CONCEPT 9

Powering The Future Energy Revolution

BOOK OF

ABSTRACTS

The 9th Conference on Emerging Energy & Process Technology 2021

24th & 25th November 2021

APPLIED SCIENCE | SUSTAINABLE ENERGY | PROCESS SYSTEM | SAFETY

Organized by:

UTM UNIVERSITI TEKNOLOGI MALAYSIA | Centre of Hydrogen Energy

Sponsored by:

GAT SCIENTIFIC

e-Makmal

Centre of Hydrogen Energy | Institute of Future Energy (IFE) | Universiti Teknologi Malaysia (UTM)

VIRTUAL CONFERENCE

WWW.CHE.UTM.MY/CONCEPT9

9th CONCEPT 2021

9th CONFERENCE ON EMERGING ENERGY AND PROCESS TECHNOLOGY 2021

Virtual Conference | Universiti Teknologi Malaysia

FOREWORD FROM ADVISOR OF CONCEPT 9 (2021)

Assalamualaikum wrh. wbt. and good day to all.

We did it! This year marks nine years since CONCEPT 2012, the landmark conference organized by the Institute of Future Energy (IFE) as one of the promising research groups in UTM.

I would like to congratulate to the organizing committee, supervisors, and students alike, for your undivided support to make this unique event a reality. Unlike other research events, CONCEPT is designed to inculcate supportive research culture towards establishing academic excellence in a socially warm environment.

With the theme 'Powering the future energy revolution', this conference shows a "coalition of the willing" came together with one objective in mind: to support and accelerate the development of renewable and clean energy corresponding to the energy crisis the world is facing today. The term "revolution" connotes a great change in conditions that involve large numbers of people in which people share the same interest in life and work together to achieve certain levels of advancement in different aspects of life. In recent years, renewable energy such as hydrogen energy, solar energy and wind energy are in the mainstream in the energy sector. As a result, research in the renewable energy sector has emerged and offered new opportunities and exciting avenues to tackle the current global energy challenges. To empower the future energy revolution, all parties must come together to think and contribute to the development of new and cleaner energy solutions for our future energy needs. This conference provides a unique platform gathering eminent scholars from different scientific discipline to share, discuss, interact, and exchange ideas in realizing the mission towards powering the future energy revolution.

As always, there are many research findings to be shared. These topics are organized into a few research themes, for needs to be understood, for concerns to be addressed, for new developments and trends to be made aware of, for best practices to be identified, for new products to be demonstrated, for standards to be discussed, and so on.

The expectations are high and the previous editions have proven the outcomes. It is hoped that this conference could deliver concrete results from a collaborative and collective process which allows a transfer of knowledge to introduce new research development as well as remediate the environment through multidisciplinary research and help to ensure full recognition of the potential of emerging energy and process technology in safe and responsible manner.

Finally, I would like to express my heartiest gratitude to the organizing team that has tirelessly gone through the journey in making this event a success. God Bless us all. Thank you

Thank You.

Professor Dr. Arshad Ahmad
Director of Institute of Future Energy
Universiti Teknologi Malaysia
81310 Johor Bahru Malaysia

MESSAGE FROM THE CHAIR OF CONCEPT 9 (2021)

On behalf of the Organizing committee, I am very delighted to welcome all the participants to the 9th Conference on Emerging Energy & Process Technology (CONCEPT 2021). This conference is intended to be a platform for information dissemination, team working and networking for academia and researchers within the area of Applied Sciences, Process System, Sustainable Energy and Safety.

For the 9th year, CONCEPT is opened up to non-Institute of Future Energy (IFE) members as well as postgraduate students around and out from Malaysia. The number of papers submitted by non-IFE members are encouraging. Thus, we would like to thank all the paper contributors for their contribution and participation in CONCEPT 2021.

Here, we are very honoured to have Professor Sang-Eon Park from Inha University, Incheon, South Korea and Professor Aicheng Chen from University of Guelph, Ontario, Canada as our Plenary Speakers. Sincere gratitude to our keynote speakers Assoc. Prof. Dr Cheng Chin Kui from Khalifa University of Science and Technology, Abu Dhabi, UAE, Assoc. Prof. Ir. Ts. Dr. Mohd Khairi Abu Husain from Razak Faculty of Technology and Informatics, Universiti Teknologi Malaysia, Assoc. Prof. Ir. Dr. Mimi Haryani Hassim from Centre of Hydrogen Energy, Universiti Teknologi Malaysia and Assoc. Prof. Ts. Dr. Dalila Mat Said from Centre of Electrical Energy Systems, Universiti Teknologi Malaysia.

Special thanks to our main sponsor, Gat Scientific Sdn Bhd and Bluedawn Services (E-Makmal) for sponsoring our event.

The effort and invaluable commitment of organizing committee members in ensuring this conference successfully accomplished as planned are acknowledged. I really hope that this conference will be a great success and lead to a fruitful outcome.

Thank You.

Dr. Muhammad Arif Ab. Aziz
Chairperson CONCEPT 9 (2021)
Centre of Hydrogen Energy
Institute of Future Energy
Universiti Teknologi Malaysia
81310 Johor Bahru, Johor

CONFERENCE INFORMATION

Conference Advisor	:	Prof. Dr. Arshad Ahmad Assoc. Prof. Adnan Ripin
Conference Chairman		Dr. Muhammad Arif Ab. Aziz
Secretary		Ms. Nazlina Ya'aini
Treasurer		Ms. Nur Fatimah Azmi
Conference Secretariat	:	Ms. Nazlina Ya'aini Ts. Mohd Fadhzir Ahmad Kamaroddin Mr. Muhammad Abdul Razak Ms. Nur Fatimah Azmi Ms. Suhailah Binti Surani
Registration & Database	:	Dr. Norafneeza Norazahar Dr. Rohul Hayat Adnan
Marketing & Sponsorship	:	Assoc. Prof. Dr. Anwar Johari Dr. Rohul Hayat Adnan Dr. Muhamed Yusuf Bin Shahul Hamid
Publication	:	Prof Dr. Aishah Abdul Jalil Prof Dr. Mohamed Mahmoud El-Sayed Nasef Assoc. Prof. Ir. Dr. Mimi Haryani Hassim Assoc. Prof. Dr. Rafiziana Md Kasmani Dr. Nurfatehah Wahyuny Che Jusoh Ms. Rozieana Abu Mr. Amirul Hafiiz Ruhaimi
Technical	:	Dr. Saharudin Haron Dr. Muhammad Arif Ab. Aziz Ts. Mohd Fadhzir Ahmad Kamaroddin Mr. Muhammad Abdul Razak
Certificate & Souvenir	:	Dr. Roshafima Rasit Ali Assoc. Prof. Dr. Mohamad Wijayanuddin Ali Dr. Tuan Amran Tuan Abdullah Dr. Mohd Johari Kamaruddin Mr. Amirulhail Ishak
Conference Host	:	Centre of Hydrogen Energy (CHE) Institute of Future Energy (IFE) Universiti Teknologi Malaysia 81310 Johor Bahru
Conference Venue	:	Virtual Conference (Webex)
Conference Date	:	24th – 25th November 2021

LIST OF REVIEWERS FOR PAPERS SUBMITTED TO CONCEPT 9 (2021)

