologi baru, serta kajian gunaan dan kajian kes yang melibatkan teknologi sel fuel dan tenaga hidrogen.

Simposium kali kedua ini dianjurkan dengan mengambilkira pengalaman yang kreatif dan inovatif dan menerima bimbingan serta pandangan yang bernas dari semua pihak di Universiti Kebangsaan Malaysia.

Sekian.

A handwritten signature in black ink, appearing to read 'Rozan'.

**Dr. Rozan Mohamad Yunus**

Pengerusi *Symposium on Fuel Cell & Hydrogen Technology 2021* (SFCHT2021)  
Insitut Sel Fuel, Universiti Kebangsaan Malaysia

## KATA ALU-ALUAN / WELCOMING MESSAGE

### Message from SFCHT2021 Chairman



Assalamualaikum wbt. and Greetings to all,

We would like to express sincere gratitude to all the speakers and participants to gather virtually for Symposium on Fuel Cell & Hydrogen Technology 2021 (SFCHT2021). It is my pleasure to welcome all to the event.

This is the second time Fuel Cell Institute and Malaysian Association of Hydrogen Energy (MAHE) organizing the symposium. We hope that organizing this event would increase the interest and exposure of fuel cell technology and hydrogen energy research in Malaysia to industries and internationally. The symposium is aimed at but not limited to discuss the original works on new products and methodologies, applied research and case studies involving fuel cell technology and hydrogen energy.

It was a great and honourable creative and innovative experience to receive guidance and thoughtful views from all the parties at Universiti Kebangsaan Malaysia.

Thank you.

A handwritten signature in black ink, appearing to read 'Rozan'.

**Dr. Rozan Mohamad Yunus**

Chairman of Symposium on Fuel Cell & Hydrogen Technology 2021 (SFCHT2021)  
Fuel Cell Institute, Universiti Kebangsaan Malaysia



## KATA ALU-ALUAN / WELCOMING MESSAGE

### Kata Alu-aluan daripada Presiden Persatuan Tenaga Hidrogen Malaysia (MAHE)



Assalamualaikum wbt. dan salam sejahtera,

Sambutan yang sangat mesra untuk semua orang.

Ini adalah kali kedua Persatuan Tenaga Hidrogen Malaysia (MAHE) bekerjasama dengan institut penyelidikan hidrogen dan sel fuel utama Malaysia, Institut Sel Fuel (SELFUEL) Universiti Kebangsaan Malaysia, sebagai penganjur bersama edisi semasa Simposium Sel Fuel & Teknologi Hidrogen 2021 (SFCHT2021). MAHE berkait rapat dengan SELFUEL sejak duludulu ketika hasrat untuk menubuhkan persatuan tenaga hidrogen nasional mula dilahirkan dan dinyatakan dalam dindingnya. Saya harap hubungan erat MAHE dengan SELFUEL akan berterusan hingga ke masa depan.

Setelah berjuang untuk meyakinkan kerajaan Malaysia selama lebih dari 25 tahun, untuk menerapkan dasar yang lebih kuat mengenai tenaga hidrogen dan kenderaan sel fuel untuk menyelesaikan keselamatan tenaga dan perubahan iklim, saya dengan senang hati mengumumkan bahawa tenaga hidrogen dan sel fuel telah akhirnya diiktiraf sebagai tenaga alternatif yang penting untuk mobiliti hijau dan layak dikembangkan dan dilaburkan oleh sektor swasta dalam Rancangan Malaysia ke12 yang dibentangkan di Parlimen oleh YAB Perdana Menteri pada 27 September 2021. Tahniah kepada semua ahli MAHE, Felo SELFUEL dan ahli Akademi Sains Malaysia yang bekerja tanpa lelah dan para peserta setia SFCHT dengan sokongan dan kerja penyelidikan mereka yang sangat penting.

Dalam salah sebuah novel Jules Verne, salah seorang penulis fiksi sains kegemaran saya yang saya temui di perpustakaan sekolah pada tahun 70-an, L'Abandonné (The Abandoned) yang diterbitkan dalam bahasa Inggeris pada tahun 1875, salah seorang protagonisnya, seorang jurutera bernama Cyrus Harding menyampaikan pesanan keramat:

"Saya yakin air suatu hari kelak akan digunakan sebagai fuel, hidrogen dan oksigen yang membentuknya, digunakan secara tunggal atau berdua, akan menjadi sumber haba dan cahaya yang tidak luput, dengan intensiti yang tidak dimiliki arang batu."

## KATA ALU-ALUAN / WELCOMING MESSAGE

Hari ini, kata hikmat Jules Verne dalam novel fiksyen sains berusia 146 tahun itu tentang pembolos Perang Saudara Amerika melarikan diri ke pulau yang tidak diketahui di Kepulauan Melayu dengan belon berisi gas hidrogen, telah menjadi kenyataan.

Salah satu teknologi yang paling dicari untuk pengeluaran hidrogen hijau sekarang ialah teknologi elektrolisis pembelahan air yang dipacu oleh tenaga boleh diperbaharui seperti tenaga suria dan angin, yang semakin murah. Pengeluaran hidrogen dari pembelahan air juga dapat dicapai secara langsung dari tenaga suria dengan menggunakan sel fotoelektrokimia, yang masih dalam pengembangan di seluruh dunia. Tidak boleh diabaikan, proses biologi seperti sel elektrolisis mikrob dan sel pembelah air fotosintetik juga menghasilkan hidrogen dengan pembelahan air tetapi kurang efisien dan pada skala yang lebih kecil.

Air memang merupakan "fuel" yang daripadanyalah Ekonomi Hidrogen berkembang.

Akhir kata, saya ingin mengucapkan ribuan terima kasih kepada sesama ahli jawatankuasa SFCHT2021 dan ahli MAHE yang telah bekerja tanpa lelah dalam menjayakan simposium ini walaupun terdapat sekatan dan kekurangan dari Pandemik COVID-19 yang sedang melanda.

Semoga anda semua memperoleh simposium yang bahagia dan selamat.

Terima kasih.



**Prof. Dato' Ir. Dr. Wan Ramli Wan Daud**  
Presiden Persatuan Tenaga Hidrogen Malaysia (MAHE)  
Universiti Kebangsaan Malaysia

## KATA ALU-ALUAN / WELCOMING MESSAGE

### Message from the President of the Malaysian Association of Hydrogen Energy (MAHE)



Assalamualaikum wbt. and Greetings to all,

A very warm welcome to everyone.

This is the second time the Malaysian Association of Hydrogen Energy (MAHE) has joined hands with the premier Malaysian hydrogen and fuel cells research institute, the Fuel Cell Institute (SELFUEL) of Universiti Kebangsaan Malaysia, as the co-organizer of the current edition of the Symposium on Fuel Cell & Hydrogen Technology 2021 (SFCHT2021). MAHE is closely associated with SELFUEL since the days when the idea of having a national association of hydrogen energy was born and articulated within its walls. I hope MAHE's close relationship with SELFUEL will continue well into the future.

After struggling to convince the Malaysian government for more than 25 years, to adopt a stronger policy on hydrogen energy and fuel cells vehicles to solve both energy security and climate change, I am happy to announce that hydrogen energy and fuel cells are finally recognized as an important alternative fuel and energy conversion technology for green mobility worthy to be developed and invested on by the private sector in the 12th Malaysia Plan that was tabled in Parliament by YAB Prime Minister on the 27th of September 2021. Congratulations to everyone in MAHE, SELFUEL and Academy of Sciences Malaysia who worked tirelessly on this and the loyal attendees of SFCHT whose support and research work on them are crucial.

In one of the last novel of Jules Verne, one of my favourite science fiction authors whom I first discovered in the school library in the 70's, L'Abandonné (The Abandoned) first published in English in 1875, one of the protagonists, an engineer by the name of Cyrus Harding delivered a prophetic message:

"I believe that water will one day be employed as fuel, that hydrogen and oxygen which constitute it, used singly or together, will furnish an inexhaustible source of heat and light, of an intensity of which coal is not capable.

## KATA ALU-ALUAN / WELCOMING MESSAGE

" Today, Jules Verne's prophetic words in this 146-year-old science fiction novel about a group of American Civil War deserters who escaped to an unknown Island somewhere in the Malay Archipelago on a hydrogen gas filled balloon, has come true.

One of the most sought-after technology for production of green hydrogen today is water-splitting electrolysis technology powered by renewable energy, like solar and wind energy, which are getting cheaper the minute. Hydrogen production from water splitting could also be achieved directly from solar energy by using photoelectrochemical cells, which is still under development around the world. Not to be outdone, biological processes such as microbial electrolysis cells and photosynthetic water-splitting cells could also produce hydrogen by water splitting but less efficiently and on a smaller scale.

Water is indeed the "fuel" on which the Hydrogen Economy thrives.

Finally, I would like to express many thanks to fellow SFCHT2021 committee and MAHE members who have worked tirelessly in making this symposium a success despite the restrictions and privations of the ongoing COVID-19 Pandemic.

Wishing you all for a happy and safe symposium.

Thank you.