Prof. Dr. Mohamed Mahmoud El-Sayed Nasef
Assoc. Prof. Ir. Dr. Mimi Haryani Hassim
Assoc. Prof. Dr. Rafiziana Md Kasmani
Ir. Dr. Lim Jeng Shiun
Ts. Dr. Azizul Azri Mustaffa
Dr. Saharudin Haron
Dr. Roshafima Rasit Ali
Dr. Nurrulhidayah Salamun
Dr. Norelyza Hussein
Dr. Norafneeza Norazhar
Dr. Mohd Asmadi Mohammed Yussuf
Dr. Juan Matmin
Dr. Muhammad Arif Ab. Aziz
Dr. Nurul Huda Baharuddin
Dr. Fatehah Wahyuny Che Jusoh
Dr. Mohd Nazri Mohd Sokri
Dr. Muhamed Yusuf Shahul Hamid
Dr. Kamarizan Kidam
Dr. Mahadhir Mohamed
Dr. Mahadi Bahari
Dr. Nur Farahain Khusnun
Dr. Nurul Sahida Hassan
Dr. Che Ku Nor Liana Che Ku Hitam
Universiti Teknologi Malaysia

ChM. Dr. Nur Farhana Jaafar
Dr. Nur Fatien Binti Muhamad Salleh
Universiti Sains Malaysia

ChM Dr. Teh Lee Peng
Universiti Kebangsaan Malaysia

Dr Fatahiya Mohamed Tap
Universiti Teknologi MARA

CONFERENCE SCHEDULE

9th Conference on Emerging Energy and Process Technology 2021 (CONCEPT 2021)

Universiti Teknologi Malaysia

Date: 24th –25th November 2021

Wednesday, 24th November 2021		
08.30 – 09.00 am	**Virtual lobby**	
09.00 – 09.05 am	**Universiti Teknologi Malaysia (Corporate Video)**	
09.05 – 09.10 am	**Doa Recitation**	
09.15 – 09.30 am	**Welcoming Remarks** **Dr. Muhammad Arif Ab. Aziz (Chairman of CONCEPT2021)**	
09.30 – 09.45 am	**Opening Speech** **Prof. Dr. Arshad Ahmad (Director, Institute of Future Energy)**	
09.45 – 10.00 am	**Sponsors Recognition** **GAT Scientific & Bluedawn Services (E-Makmal)**	
10.00 – 10.20 am	**Plenary Speaker 1: Professor Sang-Eon Park** **Title: Catalytic CO2 Utilization: From Hydrogen Demander to Oxygen Supplier** **Chairperson: Prof. Dr. Mohamed Mahmoud El-Sayed Nasef**	
10.20 – 10.30 am	**Plenary Speaker 1 [Q&A session]**	
10.30 – 10.50 am	**Keynote Speaker 1: Assoc. Prof. Ir. Ts. Dr. Mohd Khairi Abu Husain** **Title: Ocean Thermal Energy Conversion (OTEC) for Sustainability** **Chairperson: Dr. Tuan Amran Tuan Abdullah**	
10.50 – 11.00 am	**Keynote Speaker 1 [Q&A session]**	
SESSION 1 2 Parallel Session (10 min/Presenter + 10 min Q&A) **11.00 am – 12.30 pm**		
Session 1 - P1: Process System (PS) & Safety (S) **Session Chairman: Dr. Norafneeza Norazahar** **Asst. Chairman: Assoc. Ms. Nazlina Ya'aini**		
Time	**Paper ID**	**Paper Title / Authors**
11.00 am – 11.10 am	**BRFG**	**Briefing Session**
11.10 am – 11.30 am	**PS1-014**	Current Practice of Leak Detection Methods for Underground Storage Tanks: A Review ***H. Murad*, M.K. Abu Husain N.I. Mohd Zaki, N.A. Mukhlas, S.Z.A. Syed Ahmad and E. Mat Soom***

11.30 am – 11.50 am	**PS2-015**	On Appropriate Selection of People Based Practices Leading to Optimal Improved Company Performance ***L.Sukarma, Franka Hendra, Khairunnisa and Dewi Ulfah Arini***
11.50 am – 12.10 pm	**PS3-025**	Evaluation Of Hybrid Ocean Thermal Energy Conversion System Plantwide Performance ***Kamil Hafizudin Kamal Azam, Mohd Zaki Zainal Abidin, Mohd Khairi Abu Husain, A Bakar Jaafar, Noor Irza Mohd Zaki and Farah Nora Aznieta Abd Aziz***
12.10 pm – 12.30 pm	**S1-006**	Data Science Application in Structural Integrity Analysis of Fixed Offshore Jacket Platform ***X C Yak, E Mat Soom, L K Quen, M K Abu Husain, M A Azahar, N I Mohd Zaki, H S Kang***
Session 1 – P2: Safety (S) **Session Chairman: Dr. Muhamed Yusuf Shahul Hamid** **Asst. Chairman: Dr. Nur Farahain Khusnun**		
Time	**Paper ID**	**Paper Title / Authors**
11.00 am – 11.10 am	**BRFG**	**Briefing Session**
11.10 am – 11.30 am	**S2-013**	Safety Issues of Ammonia-based Refrigeration Systems in Industrial Facilities: An Overview ***Dheyaa A Khudhur, Tuan Amran T Abdullah and Norafneeza Norazahar***
11.30 am – 11.50 am	**S3-018**	Projected Flame Length and Flame Extension Length of Horizontal Buoyant Jet Flames ***N.S.Ab.Aziz and R.Md.Kasmani***
11.50 am – 12.10 pm	**S4-026**	The perspective of human factors and maintenance activities in oil and gas industry of the United Arab Emirates ***Dari Alharran, Norafneeza Norazahari***
12.10 pm – 12.30 pm	**S5-037**	Work-Related Musculoskeletal Disorders Assessment Among Welders in Onshore Industry at Gas Processing Plant Santong, Paka, Terengganu ***U.A. Fuad, A. Johari, M. J. Kamaruddin, T. A. T. Abdullah***
12.30 – 2.00 pm		**Break**
02.00 – 02.20 pm		**Keynote Speaker 2: Assoc. Prof. Ir. Dr. Mimi Haryani Hassim** **Title: Safety and Health Assessment of Alternative Hydrogen Fuel Transportation Systems from Storage to the End-User** **Chairperson: Assoc. Prof. Dr. Rafiziana Binti Md Kasmani**
02.20 – 02.30 pm		**Keynote Speaker 2 [Q&A session]**

SESSION 2

2 Parallel Session (10 min/Presenter + 10 min Q&A)

02.30 pm – 04.20 pm

Session 2 – P1: Applied Science (AP)
Session Chairman: Dr. Saharudin B. Haron
Asst. Chairman: Dr. Nurul Sahida Hassan

Time	Paper ID	Paper Title / Authors
02.30 pm – 02.40 pm	BRFG	**Briefing Session**
02.40 pm – 03.00 pm	AP1-001	Doping of Two Thallium Atoms in Silicene Nanoribbons in The Presence of An External Electric Field ***Hoang Van Ngoc***
03.00 pm – 03.20 pm	AP2-002	Prediction of CO_2 emissions in Saudi Arabia using Nonlinear Grey Bernoulli Model NGBM (1,1) compared with GM (1,1) model ***Z F Althobaiti, and A Shabri***
03.20 pm – 03.40 pm	AP3-007	Amine (Polyethyleneimine)-Modified Solid Adsorbent for CO_2 Capture: A Short Review ***M. H. A. Rani, A. H. Ruhaimi, C.N.C. Hitam, M.R. Taib, M. A. A. Aziz***
03.40 pm – 04.00 pm	AP4-009	Risk perceptions on maritime-based disaster among islanders in Pulau Redang, Malaysia ***Siti Nur Fariha Jamalluddin, Abd Halim Md Ali***
04.00pm – 04.20 pm	AP5-011	A Brief Review on Tetraethylenepentamine (TEPA) Functionalized-Adsorbents in CO_2 Capture Application ***K. W. Tan, A. H. Ruhaimi, C.N.C. Hitam, M.R. Taib, M. A. A. Aziz***