**Prof. Dato' Ir. Dr. Wan Ramli Wan Daud**

President of the Malaysian Association of Hydrogen Energy (MAHE)  
Universiti Kebangsaan Malaysia

## AHLI JAWATANKUASA / ORGANIZING COMMITTEE

Penasihat/ <i>Advisors</i>	: Prof. Ir. Dr. Siti Kartom Kamarudin Prof. Madya Dr. Mohd Shahbudin Mastar @ Masdar
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Promosi/ <i>Promotion</i>	: Dr. Mimi Hani Abu Bakar Dr. Lim Swee Su (Webmaster) Dr. Umi Azmah Hasran Dr. Mohd Nur Ikhmal Salehmin Azman Md. Nor
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Penerbitan/ <i>Publication</i>	: Assoc. Prof. Dr. Mahendra Rao Somalu Assoc. Prof. Ts. Dr. Loh Kee Shyuan Dr. Khuzaimah Arifin Dr. Sahriah Basri Dr. Norazuwana Shaari Dr. Muhammed Ali S.A Dr. Jonathan Goh Teik Ean Nabilah Mohd Sofian

## AHLI JAWATANKUASA / ORGANIZING COMMITTEE

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Protokol & Cenderamata / Sijil / <i>Protocol &amp; Souvenir</i>	: Tuti Martini Mahmud Dr. Noor Shahirah Shamsul Dr. Lim Bee Huah Hafizatul Izzati Badrul Zaman Nor Fatina Raduan Nurul Shahzira Hazri

## PROGRAM SFCHT2021 / PROGRAMME OF SFCHT2021

Time is GMT + 8 hrs

26 OKTOBER/OCTOBER 2021 (SELASA/ TUESDAY)	
8:30 am	<b>PENDAFTARAN/ REGISTRATION</b>
<b>Majlis Perasmian Pembukaan/ Opening Ceremony</b>	
9:00 am	Bacaan Doa/ <i>Recitation of Doa</i>
9:05 am	Ucapan Pembukaan oleh Pengarah Institut Sel Fuel/ <i>Welcoming Speech: Director of Fuel Cell Institute</i>  <b>YBhg. Prof. Ir. Dr. Siti Kartom Kamarudin</b>
9:15 am	Ucapan Perasmian oleh Naib Canselor/ <i>Opening Speech for SFCHT2021: Vice-Chancellor of UKM</i>  <b>YBhg. Prof. Dato' Ts. Dr. Mohd Ekhwan Hj. Toriman</b>
9:25 am	Sesi Bergambar/ <i>Group Photo session</i>
<b>Sesi Plenari/ Plenary Sessions</b>	
9:30 am	Ucapan Plenari 1/ <i>Plenary Talk 1</i>  <b>Prof. Dr. Nasir Hj. Darman (Chief Technology Officer, PETRONAS)</b>  <i>Title: Hydrogen Future: Are We on The Right Path?</i>
10:00 am	Ucapan Plenari 2/ <i>Plenary Talk 2</i>  <b>Prof. Ir. Dr. Nor Aishah Saidina Amin (Universiti Teknologi Malaysia)</b>  <i>Title: Progress in catalytic transformation of biomass-derived hydrocarbons to hydrogen</i>
<b>Sesi Selari 1/ Parallel Session 1</b>	
10:35 am	Sesi Selari 1/ <i>Parallel Session 1</i>
1:00 pm	<b>Rehat/ Break</b>
1:55 pm	Tayangan Iklan Penaja EMAS/ <i>Advertisement by GOLD Sponsor:</i>  <b>Bruker (M) Sdn Bhd</b>

## PROGRAM SFCHT2021 / PROGRAMME OF SFCHT2021

<b>Sesi Plenari/ Plenary Sessions</b>	
2:00 pm	Ucapan Plenari 3/ <i>Plenary Talk 3</i>  <b>Prof. Dr. Mohammad Kassim (The Malaysian Association Hydrogen Energy, MAHE)</b>  <i>Title: The Role of MAHE in Hydrogen Economy from NGO's Perspective</i>
<b>Sesi Selari 2/ Parallel Session</b>	
2:35 pm	Sesi Selari 2/ <i>Parallel Session 2</i>
5:00 pm	TAMAT HARI PERTAMA/ <i>END OF FIRST DAY</i>



## PROGRAM SFCHT 2021 / PROGRAMME OF SFCHT 2021

27 OKTOBER/OCTOBER 2021 (RABU/ WEDNESDAY)	
8:30 am	<b>PENDAFTARAN/ REGISTRATION</b>
<b>Sesi Plenari/ Plenary Sessions</b>	
9:00 am	<p>Ucapan Plenari 4/ <i>Plenary Talk 4</i></p> <p><b>Prof. Dato' Ir. Dr. Wan Ramli Wan Daud (Universiti Kebangsaan Malaysia)</b></p> <p><i>Title: Green Hydrogen from PEM and AEM Electrolyzers: Challenges of Commercialization</i></p>
9:30 am	<p>Ucapan Plenari 5/ <i>Plenary Talk 5</i></p> <p><b>Prof. Dr.-Eng. Eniya Listiani Dewi (National Research and Innovation Agency, Indonesia)</b></p> <p><i>Title: Toward to Indonesia Decarbonization Energy Planning by Promoting Ecosystem of Hydrogen</i></p>
10:00 am	<p>Ucapan Plenari 6/ <i>Plenary Talk 6</i></p> <p><b>Prof. Dr. Nobuyoshi Nakagawa (Gunma University, Japan)</b></p> <p><i>Title: Morphology and structure of the catalyst and catalyst layer for high performance DMFCs</i></p>
10:30 am	<p>Tayangan Iklan Penaja EMAS/ <i>Advertisement by GOLD Sponsor: Bruker (M) Sdn Bhd</i></p>
<b>Sesi Selari 3/ Parallel Session 3</b>	
10:35 am	Sesi Selari 3/ <i>Parallel Session 3</i>
1:00 pm	<b>Rehat/ Break</b>
<b>Sesi Plenari/ Plenary Sessions</b>	
2:30 pm	<p>Ucapan Plenari 7/ <i>Plenary Talk 7</i></p> <p><b>Prof. Datuk Ts. Dr. Ahmad Fauzi Ismail (Universiti Teknologi Malaysia)</b></p> <p><i>Title: Current Development of Hydrogen Fuel Cells</i></p>

## PROGRAM SFCHT 2021 / PROGRAMME OF SFCHT 2021

UPACARA PENUTUP/ CLOSING CEREMONY	
3:00 pm	Ucapan Penutup oleh Pengerusi SFCHT2021/ <i>Closing Speech: Chairman of SFCHT2021</i>  <b>YBrs. Dr. Rozan Mohamad Yunus</b>
3:10 pm	Tayangan Multimedia Rangkuman SFCHT2021/ <i>Multimedia Presentation of SFCHT2021</i>
3:15 pm	Pengumuman Anugerah Pembentangan Terbaik/ <i>Announcement of Best Oral Presenter Award</i>
3:20 pm	Sesi Bergambar/ <i>Group Photo Session</i>
<b>3.30 p.m</b>	<b>TAMATI/END</b>

# PENCERAMAH / SPEAKERS

## PLENARY SPEAKER 1



**Professor Dr. Nasir Haji Darman**  
Chief Technology Officer  
Group Research and Technology, Project Delivery & Technology Division  
PETRONAS

### Biography

Nasir Haji Darman is currently the Chief Technology Officer of Group Research and Technology, Project Delivery & Technology Division, PETRONAS. In this position, he steers and drives all technology activities in PETRONAS Group wide. He joined PETRONAS in 1991 and has worked in many technical and managerial positions. He started his career as a Research Engineer in PETRONAS before moving on to resume various positions in various OPIUs in PETRONAS. In his current position, he leads all technology projects and setting technology direction for PETRONAS activities, both in domestic and international assets. He also holds an honorary professorship from Institute of Petroleum Engineering Heriot-Watt University Edinburgh United Kingdom and Universiti Teknologi PETRONAS as part of his contribution to the society.

He has published many technical papers in local and international journal especially in the area of sub-surface engineering. He is also the recipient of the SPE 2010 Asia Pacific Regional Technical Award on *Reservoir Description and Dynamics*. He is currently the SPE Asia Pacific Regional Director and sits in the SPE Board of Directors. Nasir Haji Darman graduated in BSc from Texas Tech University and PhD from Heriot Watt University, both in Petroleum Engineering, in 1990 and 2000, respectively.

### Title: Hydrogen Future: Are We on The Right Path?

#### Abstract:

Hydrogen is the simplest, most abundant, and most versatile element. It could play a role in several parts of the energy value chain and is versatile to fit diverse application pathways. As the energy system transforms, undergoes a dynamic shift towards decarbonisation and meets the global warming limit agreed in the Paris Agreement, the role of hydrogen seems to become more important than before. It can be a clean energy carrier or fuel, as it does not produce greenhouse gas emissions (GHG) at multiple points of its application. As it can be produced from different feedstocks, both fossil fuels and renewable resources, hydrogen offers flexibility and compatibility with the current and future energy system, making it a sensible solution for the energy transition.

Petroleum Nasional Berhad (PETRONAS), Malaysia's fully integrated oil and gas company, is also embracing hydrogen. PETRONAS is leveraging its experience in the production and consumption of grey and blue hydrogen in existing plants and expanding towards green hydrogen as a solution to transforming its energy value chain as well as harnessing the opportunities of a hydrogen-based economy. This talk will provide insights into the role of hydrogen in PETRONAS' energy value chain and discuss some of the strategies driving hydrogen efforts. Technological achievements, challenges and future of research and implementations strategy are discussed, from the point of view of PETRONAS and industry.

## PENCERAMAH / SPEAKERS

### PLENARY SPEAKER 2



**Professor Ir. Dr. Nor Aishah Saidina Amin, FAsc**  
Head Chemical Reaction Engineering Group  
School of Chemical & Energy Engineering  
Faculty of Engineering  
Universiti Teknologi Malaysia

### Biography

Professor Ir. Dr. Nor Aishah Saidina Amin graduated with a PhD in Chemical Engineering from Illinois Institute of Technology. A fellow of Academy of Science, Malaysia and IChemE, UK, she is also a professional engineer. She has more than 200 ISI/Scopus indexed publications and is the Head of Chemical Reaction Engineering Group (CREG) at UTM. She is an editorial board member of ECM, Catalysts, IOPSci Notes and Frontiers in Catalysis. She was a research scholar at MIT and University of Kentucky under the MIT-UTM and Fulbright fellowships, respectively. Her field of expertise is in catalytic reaction engineering and reactor modeling.

**Title: Progress in catalytic transformation of biomass-derived hydrocarbons to hydrogen**

### Abstract:

The environmental deterioration caused by the amplified rate of conventional fossil fuel consumption has triggered the need to seek for renewable and sustainable energy sources to alleviate environmental issues. Hydrogen, a clean fuel, is the most promising alternative energy carrier for power generation, fuel cells and transportation. The development of high-performance catalysts in the catalytic transformation of biomass-derived hydrocarbons is the key to achieving green hydrogen energy production for fulfilling the sustainable development goals (SDGs). Various processes have been explored, including steam reforming, photocatalytic reforming, and non-thermal plasma dry reforming to convert biomass derivatives such as carbon dioxide, methane and tar to hydrogen. The catalytic performance in the reaction is affected by the intrinsic properties of a catalyst, which depend on the selection of atomic metals, alloying of multi-metals, control of nanoparticle sizing and effective support modification. The critical factor to be considered is to align the target reactant with catalyst structure design, physical morphology properties, particle size and surface chemical properties to achieve the optimum catalytic performance and high hydrogen yield. In addition, the application of multi-metallic alloys provides higher performance as compared to the respective monometallic catalysts due to the synergistic effect. For oxygenated carbon and light hydrocarbons, strong metal-support interaction, basicity and oxidative nature have profound effects on the conversion to hydrogen. For heavier hydrocarbons such as toluene, the weak metal-support interaction and stronger acidity are more appealing in achieving prolonged catalytic reforming stability for hydrogen production. Hence, careful consideration in designing an effective and highly selective reforming catalyst is imperative for improving the catalytic performance for hydrogen production.

## PENCERAMAH / SPEAKERS

### PLENARY SPEAKER 3



#### **Professor Dr. Mohammad Kassim**

The Malaysian Association of Hydrogen Energy (MAHE) Representative  
Professor at the Department of Chemical Sciences, Faculty of Science & Technology, Universiti Kebangsaan Malaysia  
Deputy Vice-Chancellor (Academic & International)  
Universiti Kebangsaan Malaysia

#### **Biography**

Born in Kuala Pilah, Negeri Sembilan in 1968, Mohammad B. Kassim received his B. Sc. (Hons.) in Chemistry with Energy & Fuel Science in 1993 from the Lakehead University, Thunder Bay, Ontario, Canada and Master of Science (Chemistry) in 1996 from the Universiti Kebangsaan Malaysia. He was conferred a PhD (Inorganic & Coordination Chemistry) by the University of Bristol, United Kingdom in 2003.

Professor Mohammad started his academic career at the Universiti Kebangsaan Malaysia in 1994 as a tutor at the Chemistry Department before becoming a lecturer in 1996 at the School of Chemical Sciences & Food Technology, Faculty of Science and Technology. He was promoted to an Associate Professor in 2008 and a Professor in 2014, at the age of 46 and currently he is a faculty at the Department of Chemical Sciences, Faculty of Science and Technology.

He has shown exemplary leadership qualities during his tenure as the Deputy Executive Director of Pro-Vice Chancellor, Strategy Office (2014-2017) where he was in charge of the Research, Strategic Partnership & Fund Generation affairs. Subsequently, he served as the Dean of Faculty of Science and Technology (2017-2021). Currently, he serves as a Deputy Vice Chancellor (Academic & International) (2021). He has been previously appointed as a Visiting Professor at University of Tsukuba (2019), Specially Appointed Professor at Osaka University (2018), Visiting Professor at Gifu University (2017), and Visiting Researcher at the University of Sheffield (2011).

He specialised in X-ray crystallography, coordination chemistry; molecular electronics, photo-electrochemistry, and conversion & utilization of CO<sub>2</sub>. Currently, he is the founder and leader for Solar Hydrogen Research Group.

#### **Title: The Role of MAHE in Hydrogen Economy from NGO's Perspective**

#### **Abstract:**

Given the continued growth in the world's population as well as the progressive industrialisation of developing nations, particularly in Asia, the global demand for energy is expected to continue to increase by more than 50% until 2030 with fossil fuels continuing to dominate global energy use. At the same time, there is a growing global consensus that greenhouse-gas (GHG) emissions, which keep rising, need to be managed, to prevent dangerous anthropogenic interference with the climate system. In the COP 21 in Paris 2015, Malaysia has committed itself to reduce carbon emission intensity by 45% based on 2005 level in 2030. Hence, various parties including the government are stepping up their efforts to address the challenges of sustainable development and to foster the

## PENCERAMAH / SPEAKERS

expansion of low-carbon fuels. The number of attempts and efforts to develop and test hydrogen-related technology in power generations, vehicles and implement the necessary hydrogen supply infrastructure has increased in recent years, resulting in numerous hydrogen demonstration projects around the globe. Malaysia has both the strength in scientific know-how on hydrogen energy and fuel cell, and industrial strength to further pursue the development of hydrogen economy. Despite the challenges, there is a growing trend of universities and industries collaborating to develop hydrogen economy in Malaysia. With a share of more than 80% in total energy use in the transport sector, the automotive sector is the driving force for the introduction of hydrogen as fuel. Recommendations and action plan have been proposed to help establish hydrogen economy in the 12th Malaysia Plan and beyond. As such, the role of Malaysian Association of Hydrogen Energy (MAHE) to catalyse the promotion of hydrogen fuel and technologies will be highlighted to increase the trajectory for the transition to a hydrogen economy in Malaysia.

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### PLENARY SPEAKER 4



#### **Professor Dato' Ir. Dr. Wan Ramli Wan Daud**

Professor at the Department of Chemical and Process Engineering  
Faculty of Engineering and Built Environment, Universiti Kebangsaan Malaysia  
President of the Malaysian Association of Hydrogen Energy (MAHE)  
Founding Director of the Fuel Cell Institute (SELFUEL)

### Biography

Prof. Dato' Ir. Dr. Wan Ramli Wan Daud FAsc is presently the UKM-Petronas Professor of Sustainable Hydrogen Energy at the Fuel Cell Institute, Universiti Kebangsaan Malaysia (December 2019- 2021), was 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 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 the BEng degree (First Class Hon.) in chemical engineering from the University of Monash, Victoria, Australia in 1978 and the PhD degree in chemical engineering from the University of Cambridge, United Kingdom in 1984. He is the Founding Director of the Fuel Cell Institute, Universiti Kebangsaan Malaysia (2007-2013) and the Founding President of the Malaysian Association of Hydrogen Energy (MAHE) (2018-2021). He was elected Fellow of Institution of Chemical Engineers in 2007 and was Chairman of its Malaysia branch in 2009. He was elected a Fellow of the Academy of Science Malaysia, Malaysia's institution for top scientists, in 2012 for his World leading role in scientific work on hydrogen energy and fuel cells. He won the prestigious Merdeka Award 2016 for Outstanding Scholastic Achievement, Malaysia's top award for Malaysian scientists, on 23 September 2016 for outstanding scholarly research and development work in advancing the technology of fuel cells and hydrogen energy in Malaysia, the region, and the World. He also won the Anugerah Tokoh Akademik Bahasa Melayu 2020, Malaysia's top Bahasa Melayu award 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 six times in 2015 and 2016 by Thomson Reuters, 2017, 2018, 2019, and 2020 by Clarivate Analytics for the highest number of highly cited papers. He promoted the Hydrogen Economy by spearheading the development of the first Malaysian Roadmap for Hydrogen Energy and Fuel Cells in 2006. He updated the hydrogen and fuel cells Roadmap in the Blueprint of Fuel Cells Industry in Malaysia published by Academy of Science Malaysia in 2017. He also wrote a position paper on the Hydrogen Economy in Malaysia for the Academy to be presented to the Malaysian Government in 2020. His main research areas are green hydrogen energy such as photoelectrochemical (PEC), electrolytic and microbial electrolytic water splitting; fuel cells technology such as proton exchange membrane fuel cells (PEMFC), solid oxide fuel cells (SOFC), microbial fuel cells (MFC) and direct fuel cells (DFC); and sustainable industrial drying technology such as solar, spray, drum, and fluidized bed dryers. He published 411 articles in international journals, 401 articles in proceedings of international conferences and 235 articles in proceedings of national conferences. He is cited in WOS 10,442 times with H-index 54; in SCOPUS 10,823 times with H-index 54, and in Google Scholar 17,276 times with H-index 67. He was invited to present 42

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keynote and 10 invited papers on hydrogen energy and fuel cells in China, Iceland, India, Indonesia, Iran, Japan, Malaysia, Netherlands, Philippines, Russia, Singapore, and Thailand.