Session 2 – P2: Applied Science (AP)
Session Chairman: Assoc. Prof. Dr. Mohamad Wijayanuddin Bin Ali
Asst. Chairman: Dr. Mahadi Bahari

Time	Paper ID	Paper Title / Authors
02.30 pm – 02.40 pm	BRFG	**Briefing Session**
02.40 pm – 03.00 pm	AP6-012	Recent progress on (3-Aminopropyl)triethoxysilane (APTES) functionalized-adsorbent for CO_2 capture ***Y. T. Sim, A. H. Ruhaimi, M. A. A. Aziz***
03.00 pm – 03.20 pm	AP7-028	Flake-Shaped Magnesium Oxide Adsorbent Using Tea Leaves as Template for Carbon Dioxide Adsorption ***A. H. Ruhaimi, M. A. A. Aziz***

03.20 pm – 03.40 pm	**AP8-031**	Green Synthesis of Silver Nanoparticles Doped Activated Carbon for Rhodamine B Dye Adsorption ***M A Mohd Mokhtar, R R Ali, E D Mohamed Isa, Z I Tarmizi, M S N Salleh, J C Zhe, C Peter John, M F B Burhanuddin, R M Kasmani[3] and D D Mohd Yunos***
03.40 pm – 04.00 pm	**AP9-032**	Preparation and Characterization of Acetylated Starch Mediated Silver Nanoparticles: The Effect of Solution Ratio and Time-Varying Exposure ***Zatil Izzah Tarmizi, Muhammad Fahmi Burhan Burhanuddin, Roshafima Rasit Ali, Mohd Shahrul Nizam Salleh, Mohamad Aizad Mohd Mokhtar, Justin Chan Zhe, Siti Husnaa Mohd Taib, Siti Nur Amalina Mohamad Sukri***
04.00pm – 04.20 pm	**AP10-034**	Fabrication of Self-cleaning Bio-based Plastic with Antimicrobial Properties via Solution Casting Technique ***C Peter John, R R Ali, E D Mohamed Isa, Z I Tarmizi, M S N Salleh, J C Zhe, M A Mohd Mokhtar, M F B Burhanuddin, R M Kasmani and D D Mohd Yunos***
04.20 pm		**Closing Day 1**

Thursday, 25th November 2021		
08.00 – 09.00 am	**Virtual lobby**	
09.00 – 09.20 am	**Plenary Speaker 2: Professor Aicheng Chen** **Title: Development of Nanomaterials and Nanocomposites for Hydrogen Production and Storage** **Chairperson: Assoc. Prof. Dr. Anwar Johari**	
09.20 – 09.30 am	**Plenary Speaker 1 [Q&A session]**	
09.30 – 09.50 am	**Keynote Speaker 3: Assoc. Prof. Ts. Dr. Dalila Mat Said** **Title: Power Quality Challenges and Issues in Industrial Facilities** **Chairperson: Dr. Roshafima Bte Rasit Ali**	
09.50 – 10.00 am	**Keynote Speaker 3 [Q&A session]**	
10.00 – 10.20 am	**Keynote Speaker 4: Assoc. Prof. Dr Cheng Chin Kui** **Title: Conversion of Palm Oil Clinker Waste into Mesoporous Silica for Ethanol Dehydration** **Chairperson: Dr. Mohd Johari Kamaruddin**	
10.20 – 10.30 am	**Keynote Speaker 4 [Q&A session]**	
SESSION 3 3 Parallel Session (10 min/Presenter + 10 min Q&A) **10.30 am – 12.40 pm**		
Session 3 - P1: Sustainable Energy (SE) **Session Chairman: Dr. Rohul Hayat Adnan** **Asst. Chairman: Ms. Nur Fatimah Azmi**		
Time	**Paper ID**	**Paper Title / Authors**
10.30 am – 10.40 am	**BRFG**	**Briefing Session**
10.40 am – 11.00 am	**SE1-004**	Cat Swarm Optimization for Sizing Photovoltaic-Battery based Stand-Alone System ***Hanta E, Sulaiman S I and Othman Z***
11.00 am – 11.20 am	**SE2-005**	Environmental Impact Hotspots of an Integrated Wet Anaerobic Digestion Through Life Cycle Assessment for Food Waste Management ***R Abu, M A A Aziz, C H C Hassan, Z Z Noor and R A Jalil***
11.20 am – 11.40 am	**SE3-008**	Synthesis of Potassium Hydroxide-Treated Activated Carbon Via One-Step Activation Method ***G E Harimisa, N W C Jusoh, L S Tan, K Shameli, N A Ghafar and A Masudi***

11.40 am – 12.00 pm	**SE4-010**	Environmental Impacts of Utilization of Ageing Fixed Offshore Platform for Ocean Thermal Energy Conversion ***M.A.R. Zulkifli , M.K. Abu Husain, N.I. Mohd Zaki, A.B. Jaafar, N.A. Mukhlas, S.Z.A. Syed Ahmad E. Mat Soom and N. U. Azman***
12.00 pm – 12.20 pm	**SE5-016**	Optimization of Algae Residues Gasification: Experimental and Theoretical Approaches. ***M.S.N. Atikah, Taufiq Yap Y.H. Razif Harun***
12.20 pm – 12.40 pm	**SE6-017**	A Short Review on Ni-Based Catalyst Supporter for Carbon Monoxide (CO) Methanation Process ***A.H. Hatta, A.A. Jalil, N.S. Hassan, M.Y.S. Hamid, A.F.A. Rahman, M.A.H. Aziz***
Session 3 – P2: Sustainable Energy (SE) **Session Chairman: Dr. Muhammad Arif Ab Aziz** **Asst. Chairman: Dr. Nur Farahain Khusnun**		
Time	**Paper ID**	**Paper Title / Authors**
10.30 am – 10.40 am	**BRFG**	**Briefing Session**
10.40 am – 11.00 am	**SE7-019**	Insight on the Development of Molybdenum Oxide-Based Photocatalyst Towards Pharmaceutical Pollutants Abatement: A Review ***N.M. Izzudin, A.A. Jalil, M.S. Azami, N.S. Hassan, F.F.A. Aziz,n A.A. Fauzi***
11.00 am – 11.20 am	**SE8-020**	Impact of Recycling on the Feedstock Sustainability of Waste to Energy Plant in Kuala Lumpur ***Muhamad Iqbal Hakim Tahir, Mohd Rozainee Taib, Ho Wai Shin, M.A.A. Aziz***
11.20 am – 11.40 am	**SE9-021**	Surface Modification of Grafted Porous Polyvinylidine Fluoride Membrane with Graphene Oxide for Vanadium Redox Flow Battery ***Noor Fatina Emelin, NurFatehah Wahyuny Che Jusoh, Teo Ming Ting, Saidatul Sophia Md Sha'rani, Arshad Ahmad***
11.40 am – 12.00 pm	**SE10-022**	Feasibility and Viability of Procuring Biohydrogen from Microalgae: An Emerging and Sustainable Energy Resource Technology ***Anas Al-Dailami, Imran Ahmad, Norhayati Abdullah, Iwamoto Koji, Ali Yuzir***
12.00 pm – 12.20 pm	**SE11-023**	Production and Characterization of Biodiesel from Canola Oil through Enzymatic Transesterification ***M.I. Shamsudin, L S Ta, T Tsuji and P L Kiew***
12.20 pm – 12.40 pm	**SE12-024**	Evaluation of Physically Modified Kenaf Core Adsorbent for Carbon Dioxide Adsorptive Study ***A Nurhidayah, N Zaini, M S M Zulhaziman, N Zulbadli, M Noor Ashikin, S N Ezaty, N S Shafie, M S Dzulkarnain and A M N Siti Sarah***