### **Title: Green Hydrogen from PEM and AEM Electrolyzers: Challenges of Commercialization**

#### **Abstract:**

Hydrogen is identified as the new energy carrier that would be a game changer in solving both the climate change crisis caused by greenhouse gases/carbon dioxide emissions from fossil fuel use and energy security crisis caused by uncertainty of supply of fossil fuel due to depleting reserves and political instabilities in supplying countries. Hydrogen energy is attractive because it could be used in a wide range of applications as clean fuel for transportation, heat and power generation; as energy storage and feedstock in chemical industries. Hydrogen economy is the circular economy where green hydrogen is produced from renewable energy, is used in various applications to produce water that is recycled for hydrogen production. Currently most of the World's grey hydrogen is produced cheaply from steam methane reforming (SMR) that also emits large amounts of carbon dioxide to the atmosphere. Even if the carbon dioxide could be separated and stored in suitable geological formations and in old oil wells, or converted into useful products that could be sold, the blue hydrogen produced would still suffer from security of supply of the raw material, methane from natural gas. In the last few years, there was renewed interest in green hydrogen production technology especially in water splitting electrolysis technology that is coupled with renewable energy via power to gas (PtG) process. Although water electrolysis becomes more attractive in PtG for green hydrogen production when renewable energy cost goes down due to improvement in energy efficiency and lower manufacturing cost of photovoltaic cells, the costs of green hydrogen is still 2-3 times more expensive than blue hydrogen produced from SMR. Electrolyzer market demand will grow to 25 GW by 2030 when cost of hydrogen is \$2.0/kg from the present baseline cost of \$4.0/kg. Although alkaline water electrolyzers (AWE) are already available commercially for many years, new water electrolysis technologies such as the proton exchange membrane (PEMWE) and the anion exchange membrane water electrolyzers (AEMWE) are developed because both have smaller footprints, higher current densities and higher output pressures than AWE. Since AEMWE use Ni alloys instead of Pt group catalysts compared to PEMWE, its cost is 25% less than PEMEL and 20% less than AWE. Main costs in AEMWE stack is in MEA (25%) consisting of Ni alloys catalysts and anion exchange membranes and bipolar plate (45%) comprising of Ni foam and stainless steel. Main costs in AEMWE stack is in membrane electrode assembly (MEA) (41%) consisting of Pt and Ru catalysts and proton exchange membranes; and bipolar plate (53%) comprising of coated stainless steel. The stack takes up 55% of the cost of both AEMWE and PEMWE systems while BOP takes the rest. Costs of hydrogen could be reduced marginally by \$0.45 – 0.50 by reducing catalyst and BOP costs. Local sources of catalysts could bring the input cost of catalyst down. Cost of hydrogen could be reduced further by \$1.50/kg if renewable energy electricity tariff is drastically reduced.



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### PLENARY SPEAKER 5



**Professor Dr-Eng. Eniya Listiani Dewi, B.Eng., M.Eng.**

Professor Research

National Research and Innovation Agency (*Badan Riset dan Inovasi Nasional, BRIN*)  
Indonesia

### Biography

Eniya Listiani Dewi was born in Magelang in 1974. She completed Doctor of Engineering in the Advanced Research Institute for Science and Engineering, Engineering Faculty, Department of Applied Chemistry, Waseda University, Tokyo, Japan, in 2003. She was promoted as Professor in 2014. Her current affiliation is the Professor Research, National Research and Innovation Agency (*Badan Riset dan Inovasi Nasional, BRIN*). Previously, she was the Deputy Chairperson for Technology of Information, Energy and Materials at the Agency for the Assessment and Application of Technology (BPPT) until 31<sup>st</sup> August 2021.

Her interests are on electron transfer phenomenon on the nanocatalysts, hydrocarbon polymer materials, PEM-fuel cells, zinc-air fuel cell batteries, as well as hydrogen production from biomass and PEM-electrolysers. Her activities have been recognized by several awards, such as Mizuno Award, Koukenkai Award, Asia Excellent Award, Best Scientist Award, Engineering Award, Energy Research Award, Patent Innovation Award, Habibie Award, BJ Habibie Technology Award etc. Recently, she got award from GE Electric as one of Inspired Woman in STEM. She served on the Indonesia Delegation in APEC Meeting 2012, Nobel Laureates Meeting 2006 and International Visitor Leadership Program USA 2011.

She is active as Board Director for International Association Hydrogen Energy (IAHE) from 2013 until now, and she's also a founder and Chair for Indonesia Fuel Cell and Hydrogen Energy (IFHE), and also running the consortium of fuel cell and hydrogen of Indonesia since 2014. Now, she became the Chairman of Indonesia Polymer Association (HPI) for 2017 until now. She is currently leading the National Priority Program: Development of Charging Station, Geothermal Energy Plant and Industrial Salt Project.

**Title: Toward to Indonesia Decarbonization Energy Planning by Promoting Ecosystem of Hydrogen**

### Abstract:

Indonesia has committed to reduce the GHG (Green Houses Gaseous) emission in the Paris Agreement 2015, by reducing CO<sub>2</sub> emission 29% in 2030 with self-efforts, and of 41% with international assistances. To achieve this target, several programs have been conducted. Replacing fossil fuel with a renewable energy source is the main concern, and some of ongoing programs are: the co-firing in coal power plants, and the replacement or converting oil fuel in diesel power plant (PLTD) with renewable energy sources. However, another breakthrough program is needed, and it needs to be accelerated for support the energy transition in Indonesia toward to net zero emission era.

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PLN, as the biggest electricity company in Indonesia has a program road to net-zero emissions by 2060. The utilization of new and renewable energy sources for power generation will be increased to add electricity capacity

of 1,500 TWh by 2060. This amount is five times larger than the existing capacity. Another program is to replace more than 5,000 diesel power plants (PLTD) with capacity about 2,000 megawatts by renewable energy-based power plants. An in-line program is also committed by Pertamina, as the biggest oil-fuel company in Indonesia, to support the government in achieving the carbon neutral. Pertamina has a program to increase the green energy portfolio to be at 17% by 2030. This program is implemented through the development of geothermal power plant, hydrogen energy, batteries for electric vehicle and energy storage systems (ESS), gasification, bioenergy, green refinery, circular carbon economy and new and renewable Energy program.

As a national agency for assessment and application of technology, BPPT has important role on the development of hydrogen fuel in Indonesia. BPPT has an existing program on the development of fuel cell electric vehicle through the combination concept in hybrid of PV - Hydrogen for power generation. Some initial studies have been conducted and documented as a milestone of the development of hydrogen fuel in Indonesia. Therefore, this paper has been made with an aim to describe and promote the hydrogen-energy as a potential source of energy development in Indonesia. The role of hydrogen energy needs to be strengthened to support decarbonization program. An integrated strategy for the implementation should be assessed in the development of green hydrogen technology, through the research and development as well as through the policy.

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### PLENARY SPEAKER 6



**Professor Dr. Nobuyoshi Nakagawa**  
Division of Environmental Engineering Science  
Graduate School of Science and Technology  
Gunma University, 1-5-1 Tenjin-cho  
Kiryu, Gunma 376-8515  
Japan.

### Biography

In 1989, he obtained a doctoral degree in research on a SOFC from Tokyo Institute of Technology. He moved to the Department of Chemical and Biological Engineering, Gunma University in 1990. He became a full professor at Gunma University in 2005 and continues to this day. His current research interests are technologies related to high performance DMFCs and PEMFCs, including development of new electrode catalysts and electrolyte membranes. He has published more than 170 international journal articles so far. He is a chairman of Division of Energy Engineering, the Society of Chemical Engineering of Japan.

**Title: Morphology and structure of the catalyst and catalyst layer for high performance DMFCs**

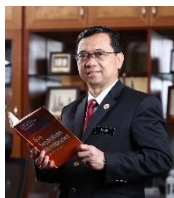
### Abstract:

Direct methanol fuel cell (DMFC) has attracted a great deal of attention as promising power source for clean and renewable energy applications, due to its high energy density, efficiency and low emissions. However, several challenges still hinder DMFC commercialization, including low performance, high cost and insufficient durability. With respect to the performance improvement, development of breakthrough catalyst has been actively investigated by many researchers applying composites of Pt-based catalyst with nano-sized co-catalysts and 1D or 2D nano-carbon as catalyst support. In those studies, the mass activity on the basis of mass of the precious metal is generally used as an evaluation index of the catalyst.

In case of DMFC, it is necessary to apply a relatively large amount of catalyst to the MEA compare to that of the hydrogen fuel cell. This means the thickness of the catalyst layer increase, suggesting that the structure of the catalyst layer becomes critical for the fuel cell performance relating to the distribution of active reaction site, the mass and ion transport resistances. Therefore, in order to realize a high-performance DMFC, the macro and micro-structures of the catalyst layer are important. It is effective to make the active reaction sites as dense as possible on the surface of the electrolyte membrane, but in terms of mass transfer resistance, a certain volume of pores is necessary. It is a trade-off relationship, so it is not a simple matter. In particular, for fine particle catalysts in the shape of 1D or 2D, not only the activity of the catalyst itself but also the evaluation as a catalyst layer is indispensable. Based on the previous studies on the structure of catalyst layer of DMFC including the authors works, structure for the highly active catalyst layer and the catalyst for that purpose will be considered.

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### PLENARY SPEAKER 7



**Professor Datuk Ts. Dr. Ahmad Fauzi Ismail**  
Vice Chancellor of Universiti Teknologi Malaysia  
Ph. D, D.P.S.M., FASc., CEng, FIChemE, P. Tech

### Biography

Professor Ahmad Fauzi Ismail is the Vice Chancellor of Universiti Teknologi Malaysia. He is a professor of membrane technology and the author of over 1000 papers in refereed journals and over 50 book chapters. He has authored or co-authored 6 books and edited or co-edited 11 books, 11 Patents granted and 20 Patents pending. His current Scopus h-index 85 (Citation 33, 532) & Web of Science h-index 79 (Citation 27,377). He has supervised more than 70 PhD and 50 MSc students to completion as well as having supervised 10 post-doctoral fellows. He received more than 130 awards both at the National and International level.

### Title: Current Development of Hydrogen Fuel Cells

#### Abstract:

It is universally acknowledged that energy is the very lifeblood of today's society and economy. Three principal areas such as physical, economic and social welfare mainly relies on the adequate and uninterrupted energy supply from the limited traditional fossil energy sources including coal, oil and natural gas. However, as the global demand for energy is increasing rapidly because of population and economic growth, it creates a wide gap between the increasing demand and shrinking supply of energy. In particular, the energy demand is projected to almost double in the Asia region with a large population (4.64 billion) by 2030. Hence, there is an urgent need for innovative ways to generate energy in a socially, economically, and environmentally sustainable manner. This has led to prompt actions in promoting renewable energy sources, especially hydrogen fuel cell technology as alternative solutions for achieving a clean, secure and affordable energy systems. Therefore, this talk will comprehensively discuss about the specific characteristics of hydrogen energy especially the hydrogen fuel cell, which recommends it as a clean energy to power a range stationary and mobile applications. The discussion also provides an overview of the sustainability elements in hydrogen fuel cell, ranging from fuel cell material to economic advancement, the efficient manufacturing techniques in hydrogen fuel cell components and storage systems production, as well as the challenges to overcome for making hydrogen fuel cell technology commercially available.

## JADUAL PENYAMPAIAN TEKNIKAL / TECHNICAL PRESENTATION SCHEDULE

### PARALLEL SESSION 1 (26<sup>th</sup> October 2021)

Presentation time	Room 1	Room 2	Room 3	Room 4
10.35 am	A19	E22	F03	B03
10.50 am	A11	E06	F02	B11
11.05 am	A18	E07	F05	C01
11.20 am	A13	E14	F07	B02
11.35 am	A15	E15	F16	B04
11.50 am	A10	E03	F14	B10
12.05 pm	A09	E17		B09

### PARALLEL SESSION 2 (26<sup>th</sup> October 2021)

Presentation time	Room 1	Room 2	Room 3	Room 4
2.35 pm	A21	E19	F01	B08
2.50 pm	A23	E21	F08	C03
3.05 pm	A12	E16	F17	D02
3.20 pm	A01	E01	F10	B06
3.35 pm	A04	E08	F13	B07
3.50 pm	A08	E11		B13

### PARALLEL SESSION 3 (27<sup>th</sup> October 2021)

Presentation time	Room 1	Room 2	Room 3	Room 4
10.35 am	A16	E12	F15	A25
10.50 am	A22	E02	F20	A24
11.05 am	A03	E04	F09	A17
11.20 am	A07	E09	F11	B05
11.35 am	A02	E10	F06	C02
11.50 am	A06	E13	F04	D01
12.05 pm	A05	E05		B01

## JADUAL PENYAMPAIAN TEKNIKAL / TECHNICAL PRESENTATION SCHEDULE

PARALLEL SESSION 1 (26<sup>th</sup> October 2021)

### Room 1: Fuel Cells for Mobile and Stationary Systems

Time	Abstract ID	Title	Name of Authors	Name of Institution
10.35 am	A19	Voltage Oscillation in PEMFC during Power Generation Accompanied by Oxygen Partial Pressure Oscillation	<u>Junji Inukai*</u>	University of Yamanashi
10.50 am	A11	A Review: Recent Advances in (bio)cathode Catalysts for Microbial Electrosynthesis Cells	<u>Irwan Ibrahim</u> , Mimi Hani Abu Bakar, Swee Su Lim*	Universiti Kebangsaan Malaysia
11.05 am	A18	Supported System for Biogas-Fueled Solid Oxide Fuel Cells- An Overview	<u>Ahmad Faig Omar</u> , Mahendra Rao Somalu*, Andanastuti Muchtar, Nurul Akidah Baharuddin, S.A. Muhammed Ali S.A.	Universiti Kebangsaan Malaysia
11.20 am	A13	Short Review of the Challenges in Biogas as Fuel for Solid Oxide Fuel Cell	<u>Ole Ronie</u> , Andanastuti binti Muchtar*, Noor Shieela Kalib, Wan Aizon Wan Ghopa, Mahendra Rao Somalu, Nurul Akidah Baharuddin	Universiti Kebangsaan Malaysia
11.35 am	A15	Reduced Graphene Oxide Supported Pt-Ni nanoframes Electrocatalysts for Fuel Cell Oxygen Reduction Reaction	<u>Lee Pak Hoe</u> , Loh Kee Shyuan*, Wan Ramli Wan Daud, Mahendra Rao Somalu	Universiti Kebangsaan Malaysia
11.50 am	A10	A Short Review on Carbon-Based Compounds as Chemical Agent in the Production of Ceramics for Fuel Cell Application	<u>Siti Hajar Zahari</u> , Abdullah Abdul Samat*, Nafisah Osman.	Universiti Malaysia Perlis
12.05 pm	A09	Heat Transfer Phenomenon in an Anode Supported High-Temperature Solid Oxide Fuel Cell: Steady State case study	<u>Noor Shieela Kalib</u> , Andanastuti Muchtar*, Mahendra Rao Somalu, Ahmad Kamal Ariffin Mohd Ihsan, Ole Ronie	Universiti Kebangsaan Malaysia

*Note: The name with underline is the presenter's name while the name with \* mark is the corresponding author.*

## JADUAL PENYAMPAIAN TEKNIKAL / TECHNICAL PRESENTATION SCHEDULE

### PARALLEL SESSION 1 (26<sup>th</sup> October 2021)

#### Room 2: Materials

Time	Abstract ID	Title	Name of Authors	Name of Institution
10.35 am	E22	Adhesion Behavior of 3D Printed Polyamide-Carbon Fibre Composites Filament	<u>Nabilah Afiqah Mohd Radzuan</u> *, Abu Bakar Sulong	Universiti Kebangsaan Malaysia
10.50 am	E06	Synthesis and Characterization of $\text{LiCo}_{0.8}\text{M}_{0.2}\text{O}_{2-δ}$ (M = Ti or Ca) Powder as Triple Conducting Oxide Cathode for Solid Oxide Fuel Cell	<u>Muhammad Amirul Mamsor</u> , Mahendra Rao Somalu*, Nurul Akidah Baharuddin, Andanastuti Muchtar	Universiti Kebangsaan Malaysia
11.05 am	E07	Reducibility Behavior of Spinel Catalyst Produced Via Glycine Nitrate Process with Different Mixing Times	<u>Isyraf Aznam</u> , Joelle C.W. Mah, Andanastuti Muchtar*, Nurul Akidah Baharuddin, Mahendra Rao Somalu	Universiti Kebangsaan Malaysia
11.20 am	E14	Synthesis and Characterization of Carboxymethyl Chitosan/Polyvinyl Alcohol/Mxene (CMC/PVA/Ti <sub>3</sub> C <sub>2</sub> T <sub>x</sub> ) as Polymer Electrolyte Membrane.	<u>Muhamad Hafizzul Isyraf Hardi</u> , Kee Shyuan Loh*, Wai Yin Wong, Rozan Mohamad Yunus, Azizan Ahmad, R. Saidur.	Universiti Kebangsaan Malaysia
11.35 am	E15	Ionic Liquid In Phosphoric Acid Doped Polybenzimidazole (PA-PBI) As Electrolyte Membranes For PEM Fuel Cell: A Review	<u>Kok Seng Leong</u> , Mohd Shahbudin Mastar @ Masdar*, Kee Shyuan Loh	Universiti Kebangsaan Malaysia
11.50 am	E03	Synthesis Techniques for the Preparation of Proton-conducting Solid Oxide Fuel Cell Electrolyte Materials: A Short Review	<u>Nur Wardah Norman</u> , Mahendra Rao Somalu*, Andanastuti Muchtar, Nurul Akidah Baharuddin, Muhammed Ali S.A.	Universiti Kebangsaan Malaysia
12.05 pm	E17	Effect of Sintering Temperature on Structural Properties of Cobalt Oxide Based Bifunctional Catalyst for Oxygen Reduction and Oxygen Evolution Reactions	<u>Nur Ubaidah Saidin</u> , Rozan Mohamad Yunus*, Loh Kee Shyuan, Wong Wai Yin, Choo Thye Foo, Sharifah Najiha Timmiati	Universiti Kebangsaan Malaysia

Note: The name with underline is the presenter's name while the name with \* mark is the corresponding author.