Session 3 – P3: Sustainable Energy (SE) **Session Chairman: Dr. Walid Nabgan** **Asst. Chairman: Ms. Fazilah Farhana Abd Aziz**		
Time	**Paper ID**	**Paper Title / Authors**
10.30 am – 10.40 am	**BRFG**	**Briefing Session**
10.40 am – 11.00 am	**SE13-027**	Preliminary study on *Azolla* cultivation and characterization for sustainable biomass source ***N Adzman, S J Goh, A Johari, M N H Zainal Alam and M J Kamaruddin***
11.00 am – 11.20 am	**SE14-029**	Effect of amine head group imparted to poly (glycidyl methacrylate) grafted fibrous adsorbent for CO_2 adsorption ***Noor Ashikin Mohamad, Mohamed M. Nasef, Tuan Amran Tuan Abdullah, Arshad Ahmad***
11.20 am – 11.40 am	**SE15-030**	Improving Proton Conductivity of Porous PBI Membrane Doped Acid ***Nur Anati Bazilah Daud, Roshafima Rasit Ali, Mohamed M. Nasef, Arshad Ahmad***
11.40 am – 12.00 pm	**SE16-033**	A Short Review on The Promotional Effects of Ceria-Based Catalyst for Dry Reforming Methane ***S. Y. Liew, A. A. Jalil, N. Norazahar, J. S. Tan***
12.00 pm – 12.20 pm	**SE17-035**	Enhancement of Carbon Dioxide Adsorption Performances by Hydrazinolysis of Poly (N-VINYLFORMAMIDE) Grafted Fibrous Adsorbent ***N. A. Zubair, M. M. Nasef, E. C. Abdullah, A. Ahmad***
12.20 pm – 12.40 pm	**SE18-036**	Application of Regenerated Spent Bleaching Earth as An Adsorbent for The Carbon Dioxide Adsorption by Gravimetric Sorption System ***Melissa Low Phey Phey, Tuan Amran Tuan Abdullah, Arshad Ahmad, Umi Fazara Md Ali and Noor Ashikin Binti Mohamad***
12.40-02.00 pm		**Break**
02.00 – 03.00pm		**Closing Ceremony and Award Presentation**

ABSTRACT

PLENARY SPEAKER I

Catalytic CO_2 Utilization: From Hydrogen Demander to Oxygen Supplier

Professor Sang-Eon Park
Laboratory of Nano-Green Catalysis & Nano Center for Fine Chemicals Fusion Technology,
Department of Chemistry, Inha University, Incheon, Korea

ABSTRACT - CO_2 molecule is difficult to be activated due to its quadruple character which leads strong stability both thermodynamically and kinetically. When it comes to CO_2 utilization, it's better to transform into products in large quantity with reasonable value addition and long life time to be returned back to CO_2. Mostly, hydrogen has been used as reductant for depriving oxygen to transform into fuels and chemicals. But, due to hydrogen economy, CO_2 utilization would be viable only in the case of renewable energy used at this moment. There would be another way of the use of saturated hydrocarbons as reductants to utilize CO_2 as oxygen supplier instead of hydrogen demander for the hydrogenation into methane, methanol and hydrocarbons. Oxygen from CO_2 could react with saturated hydrocarbons and C-H bond of hydrocarbons enable to produce olefins, aromatics and oxygenates, that are pivotal basic chemicals in the current chemical industry. Here, CO_2 uses as oxygen sources will be discussed for the production of basic chemicals such as ethylene, propylene, butenes, and styrene, aromatics via aromatization as well as oxygenates like acetic acid, phenol and etc. The role of CO_2 for dehydrogenating agent was coined as a soft oxidant in the oxidative dehydrogenation due to enhancement in both activity and selectivity in the conversions of saturated hydrocarbons into the corresponding hydrogen deficient basic chemicals.

PLENARY SPEAKER II

Development of Nanomaterials and Nanocomposites for Hydrogen Production and Storage

Professor Aicheng Chen
Department of Chemistry, University of Guelph, Ontario, Canada

ABSTRACT - With rapidly intensifying environmental crises and the accelerated depletion of fossil fuels, there is an urgent need for the development of clean and sustainable energy technologies. Hydrogen production, storage, distribution, and utilization comprise the fundamental components of an envisaged hydrogen economy. Although these elements have been the focus of intense research for decades, the development of viable, safe, and efficient strategies for the storage of hydrogen remains as the most challenging. Nanostructured materials have garnered significant interest due their extensive surface areas and unique properties. Recently, my research team has designed and investigated a variety of novel functional nanomaterials. In this talk, the synthesis and surface characterization of advanced palladium-based nanomaterials and nanocomposites for hydrogen storage will be presented. The development of nanostructured electrocatalysts and photocatalysts for water splitting will be addressed. The significant roles of nanomaterials for hydrogen production and storage toward the development of an envisioned hydrogen economy will be highlighted.

KEYNOTE SPEAKER I

Ocean Thermal Energy Conversion (OTEC) for Sustainability

Assoc. Prof. Ir. Ts. Dr.Mohd Khairi Abu Husain
UTM Ocean Thermal Energy Centre, Universiti Teknologi Malaysia

ABSTRACT - Ocean Thermal Energy Conversion (OTEC) is a marine renewable energy system that converts solar radiation to energy. OTEC system uses the ocean's natural thermal gradient; the ocean's layers of water have different temperatures to drive a power-producing cycle. As long as the temperature between the warm surface water and the cold deep water differs by about 20°C, an OTEC system can produce a significant amount of power with minimal impact on the surrounding environment. The oceans are thus a vast renewable resource, with the potential to help us generate billions of watts of energy. The distinctive feature of OTEC energy systems is that the end products include energy in the form of electricity and several other synergistic products. Overall, OTEC is among the first 21 most impactful and emerging technologies and the only type, perhaps to date, that could easily fulfil all the 17 SDGs, hence should be fully utilised for the benefits of society, economy and the environment.