## JADUAL PENYAMPAIAN TEKNIKAL / TECHNICAL PRESENTATION SCHEDULE

### PARALLEL SESSION 1 (26<sup>th</sup> October 2021)

#### Room 3: Fuel Cells and Miscellaneous

Time	Abstract ID	Title	Name of Authors	Name of Institution
10.35 am	F03	Mechanistic Insights into Solid Oxide Fuel Cell Cathodes and Their Characterization Using X-Ray Photoelectron Spectroscopy	<u>Muhammed Ali S.A*</u> , Andanastuti Muchtar, Mahendra Rao Somalu, Nurul Akidah Baharuddin	Universiti Kebangsaan Malaysia
10.50 am	F02	Titanium Hydride Powder Production from Reduction of Titanium Tetrachloride with Calcium Hydride in Hydrogen Atmosphere	<u>Mohammad Rezaei Ardani</u> , Sheikh Abdul Rezan Sheikh Abdul Hamid*, Hooi Ling Lee, Abdul Rahman Mohamed	Universiti Sains Malaysia
11.05 am	F05	Modelling of Oxygen Diffusion Mechanism at SOFC Cathode using Adler-Lane-Steele Mathematical Method: A Short Review	<u>Azreen Junaida Abd Aziz</u> , Nurul Akidah Baharuddin*, Mahendra Rao Somalu, Andanastuti Muchtar	Universiti Kebangsaan Malaysia
11.20 am	F07	PtRu Supported on 3D Hierarchical Porous TiO <sub>2</sub> - Graphene Aerogel as Potential Electrocatalyst for Direct Methanol Fuel Cells	<u>S.H. Osman</u> , S.K. Kamarudin*, S. Basri, N.A. Karim	Universiti Kebangsaan Malaysia
11.35 am	F16	Electrospinning of Polymeric Nanofibers for Tissue Engineering Application: A review	<u>M. Z. A. Zulkifli</u> , D. Nordin*, N. Shaari, S. Kamarudin	Universiti Kebangsaan Malaysia
11.50 am	F14	Adsorption and Magnetism of MnO <sub>x</sub> on the 3D-G Surface with Oxygen Vacancies in the Interface	<u>K.S. Ahmad</u> , S. Basri*	Universiti Kebangsaan Malaysia

*Note: The name with underline is the presenter's name while the name with \* mark is the corresponding author.*



## JADUAL PENYAMPAIAN TEKNIKAL / TECHNICAL PRESENTATION SCHEDULE

### PARALLEL SESSION 1 (26<sup>th</sup> October 2021)

#### Room 4: Hydrogen Energy

Time	Abstract ID	Title	Name of Authors	Name of Institution
10.35 am	B03	Biohydrogen Purification System via Adsorption-Desorption Process: Pilot Plant Case Study	M Z Sidek, N N Zulkefii, <u>M S Masdar*</u> , W N R W Isahak	Universiti Kebangsaan Malaysia
10.50 am	B11	Photocatalytic Hydrogen Generation Over C-doped g-C <sub>3</sub> N <sub>4</sub> based-Heterojunction Photocatalyst	<u>Mohamad Azuwa</u> <u>Mohamed*</u>	Universiti Kebangsaan Malaysia
11.05 am	C01	Hydrogen Production via Electrolysis Unit: Mathematical Modelling and Simulation on Parametric Towards Electrolysis Performance	<u>Adam Mohd Izhan Bin Noor Azam</u> , Radhiatul Atiqah binti Ramli Shah, Mohd Shahbudin Mastar @ Masdar*, Umi Azmah Hasran	Universiti Kebangsaan Malaysia
11.20 am	B02	Three-Dimensional Free-standing Graphene: Influence of Etchant Solution and Etching Time on Graphene/Nickel Foam	<u>Nurul Nabila Rosman</u> , Rozan Mohamad Yunus*, Nur Rabiatul Adawiyah Mohd Shah, Khuzaimah Arifin, Lorna Jeffery Minggu, Norasikin Ahmad Ludin	Universiti Kebangsaan Malaysia
11.35 am	B04	Core Shell Adsorbents Synthesis: Performance of H <sub>2</sub> S Adsorption at Minimal Operating Parameter	<u>Nurul Noramelya Binti Zulkefii</u> , Rajeevelosana Seladorai, Mohd Shahbudin Masdar*	Universiti Kebangsaan Malaysia
11.50 am	B10	Static and Dynamic Factors Influencing PEM Water Electrolyzer Performance: A Review of Current and Potential Trends	Teuku Husaini*, <u>Ammar Bazarah</u> , Ibrahim Alshami, Jonathan Goh, Mohd Shahbudin Masdar, and Loh Kee Shyuan	Universiti Kebangsaan Malaysia
12.05 pm	B09	Review on Bipolar Plates for Polymer Electrolyte Membrane Water Electrolyzer	Teuku Husaini*, <u>Ibrahim Alshami</u> , Jonathan Goh, Mohd Shahbudin Masdar, and Loh Kee Shyuan	Universiti Kebangsaan Malaysia

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## JADUAL PENYAMPAIAN TEKNIKAL / TECHNICAL PRESENTATION SCHEDULE

### PARALLEL SESSION 2 (26<sup>th</sup> October 2021)

#### Room 1: Fuel Cells for Mobile and Stationary Systems

Time	Abstract ID	Title	Name of Authors	Name of Institution
2.35 pm	A21	Analysis of Water Distribution and its Chemical State inside the Proton Exchange Membranes under Transient Conditions During Operation by Operando Time-Resolved CARS Spectroscopy	<u>Hironichi Nishiyama</u> , Junji Inukai*	University of Yamashi
2.50 pm	A23	Static Stress Analysis of Electrode and Gasket in Proton Exchange Membrane Fuel Cell Stack Assembly Pressure	<u>Nurato*</u> , Edy Herianto Majlan*, Wan Ramli Wan Daud, Teuku Husaini, Masli Irwan Rosli, Abu Bakar Sulong, Mohd Shahbudin Mastar, Darwin Sebayang	Universiti Kebangsaan Malaysia
3.05 pm	A12	Physical and Mechanical Characterizations of Cathode Materials for Proton Ceramic Fuel Cell Application: A Short Review	<u>Nur Syamimi Rizal Hisham</u> , Muhamad Zakwan Naim Nasir, Ismariza Ismail*, Nafisah Osman	Universiti Malaysia Perlis
3.20 pm	A01	Current Trend of Perovskite-Based Anode Materials for Direct Hydrocarbon Fuel Utilization in Intermediate Temperature Solid Oxide Fuel Cell (IT-SOFC)	<u>Ainaa Nadhirah Zainon</u> , Mahendra Rao Somalu*, Audi Majdan Kamarul Bahrain, Andanastuti Muchtar, Nurul Akidah Baharuddin	Universiti Kebangsaan Malaysia
3.35 pm	A04	A Computational Node Model for Proton Exchange Membrane Fuel Cells	<u>Yuwei Pan</u> , Huizhi Wang, Nigel P. Brandon*	Imperial College London
3.50 pm	A08	Formulation and Characterisation of LSCF/YSZ-SDC with LSCF/YSZ-SDCC Dual Composite Cathode for Intermediate Temperature to Low Temperature Solid Oxide Fuel Cell	<u>Nurul Farhana Rahman</u> , Umira Asyikin Yusop, Hamimah Abd.Rahman*, Mohd Azham Azmi1, Azzura Ismail, Shahrudin Mahzan	Universiti Tun Hussein Onn Malaysia

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## JADUAL PENYAMPAIAN TEKNIKAL / TECHNICAL PRESENTATION SCHEDULE

### PARALLEL SESSION 2 (26<sup>th</sup> October 2021)

#### Room 2: Materials

Time	Abstract ID	Title	Name of Authors	Name of Institution
2.35 pm	E19	Sublayered Structures of Hydrated Ionomer Thin Film on Substrates Analyzed by Neutron Reflectometry at Controlled Temperature and Humidity	<u>Tepei Kawamoto</u> , Junji Inukai*	University of Yamanashi
2.50 pm	E21	Enhancing the Oxygen Reduction Reaction of Low-Platinum and Non-Platinum Catalysts for Fuel Cell Applications	<u>Kazi Rumanna Rahman</u> , Kuan Ying Kok, Wai Yin Wong, Kean Long Lim*	Universiti Kebangsaan Malaysia
3.05 pm	E16	Review: Recent Catalytic Synthesis of 5-hydroxymethylfurfural (HMF) from Carbohydrates with Process Development Analysis	<u>M.A.A.A. Rani</u> , N.A. Karim*, S.K. Kamarudin	Universiti Kebangsaan Malaysia
3.20 pm	E01	Fabrication and Characterization of Sol-Gel Derived NiO-BCZY Cermet Anode for Protonic Ceramic Fuel Cell	<u>Nur Hanisah Hadi</u> , Mahendra Rao Somalu*, Abdullah Abdul Samat, Andanastuti Muchtar, Nurul Akidah Baharuddin	Universiti Kebangsaan Malaysia
3.35 pm	E08	Potential of Textile Waste as Hierarchical Porous Carbon for Oxygen Reduction Reaction Electrocatalyst	<u>S.M. Sauid</u> , S.K. Kamarudin*, N.A. Karim, L.K. Shyuan	Universiti Kebangsaan Malaysia
3.50 pm	E11	Proton Conduction in Perovskite Solid Electrolyte at Intermediate Temperatures: A Short Review	Nur Syafkeena Mohd Affandi, Lidayatty Abdul Malik, <u>Suhaida Dila Safian</u> , Nafisah Osman*	Universiti Teknologi MARA

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## JADUAL PENYAMPAIAN TEKNIKAL / TECHNICAL PRESENTATION SCHEDULE

### PARALLEL SESSION 2 (26<sup>th</sup> October 2021)

#### Room 3: Fuel Cells & Miscellaneous

Time	Abstract ID	Title	Name of Authors	Name of Institution
2.35 pm	F01	The Effect of Membrane Thickness on the Performance of Passive Direct Ethanol Fuel Cells Using a Poly (Vinyl Alcohol)/Graphene Oxide Composite Membrane	<u>Zulfirdaus Zakaria*</u> , Siti Kartom Kamarudin	Universiti Kebangsaan Malaysia
2.50 pm	F08	The Effects of FDM Printing Parameters on the Compression Properties of Polymethylmethacrylate (PMMA) using Finite Element Analysis	Noorazizi Mohd Samsudin, <u>Nor Aiman Sukindar*</u> , Sharifah Imihezi Syed Shaharuddin, Shafie Bin Kamaruddin, Ahmad Zahirani Bin Ahmad Azhar, Yang Chuan Choong, Erry Yulian Triblas Adesta	International Islamic University of Malaysia (IIUM)
3.05 pm	F17	Sustainable Desalination and Bioelectricity Generation using Green Technology of Microbial Desalination Cell	<u>Amal Al Balushi</u> , Fatema Al Maqbali, Haitham Al Saidi, Ibtisam Al Maaini, Anteneh Mesfin Yeneneh, Tahereh Jafary*	International maritime College Oman
3.20 pm	F10	Effect of pH on the Preparation of Gold-Copper Nanoparticles on Anodic Aluminium Oxide (Au-Cu/AAO) for Reduction of p-Nitrophenol	<u>Norizwan Nordin</u> , Hanani Yazid, Nor Azira Irma Muhammad and Abdul Motalib Md Jani*	Universiti Teknologi MARA
3.35 pm	F13	CVD-grown Molybdenum Disulfide: Effect of Temperature Variations on Morphological Appearance and Optical Properties	<u>Abu Dzar Al-Ghiffari</u> , Norasikin Ahmad Ludin*, Rozan Mohd Yunus	Universiti Kebangsaan Malaysia

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## JADUAL PENYAMPAIAN TEKNIKAL / TECHNICAL PRESENTATION SCHEDULE

PARALLEL SESSION 2 (26<sup>th</sup> October 2021)

### Room 4: Hydrogen Energy

Time	Abstract ID	Title	Name of Authors	Name of Institution
2.35 pm	B08	Investigation of the Influence of Annealing Condition on Photoelectrochemical Water Splitting of Electrodeposited Hematite on FTO substrates	Noradiba Nordin, <u>Lorna Jeffery Minggu*</u> , Khuzaimah Arifin, Rozan Mohamad Yunus, Mohammad B. Kassim	Universiti Kebangsaan Malaysia
2.50 pm	C03	High Pressure Water Electrolysers: A Review on The Prevailing Challenges and Recent Advancements in the Quest for an Economic Hydrogen Production	<u>Mohd Nur Ikmal Salehin</u> and Teuku Husaini*	Universiti Kebangsaan Malaysia
3.05 pm	D02	Resiliency of Photovoltaic Applied Fuelling Station: Emission Displacement Assessment	Norasikin Ahmad Ludin*, <u>Nurfarhana Alyssa Ahmad Affandi</u> , Mirratul Mukminah Junedi, Lim Chin Haw, Mohd Adib Ibrahim, Kamaruzzaman Sopian, Mohd Asri Mat Teridi, Suhaila Sepeai, Mohd Sukor Suait	Universiti Kebangsaan Malaysia
3.20 pm	B06	Photocatalytic Hydrogen Generation from Water by TiO <sub>2</sub> /Co <sub>3</sub> O <sub>4</sub> Composite Photocatalysis	<u>Siti Nurul Falaein Moridon</u> , Dian Anggraini, Khuzaimah Arifin*, Lorna Jeffery Minggu, Mohammad B. Kassim	Universiti Kebangsaan Malaysia
3.35 pm	B07	Taxonomic Classification of Sulphate Reducing Bacteria Communities Attached to Biocathode in Hydrogen Producing Microbial Electrolysis Cell	<u>Tahereh Jafary*</u> , Anteneh Mesfin Yeneneh, Wan Ramli Wan Daud, Manar Said Saleh Al Attar, Reem Khalaf Mohammed Al Masani	International Maritime College Oman
3.50 pm	B13	Metal-Organic Frameworks in Proton Exchange Membrane for High Temperature Fuel Cell Applications: A review	<u>Bo Wu</u> , Se Yong Eh Noum*, Wai Yin Wong, Ming Meng Pang	Taylor's University

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## JADUAL PENYAMPAIAN TEKNIKAL / TECHNICAL PRESENTATION SCHEDULE

### PARALLEL SESSION 3 (27<sup>th</sup> October 2021)

#### Room 1: Fuel Cells for Mobile and Stationary Systems

Time	Abstract ID	Title	Name of Authors	Name of Institution
10.35 am	A16	Neutron Imaging of Water Distribution Inside a Running PEFC	Yu Kakizawa, Kohei Suda, <u>Solomon Wekesa Wakolo</u> , Teppei Kawamoto, Hiromichi Nishiyama, Makoto Uchida, Katsuyoshi Kakinuma, Hirotochi Hayashida* and Junji Inukai*	University of Yamanashi
10.50 am	A22	Computational Numerical Analysis of a Hydrogen Preheater System to Enhance the Fuel Cell Power Output	<u>Mohd Hadrami Hamdan</u> , W.A.N.W. Mohamed*, Irmie Azlin Zakaria, Nur Syarafana M Rosman, Mohd Faizal Mohamad, Masli Irwan Rosli	Universiti Teknologi MARA
11.05 am	A03	A Review on Preparation, Modification and Fundamental Properties of SPEEK Nanocomposite PEM for Fuel Cell Applications	<u>Nor Fatina Raduwan</u> , Norazuwana Shaari*	Universiti Kebangsaan Malaysia
11.20 am	A07	Monitoring System Development for High Temperature Proton Exchange Membrane Fuel Cell (HT-PEMFC)	<u>R.E. Rosli</u> , A.B. Sulong*, W.R.W. Daud, M.I. Rosli, E.H. Majlan, M.A. Zulkifley	Universiti Kebangsaan Malaysia
11.35 am	A02	Review on Microstructure Degradation of Solid Oxide Fuel Cell Anodes	<u>Nireshah Asokumar</u> , Mahendra Rao Somalu*, Nurul Akidah Baharuddin, Andanastuti Muchtar, Muhammed Ali S.A	Universiti Kebangsaan Malaysia
11.50 am	A06	Ag Nanoparticle Modified Ceramic Surface Impacts on MFC Initial Power Performance	<u>Nur Iman Syafiqah Muhammad Nasruddin</u> , Mimi Hani Abu Bakar*, Syukran bin Zainol	Universiti Kebangsaan Malaysia
12.05 pm	A05	An Overview of Ceramic-based Materials in Fuel Cell Applications	<u>Nurul Akidah Baharuddin</u> *	Universiti Kebangsaan Malaysia