KEYNOTE SPEAKER II

Safety and Health Assessment of Alternative Hydrogen Fuel Transportation Systems from Storage to the End-User

Assoc. Prof. Ir. Dr. Mimi Haryani Binti Hassim
Centre of Hydrogen Energy, Institute of Future Energy, Universiti Teknologi Malaysia

ABSTRACT - In recent times, the transition of energy sources from conventional fossil fuels to renewable-based cleaner fuels has become a hot topic of interest all over the world. Although the heavy reliance on fossil fuel based energy is causing a series of adverse impacts to the world, the global demand for fossil fuels is still continuously increasing. As an alternative, a wide variety of non-fossil energy sources are slowly being introduced to meet the growing demand for fuel consumption. Hydrogen is an ideal alternative fuel and energy carrier with near-zero or zero end-use emissions. It could be synthesized from renewable resources such as solar, wind and hydro energy. Another pushing factor on the uprising hydrogen technology revolves around its storage flexibility. Hydrogen itself complements electricity where it can be stored in bulk over a long time, and in various forms. Through different conversion technologies, hydrogen can either be stored as liquid, gas, as well as chemically or physically bonded to the carriers. Depending on the forms of storage, hydrogen could be transported and distributed via trucks or pipelines. Nevertheless, the lack of safety regulations on distribution infrastructures hinders many countries from further developing their hydrogen economy. Thus, a comprehensive understanding on the associated hazards and risks during hydrogen delivery is critically needed to develop a safe and reliable hydrogen distribution system. A detailed study focusing on the spatial deployment of hydrogen technologies, and a comprehensive assessment of hydrogen transportation systems through a modified safety hazards assessment method, are believed to provide a perfect complement solution towards the establishment of full hydrogen economy in a country.

KEYNOTE SPEAKER III

Power Quality Issues and Challenges in Industrial Facilities

Assoc. Prof. Ts. Dr. Dalila Mat Said
Centre of Electrical Energy Systems, School of Electrical Engineering, Universiti Teknologi Malaysia

ABSTRACT - Power quality issues are important with the increasing use of nonlinear loads and the usage of plant automation to facilitate the production process. Power quality consists of many disturbances such as voltage sags, swells, harmonics, flicker, unbalanced, etc. Power quality issues are usually invisible from the electricity bills, but their effects are almost noticeable. Manufacturing downtime, loss of production, product damage and equipment failure are all the consequences of power quality events which may cause significant financial impact on every industrial plant. Most of industrial facilities fail to notice the necessity of power quality monitoring until they face the problems. This is due to the cost of monitoring devices and the complexity of detection, analysis and solving power quality problems. Plant owners are responsible for protecting their own equipment from power quality issues. By comprehensive knowledge of power quality issues and taking actions before incidents happen, the cost can be reduced and the reliability of their production lines can be improved.

KEYNOTE SPEAKER IV

Conversion of Palm Oil Clinker Waste into Mesoporous Silica for Ethanol Dehydration

Assoc. Prof. Dr Cheng Chin Kui
Khalifa University of Science and Technology, Abu Dhabi, United Arab Emirates

ABSTRACT - Ethylene (C_2H_4) is one of the most important feed-stocks in the petrochemical industry. It is a primary precursor in plastic manufacturing, polyethylene production and even in surfactant synthesis (for example, ethylene glycol and ethylene oxide). The conventional ethylene production is via cracking or steam cracking of hydrocarbon. For sustainability reason, ethanol dehydration ($C_2H_5OH \rightarrow C_2H_4 + H_2O$) is touted as an alternative route. Acid-catalysed ethanol dehydration over sulphuric acid (H_2SO_4) or phosphoric acid (H_3PO_4) is typically employed. In the current work, the silica-rich palm oil clinker (POC) from oil palm agroindustry was valorised into mesoporous silica and acted as an agent to catalyse the dehydration of ethanol. Some interesting results will be presented, which confirm the dehydration activity of this class of material.

PROCESS SYSTEM (PS)

PS1-014

Current Practice of Leak Detection Methods for Underground Storage Tanks: A Review

H. Murad[a], M.K. Abu Husain[a] N.I. Mohd Zaki[a], N.A. Mukhlas[a], S.Z.A. Syed Ahmad[a,b] and E. Mat Soom[c]

[a] Razak Faculty of Technology and Informatics, Universiti of Teknologi Malaysia, Jalan Sultan Yahya Petra 54100 Kuala Lumpur, Malaysia

[b] Faculty of Ocean Engineering Technology and Informatics, Universiti Malaysia Terengganu, 21030 Kuala Nerus, Malaysia

[c] Repsol Oil and Gas Malaysia Limited, Jalan Ampang, 54450 Kuala Lumpur, Malaysia

Correspondent authorhamidi5@graduate.utm.my

ABSTRACT - This article aims to provide a review of leak detection methods of underground storage tanks (UST). Fuel (i.e. gasoline and diesel oil) leakage from UST can contaminate groundwater and drinking water with various hydrocarbon contaminants. These leaks create ponds of fuel that spill into the land and aquifers, polluting and seriously destroying habitats. Numerous efforts have been focused on the development of leak detection to the tanks. However, without the opportunity to conduct fault intensity calibration and estimate a product's lifetime, there is a lack of information provided to consider the condition of previous underlying leakage. As a result, it is too late whether the harm has already been done. There are methods of detection that have been studied for the past ten years. Many approaches have been practised to detect leakage. Specific sensing devices will combine with additional applications that analyse and interpret the data to detect storage tank leaks. Various methods will provide different results depending on the feature chosen. Some approaches will use machine learning to analyse the provided data and provide the best leak detection result. This paper will explore the best leak detection techniques to improve underground tanks' structural integrity.

PS2-015

On Appropriate Selection of People Based Practices Leading to Optimal Improved Company Performance

L.Sukarma[1], Franka Hendra[2], Khairunnisa[3] and Dewi Ulfah Arini[2]*

[1]Institut Sains dan Teknologi Nasional, Jakarta, Indonesia. Jl. Kahli II, Srengseng Sawah, Jagakarsa, Jakarta Selatan, Indonesia

[2]Industrial Engineering, Pamulang University, Jl. Surya Kencana no. 1, Pamulang,, Indonesia

[4]Department of Mechanical Engineering

Correspondent author: dosen01508@unpam.ac.id

ABSTRACT – In order to assist manufacturers to allocate resources properly which will lead to the attainment of an optimum condition of improved company performance, the previous paper by the same authors discussed the Manufacturing Technology Optimisation Model. The model provides insights into the crucial role of industrial mass-training in improving company performance. To be more practical to be applied, this paper presents the appropriate selection of people-based practices which can lead to enhanced optimal company performance. Furthermore, it is found that changing budget allocation from the '*normal*' to the '*accelerated*' scenario may increase manufacturing performance due to improved

management of human resource from 10% to 16%. In other words, manufacturers can improve the effectiveness measure 'quickly' by expanding industrial mass-training in practices contributing to effectiveness.

PS3-025

Evaluation of Hybrid Ocean Thermal Energy Conversion System Plantwide Performance

Kamil Hafizudin Kamal Azam[1], Mohd Zaki Zainal Abidin[1], Mohd Khairi Abu Husain[2,3], A Bakar Jaafar[2,3], Noor Irza Mohd Zaki[3] and Farah Nora Aznieta Abd Aziz[4,51]

[1]School of Chemical Engineering, College of Engineering, Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia
[2]UTM Ocean Thermal Energy Centre, Universiti Teknologi Malaysia, Jalan Sultan Yahya Petra, 54100 Kuala Lumpur, Malaysia
[3]Razak Faculty of Technology and Informatics, Universiti Teknologi Malaysia, Jalan Sultan Yahya Petra, 54100 Kuala Lumpur, Malaysia
[4]Faculty of Engineering, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia
[5]International Institute of Aquaculture and Aquatic Sciences (I-AQUAS), Universiti Putra Malaysia, Lot 960, Jalan Kemang 6, 71050 Port Dickson, Negeri Sembilan Malaysia.