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## JADUAL PENYAMPAIAN TEKNIKAL / TECHNICAL PRESENTATION SCHEDULE

### PARALLEL SESSION 3 (27<sup>th</sup> October 2021)

#### Room 2: Materials

Time	Abstract ID	Title	Name of Authors	Name of Institution
10.35 am	E12	The Effects of Fe-doping towards the Structural Formation of ZIF-8 and ZIF-67 Based Electrocatalysts for Oxygen Reduction	<u>Diwya Darshini. R.</u> , Kee Shyuan Loh*, Wai Yin Wong, Kean Long Lim	Universiti Kebangsaan Malaysia
10.50 am	E02	The Effect of Diammonium Phosphate and Potassium Nitrate as Filler on Corn-Based Film Properties	<u>Nur Nadia Nasir*</u> , Siti Amira Othman	Universiti Tun Hussein Onn Malaysia
11.05 am	E04	Preliminary Analysis of $\text{LiNi}_{0.5}\text{Ru}_{0.5}\text{O}_2$ as the Dual Functioning Electrode for Symmetrical Solid Oxide Fuel Cell	<u>Wan Nor Anasuhah Wan Yusoff</u> , Nurul Akidah Baharuddin*, Mahendra Rao Somalu, Andanastuti Muchtar, Muhammed Ali S.A., Nigel P. Brandon	Universiti Kebangsaan Malaysia
11.20 am	E09	A Review on Sulfonated Poly(Ether Ether Ketone) (SPEEK) Based-Membrane in Direct Borohydride Fuel Cell (DBFC Applications)	<u>Nur Ain Masleeza Harun</u> , Norazuwana Shaari*	Universiti Kebangsaan Malaysia
11.35 am	E10	Carbon and Graphene Based-Materials/Metal-Organic Framework for Catalytic Oxidation in Direct Borohydride Fuel Cell Application	<u>Nik Farah Hanis Nik Zaiman</u> , Norazuwana Shaari*	Universiti Kebangsaan Malaysia
11.50 am	E13	Effect of Compositional Ratio on the Physical Properties of NiO nanoparticles- $\text{BaCe}_{0.54}\text{Zr}_{0.36}\text{Y}_{0.1}\text{O}_{2.95}$ Composite Anode	<u>Noor Hidayah Aniza Zakaria</u> , Nafisah Osman*	Universiti Teknologi MARA
12.05 pm	E05	Structural & Electrochemical Behaviors of $\text{LiCo}_{0.6}\text{Sr}_{0.4}\text{O}$ Cathode for Intermediate-Low Temperature Solid Oxide Fuel Cell	<u>Nur Nadhihah Mohd Tahir</u> , Nurul Akidah Baharuddin*, Mahendra Rao Somalu, Andanastuti Muchtar	Universiti Kebangsaan Malaysia

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## JADUAL PENYAMPAIAN TEKNIKAL / TECHNICAL PRESENTATION SCHEDULE

### PARALLEL SESSION 3 (27<sup>th</sup> October 2021)

#### Room 3: Fuel Cells & Miscellaneous

Time	Abstract ID	Title	Name of Authors	Name of Institution
10.35 am	F15	Biogas Fed Solid Oxide Fuel Cell: A Prospect	<u>Lim Bee Huah</u> *, Masli Irwan Rosli, Nuriyana Aznan	Universiti Kebangsaan Malaysia
10.50 am	F20	Effect of Perpendicular External Electric Field to Bilayer Graphene Bandgap Opening	<u>Khuzaimah Arifin</u> *, Rozan M. Yunus	Universiti Kebangsaan Malaysia
11.05 am	F09	Effect of Fe-N-C Morphologies on the Oxygen Reduction Reaction	<u>Norhamizah Hazirah Ahmad Junaidi</u> , Wai Yin Wong*, Kee Shyuan Loh, Saidur Rahman	Universiti Kebangsaan Malaysia
11.20 am	F11	The Thermal Stability and Preliminary Performance of Sodium Alginate and Polyvinyl Alcohol-Based Copolymer Electrolyte Membrane in DMFC: Montmorillonite as a Filler	<u>Musa, Maryam Taufiq</u> , Shaari, Norazuwana*, Kamarudin, Siti Kartom	Universiti Kebangsaan Malaysia
11.35 am	F06	Rice Husk-derived SiO <sub>2</sub> as Pt Electrocatalyst Support for Oxygen Reduction Reaction	<u>Jivita Darshini Sinniah</u> , Wai Yin Wong*, Kee Shyuan Loh, Rozan Mohamad Yunus	Universiti Kebangsaan Malaysia
11.50 am	F04	Effect of Anode Distance and Electrolyte Volume on Performance of Mg-Air Fuel Cell	<u>Nurul Shahzira Hazri</u> *, Sahriah Basri	Universiti Kebangsaan Malaysia

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## JADUAL PENYAMPAIAN TEKNIKAL / TECHNICAL PRESENTATION SCHEDULE

### PARALLEL SESSION 3 (27<sup>th</sup> October 2021)

#### Room 4: Hydrogen Energy

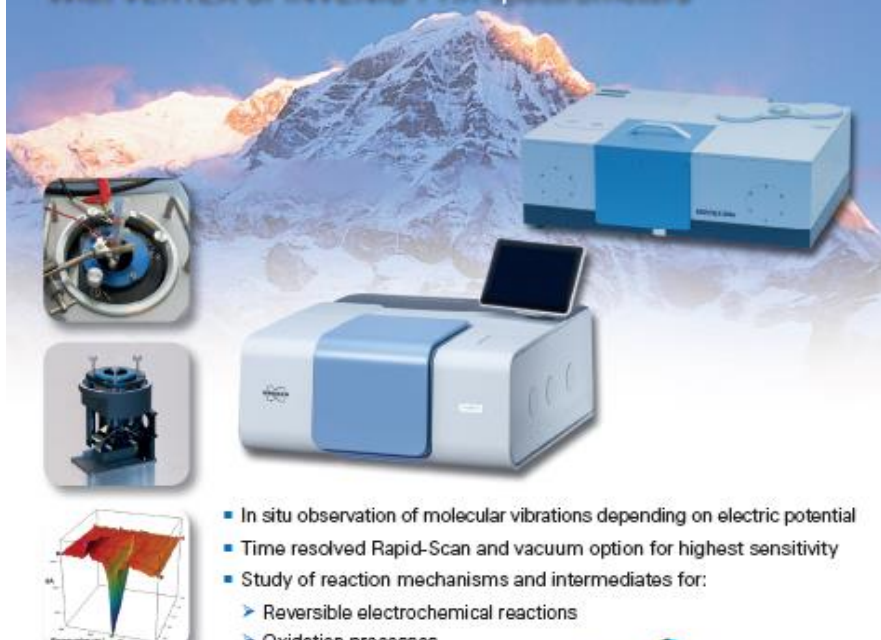
Time	Abstract ID	Title	Name of Authors	Name of Institution
10.35 am	A25	Carbon Anode Modification With Fes <sub>2</sub> /rGO in UKM2 Chlorella Biophotovoltaic Cell Part 1: Power Improvement Analysis	Muhammad Farhan Hil Me, Johana Johan, Darman Nordin, <u>Mimi Hani Abu Bakar*</u> , Wan Ramli Wan Daud	Universiti Kebangsaan Malaysia
10.50 am	A24	A review on sintering aid for Samarium Doped Ceria (SDC) electrolyte modification to reduce sintering temperature	<u>J. Zolhafizi</u> , M. Azham Azmi*, H.A. Rahman, H. Zakaria, S. Hassan, S. Mahzan, A. Ismail, A.M.T. Ariffin, N. A. Baharuddin	Universiti Tun Hussein Onn Malaysia
11.05 am	A17	Conceptual Design of Biogas-Fueled Solid Oxide Fuel Cell Power Generation Plant	<u>Ahmad Faris Mohd Fekeri</u> , Andanastuti Muchtar, Darman Nordin*, Masli Irwan Rosli	Universiti Kebangsaan Malaysia
11.20 am	B05	A Short Review on Bimetallic Ni-Noble Metal Catalysts for Dry Methane Reforming	<u>Nur Farahin Yusoff*</u> , Zadariana Jamil*, Nafisah Osman, Abdullah Abdul Samat	Universiti Teknologi MARA
11.35 am	C02	Numerical Study of Different Flow Field Designs on Proton Exchange Membrane Water Electrolyzer	<u>S.N Chan</u> , W.Y Wong*, B.H. Lim, E. Herianto, T. Husaini, M.L Rosli	Universiti Kebangsaan Malaysia
11.50 am	D01	Dynamic Hazard Identification on SOFC system using Bayesian Network	<u>Nurzailyn Shamsuddin</u> , Andanastuti Muchtar, Faisal Khan, Masli Irwan Rosli*	Universiti Kebangsaan Malaysia
12.05 pm	B01	Synthesis of 3D Graphene/ZnO on Nickel Foam for Photoelectrochemical Water Splitting	<u>Nur Rabiatul Adawiyah Mohd Shah</u> , Rozan Mohamad Yunus*, Nurul Nabila Rosman, Wong Wai Yin, Khuzaimah Arifin, Lorna Jeffery Minggu	Universiti Kebangsaan Malaysia

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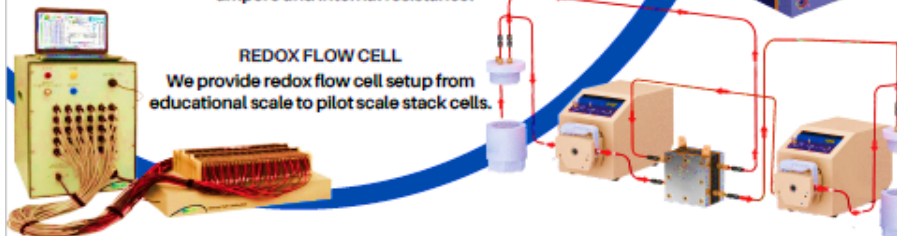
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