ABSTRACT – Ocean Thermal Energy Conversion is a renewable energy source in which energy is produced by converting the heat stored in the sea or the ocean thermal energy into valuable work, based on the temperature difference between the warm surface seawater and the cold deep seawater. One of the OTEC system requirements is to have a seawater temperature difference at a minimum of 20 °C within a depth of 1000 m below sea level. Recognizing the importance of optimum sea water temperature, several studies have been conducted to optimize the OTEC system. However, none of these studies was attempted under a hybrid OTEC setup. The objective of this study is to evaluate the performance of the H-OTEC process system based on the impact of seawater temperature variation by simulating H-OTEC process system. Aspen HYSYS was used as a chemical process simulation platform for conducting this study. After the model was completed and converged, verification test was conducted before the simulated data was recorded. The data for the pump work input and the turbine work output were acquired to determine the net power output and system efficiency. The net power output, Carnot efficiency, and thermal efficiency were recorded approximately 1.39 kW, 5.7%, and 1.45%. The data for net power output and the efficiencies of the system was recorded for every 1 °C of increment in surface seawater temperature. The results showed that the net power output increased slightly by 0.5kW, with efficiency difference for both Carnot cycle and actual cycle, recorded to be less than 3% and 0.1% respectively.

SAFETY (S)

S1-006

Data Science Application in Structural Integrity Analysis of Fixed Offshore Jacket Platform

X C Yak[1], E Mat Soom[2], L K Quen[1], M K Abu Husain[3], M A Azahar[4], N I Mohd Zaki[3], H S Kang[5]*

[1] Malaysia-Japan International Institute of Technology, Universiti Teknologi Malaysia, Jalan Sultan Yahya Petra, 54100 Kuala Lumpur, Malaysia
[2] Repsol Malaysia Limited, Jalan Ampang, Kuala Lumpur, 50450 Kuala Lumpur, Malaysia
[3] Razak Faculty of Technology and Informatics, Universiti Teknologi Malaysia, Jalan Sultan Yahya Petra, 54100 Kuala Lumpur, Malaysia
[4] Universiti Kebangsaan Malaysia, 43600 UKM, Bangi, Selangor, Malaysia.
[5] School of Mechanical Engineering, Universiti Teknologi Malaysia, 81310 Skudai, Johor Bahru, Johor, Malaysia.
*Corresponding author: ezanizam@outlook.com

ABSTRACT – Accuracy in analysing the integrity of a structure is critical for determining the structure's fitness for service and reliability status. Today, a variety of techniques and approaches are applied, including the use of data science applications. Data science is a synthesis of computer science, mathematics, and statistics. Meanwhile, the integrity of a structure is susceptible to a mix of statistical and technical design uncertainties that may remain flexible as long as the structure is capable of successfully managing the encountered load. Numerous applications are used in the oil and gas sector to estimate the probability of failure (POF), but they all have a particular restriction. Integral interference equations based on load versus strength are reliable for determining the POF of fixed offshore structures. This study is a quantitative risk assessment, emphasising the Python application, an improved and reliable method for calculating the POF value. A representative sample of the monopod offshore structure was chosen and subjected to global non-linear analysis in this study. The most reliable form of distribution was predetermined, and the Python algorithm was used to apply and compute the suitable integral equation depending on the load and strength conditions. The Python method's result demonstrated a high degree of confidence in calculating the new POF in intact condition from a design perspective, inspection interval, and risk to consider.

S2-013

Safety Issues of Ammonia-based Refrigeration Systems in Industrial Facilities: An Overview*Dheyaa A Khudhur [1], Tuan Amran T Abdullah[1,2] and Norafneeza Norazahar[1,2]*

[1]School of Chemical and Energy Engineering, Faculty of Engineering, Universiti Teknologi Malaysia, 81310 Johor Bahru, Malaysia
[2]Centre of Hydrogen Energy, Institute of Future Energy, Universiti Teknologi Malaysia, 81310 Johor Bahru, Malaysia.
*Corresponding author: norafneeza@utm.my

ABSTRACT – We overview the safety concerns of the ammonia-based refrigeration systems utilized in the sundry industrial facilities. Several industries like cold storage and ice plants heavily rely on ammonia (NH_3)

due to its low cost, excellent thermo-physical traits, and zero effects on the ozone layer. Despite its widespread uses as a potential refrigerant in the mechanical compressor, the hazardous nature of ammonia remains a major health concern. An excessive release of ammonia led to numerous major accidents including the fire and vapour cloud explosions since the industrial revolution. Thus, it is vital to maintain and improve the safety levels of diverse industries that use the ammonia-based refrigeration systems. Based on these facts, various characteristics of the ammonia-based refrigeration systems and their safety issues related to the industries, present development and future trends are comprehensively underscored. This review may act as taxonomy to develop better understanding for dealing effectively with the hazards ammonia-based refrigeration systems and risk assessment, thus enhancing the overall safety for human and environment.

S3-018

Projected Flame Length and Flame Extension Length of Horizontal Buoyant Jet Flames

N.S.Ab.Aziz, [1,2] R.Md.Kasmani[2]*

[1]School of Chemical Engineering, Universiti Teknologi MARA, Malaysia
[2]School of Chemical Engineering and Energy, Universiti Teknologi Malaysia, Malaysia
*Corresponding author: rafiziana@utm.my

ABSTRACT – Jet fires are a type of dangerous fire caused by the sudden release of flammable materials. In this work, propane was used as fuel and released through a 7.15mm and 9.8 mm circular nozzle with the exit velocities were set ranging between 27 and 65 m/s. The data of this study are compared against theoretical measurement and prediction using previously suggested correlation for projected flame length and flame extension length. It was determined, the projected flame length gives a good prediction by using theoretical measurement while for the prediction of flame extension length, an elliptical shape assumption was suitable to be used after impinging point for a horizontal buoyant jet fire.

S4-026

The perspective of human factors and maintenance activities in oil and gas industry of the United Arab Emirates

Dari Alharran[1], Norafneeza Norazahar[1,2]

[1]School of Chemical and Energy Engineering, Faculty of Engineering, Universiti Teknologi Malaysia, 81310 Johor Bahru, Malaysia
[2]Centre of Hydrogen Energy, Institute of Future Energy, Universiti Teknologi Malaysia, 81310 Johor Bahru, Malaysia
*Corresponding author: dari.alharran@gmail.com

ABSTRACT – Maintenance is a task to maintain machinery or plants a good condition and well-functioning. It is one of twenty elements of process safety management. Maintenance activities aim to keep equipment in good condition for performance during the operation process. However, ineffective maintenance may have a negative effect on the machinery's or plant's performance. Inadequate maintenance can shorten the life of equipment and plant and, consequently, have a potentially high risk

leading to incidents or accidents. Causes of ineffective maintenance programs include the complexity of maintenance tasks, poorly written maintenance procedure, fatigue and organizational factors such as poor experience, lack of training, lack of safety systems and barriers, and poor health and safety culture. Therefore, this paper identifies common human performance factors associated with maintenance activities in oil and gas plants in the United Arab Emirates (UAE). The questionnaire consists of four performance shaping factors: experience and training, procedures, time and stress, and work process. Ninety-three respondents from the maintenance companies for oil and gas industry participated in the survey. The responses show that both experience and training could improve the workers' skills and the success of the maintenance tasks. The results also show that training and education of maintenance workers are important and that experienced workers can handle abnormal situations. The responses show that both experience and training could improve the workers' skills and the success of the maintenance tasks. The results also show that training and education of maintenance workers are important and that experienced workers can handle abnormal situations.

S5-037

Work-Related Musculoskeletal Disorders Assessment Among Welders in Onshore Industry at Gas Processing Plant Santong, Paka, Terengganu

U.A. Fuad, A. Johari, M. J. Kamaruddin, T. A. T. Abdullah

Center of Hydrogen Energy (CHE), School of Chemical & Energy Engineering, Faculty of Engineering, Universiti Teknology Malaysia, 81310, Johor Bahru, Johor, Malaysia.
**Corresponding author: umiazeera@graduate.utm.my*

ABSTRACT – Musculoskeletal disorder (MSDs) is a well-known health issue commonly suffered by every employee. The problem arises when the workplace's risk factors increase. For example, onshore workers were not excluded especially those who involved in welding operations. Petronas Gas Berhad encountered problems where employees tend to take sick leave due to pain or discomfort in their body regions. Furthermore, some employees were seriously considering changing jobs. These issues eventually impacted their ability to perform at work. Therefore, this study is conducted to identify the prevalence of work-related MSDs among onshore workers and the risk-factors that correlated to this problem. A total of 35 welders of onshore workers from Petronas Gas Berhad at Gas Processing Plant, Santong, Paka, Terengganu were chosen as respondents for this study. The data are collected from questionnaire. Pilot survey is done to obtain information prior for conducting main survey or large scale of survey. It will then pass to a small group or several number of professional or competent person for checking on correctness and suitability and the main survey can be revised to an appropriate questionnaire survey. The data obtained then will used to analyse the risk ranking of work-related MSDs using REBA method. The responses show that the risk factors which are repetitive works, heavy lifting, awkward posture and hot temperature has relationship with MSDs. The REBA score shows that 59.4% of respondents had a high risk of MSD, necessitating further investigation and change implementation. Meanwhile, another 18.9% of respondents require change to be implemented because they have a very high risk of MSDs. Any necessary changes must be implemented as soon as possible in order to reduce the MSD problem among these high-risk respondents.

APPLIED SCIENCE (AP)

AP1-001

Doping of Two Thallium Atoms in Silicene Nanoribbons in The Presence of An External Electric Field

Hoang Van Ngoc

Institute of Applied Technology, Thu Dau Mot University, No 6, Tran Van On Street, Thu Dau Mot city, Binh Duong province, Vietnam
Email: ngochv@tdmu.edu.vn

ABSTRACT – The low-dimensional material that revolutionizes technology, silicene is a monolayer of silicon molecules, which is a potential material. Silicene nanoribbons (SNRs) are one-system silicene ribbons with two hydrogen-modified edges. Two thallium atoms will be doped in each unit cell of the SNRs, the electric field acting on the doped system has a magnitude of 0.1V/angstrom. The configurations studied here all exhibit stability because of the bonds between atoms. The configurations studied here all exhibit stability because of the bonds between atoms. Density functional theory (DFT) and VASP software are used to study and simulate materials.

AP2-002

Prediction of CO_2 emissions in Saudi Arabia using Nonlinear Grey Bernoulli Model NGBM (1,1) compared with GM (1,1) model

Z F Althobaiti,[1] and A Shabri, [2]*

[1] Department of Statistics, Faculty of Science, University of Tabuk, Universiti Teknologi Malaysia, 81310, Johor Bahru, Johor, Malaysia
[2] Department of Mathematical Sciences, Faculty of Science, Universiti Teknologi Malaysia, 81310, Johor Bahru, Johor, Malaysia
Email: zalthebiti@ut.edu.sa

ABSTRACT – One of the most critical solution for tackling the challenges of global warming and climate change is to study and know the accurate prediction of carbon dioxide (CO_2) emissions. Thus, aid to develop appropriate strategic plans that will reduce future damages caused by these emissions into the atmosphere. This study utilizes annual time series data on CO_2 emissions in Saudi Arabia from 1970 to 2016. The goal of this study is to predict CO_2 emissions using the Nonlinear Grey Bernoulli model NGBM (1,1), and compared with the GM (1,1) model based on MAPE metrics to achieve a high-accuracy prediction. The NGBM (1,1) is a newly created grey model with wide ranging applications in diverse fields due to its precision in handling small time-series datasets with nonlinear variations. The NGBM (1,1) with power γ is a nonlinear differential equation that can control the predicted result and adjust the solution to fit the 1-AGO of previous raw data. Thus, the findings show that at sample sizes of N=10 and N=5, the Nonlinear Grey Bernoulli Model (NGBM) is more precise than the Grey Model GM (1, 1). The findings could help the government develop future economic policies.

AP3-007

Amine (Polyethyleneimine)-Modified Solid Adsorbent for CO_2 Capture: A Short Review

M. H. A. Rani, [1] A. H. Ruhaimi, [1] C.N.C. Hitam,[1] M.R. Taib,[1] M. A. A. Aziz,[1,2]*

[1]School of Chemical and Energy Engineering, Faculty of Engineering, Universiti Teknologi Malaysia (UTM), 81310 UTM Johor Bahru, Johor, Malaysia
[2]Centre of Hydrogen Energy, Institute of Future Energy, Universiti Teknologi Malaysia (UTM), 81310 UTM Johor Bahru, Johor, Malaysia
*Corresponding author: m.arif@utm.my

ABSTRACT – The increase in the concentration of carbon dioxide (CO_2) gas in the atmosphere has led to various severe negative consequences. There are numerous methods for the reduction of CO_2 that have been introduced such as chemical and physical absorption, organic liquid scrubbing, amine-based absorption, etc. Adsorption by using solid adsorbents is one of the promising methods that has been widely studied by researchers. The performance of the adsorbents can be enhanced by functionalized with diverse types of promoters. This review is discussing the performance of polyethyleneimine (PEI) as a promoter towards the adsorption of CO_2. To achieve high effective PEI-adsorbents, the percentage of PEI amine loading, type of porous support, temperature, and different flow conditions are among the important parameters that need to be considered. The chemical stability of PEI can be improved through modification crosslinking of PEI. Hence in this review, the effect of amine loading, porous support, temperature, slow condition and crosslinking of PEI to its CO_2 adsorption performance is observed.

AP4-009

Risk perceptions on maritime-based disaster among islanders in Pulau Redang, Malaysia

Siti Nur Fariha Jamalluddin, Abd Halim Md Ali*

Malaysia-Japan International Institute of Technology
Universiti Teknologi Malaysia, Jalan Sultan Yahya Petra, 54100 Wilayah Persekutuan Kuala Lumpur
*Corresponding author: fariha.jamalluddin@gmail.com

ABSTRACT – Rural populations living in island communities that are only accessible via air and water are vulnerable to various maritime-based disasters. These communities are geographically isolated, with minimal resources which may lead to a lack of coordination in case of disaster. Due to such fragility, protective action is needed to minimize the disaster impact—community-based disaster risk management (CBDRM) is one of the best strategies to increase their resiliency. However, the way the risk being interpret and understood (risk perceptions) among the islanders themselves are all matters. A pilot study has been conducted to examined the Malaysian islanders' perceptions on maritime-based disaster risk, and how it influences their reaction. The pilot study was conducted quantitatively, involving 40 permanent residences of Pulau Redang. The results revealed a high-risk perception, especially for flood and tropical storm or typhoon. The experience and knowledge are positively influence the respondents' perceptions which effect their level of preparedness. The pilot study finds that risk perception could lead to disaster resilience if the community appreciate the impact of natural hazards.

AP5-011

A Brief Review on Tetraethylenepentamine (TEPA) Functionalized-Adsorbents in CO_2 Capture Application

K. W. Tan, [1] A. H. Ruhaimi, [1] C.N.C. Hitam,[1] M.R. Taib,[1] M. A. A. Aziz, [1,2]*

[1] School of Chemical and Energy Engineering, Faculty of Engineering, Universiti Teknologi Malaysia (UTM), 81310 UTM Johor Bahru, Johor, Malaysia
[2] Centre of Hydrogen Energy, Institute of Future Energy, Universiti Teknologi Malaysia (UTM), 81310 UTM Johor Bahru, Johor, Malaysia
*Corresponding author: m.arif@utm.my

ABSTRACT – Among numerous carbon capture technologies, adsorption is considered one of the most effective approaches to reduce carbon dioxide (CO_2) emissions in the atmosphere. Various modification approaches of adsorbents have been introduced to enhance the CO_2 adsorption ability. Recently, an amine such as tetraethylenepentamine (TEPA) has been extensively used as an adsorbent's promoter because of its high amine density, low viscosity, low cost, and low toxicity properties. This has added an advantage to the adsorbent in terms of economical and environmentally benign. Therefore, it is important to provide the latest review on TEPA-functionalized adsorbents, specifically on the effects of TEPA functionalization, different TEPA loading, diverse adsorption conditions, as well as the structure of adsorbents towards the CO_2 adsorption capacity. Different adsorption conditions over a wide range of adsorption temperatures were thoroughly discussed and several recommendations for future studies were also been proposed.

AP6-012

Recent Progress on (3-Aminopropyl)Triethoxysilane (APTES) Functionalized-Adsorbent for CO_2 Capture

Y. T. Sim, [1] A. H. Ruhaimi, [1] M. A. A. Aziz, [1,2]

[1] School of Chemical and Energy Engineering, Faculty of Engineering, Universiti Teknologi Malaysia (UTM), 81310 UTM Johor Bahru, Johor, Malaysia
[2] Centre of Hydrogen Energy, Institute of Future Energy, Universiti Teknologi Malaysia (UTM), 81310 UTM Johor Bahru, Johor, Malaysia
Email: m.arif@utm.my

ABSTRACT – The increasing emission of carbon dioxide (CO_2) to the atmosphere has gained worldwide concern due to its main contribution to climate changes, global warming, and the greenhouse effect. Numbers of technologies have been carried out to remove this hazardous gas from the environment such as absorption, adsorption, membrane separation, cryogenic separation, and the biological process. In this review, the impact of the diverse amine loadings on different adsorbents and the type of solvent used for APTES-functionalization towards CO_2 capture performance was thoroughly elaborated. The suitable reaction conditions and the regenerability of the adsorbents that could significantly affect their CO_2 adsorption capacity were also discussed in detail. Other than distributing useful knowledge on the current progress of the APTES-functionalization adsorbents, this review is anticipated to provide benefit for the industrial and academic usage and appeal more attention in this fascinating area of CO_2 capture.

AP7-028

Flake-shaped Magnesium Oxide Adsorbent Using Tea Leaves as Template for Carbon Dioxide Adsorption

A. H. Ruhaimi,[1] M. A. A. Aziz,[1,2]*

[1] School of Chemical and Energy Engineering, Faculty of Engineering, Universiti Teknologi Malaysia (UTM), 81310 UTM Johor Bahru, Johor, Malaysia
[2] Centre of Hydrogen Energy, Institute of Future Energy, Universiti Teknologi Malaysia (UTM), 81310 UTM Johor Bahru, Johor, Malaysia
Email: m.arif@utm.my

ABSTRACT – A flake-like mesoporous magnesium oxide (MgO-TLT) was prepared via biotemplating method using dried tea leaves waste (TLT) as a template. The MgO-TLT has exhibited smaller in crystallite size of 7.52 nm than MgO prepared through thermal decomposition method (22.52 nm). This reduction has induced more structural defects in the adsorbent, which may result in high basic site density, thus has resulted in high CO_2 uptake capacity of MgO-TLT. Regardless of MgO-TLT's low surface area, MgO-TLT has demonstrated higher CO_2 uptake capacity of 3.17 mmol/g, 12-times higher than MgO-TD at 1 atm and 300 K. Moreover, as the result of high surface reactivity due to present of high structural defect, MgO-TLT has demonstrated high uptake capacity per surface area, about more than 15-times higher than MgO-TD. This study revealed that utilisation of TLT as a template is a promising bio-templating synthesis method to obtained high surface reactivity MgO adsorbent thus enhanced its CO_2 uptake capacity.

AP8-031

Green synthesis of silver nanoparticles doped activated carbon for rhodamine b dye adsorption

M A Mohd Mokhtar[1], R R Ali[1], E D Mohamed Isa[1], Z I Tarmizi[1], M S N Salleh[1,2], J C Zhe[1], C Peter John[1], M F B Burhanuddin[1], R M Kasmani[3] and D D Mohd Yunos[3]*

[1]Department of Chemical and Environmental Engineering, Malaysia-Japan International Institute of Technology, Universiti Teknologi Malaysia, Jalan Sultan Yahya Petra, 54100 Kuala Lumpur, Malaysia.
[2]School of Chemical Engineering, College of Engineering, Universiti Teknologi MARA Cawangan Terengganu, Bukit Besi Campus, 23200 Dungun, Terengganu, Malaysia.
[3]School of Chemical and Energy Engineering, Faculty of Engineering, Universiti Teknologi Malaysia, 81310 Johor Bharu, Malaysia.
[*]roshafima@utm.my.

ABSTRACT – Application of dye is one of major industry with various application from everyday attire until food colouring. However, dye pollution is serious and threatening issue that need to be address to avoid harmful effect towards humans, animals and environments. In this study, silver nanoparticles (Ag NPs) were synthesised via *Clitoria Ternatea* (CT) flower extract and doped with activated carbon (Ag NPs/AC) to act as adsorbent in removing rhodamine B dye (RB). CT Flower mediated green synthesis for Ag NPs provide safe, low cost and sustainable method compared to conventional chemical and physical synthesis. UV-visible spectroscopy was used to analyse the green synthesis for the formation of Ag NPs with peak absorbance at 400 nm. The effect of activated carbon (AC) mass, contact time and adsorbent dosage were analysed to study the adsorption capacity of Ag NPs/AC with viable condition of 0.75 g AC mass and 30 mg dosage with full removal at 90 minutes. Hence, incorporation of Ag NPs with AC contribute to better

adsorption properties for the removal of RB dye.

AP9-032

Preparation and Characterization of Acetylated Starch Mediated Silver Nanoparticles: The Effect of Solution Ratio and Time-Varying Exposure

Zatil Izzah Tarmizi[1], Muhammad Fahmi Burhan Burhanuddin[1], Roshafima Rasit Ali[1*], Mohd Shahrul Nizam Salleh[1,2], Mohamad Aizad Mohd Mokhtar[1], Justin Chan Zhe[1], Siti Husnaa Mohd Taib[1], Siti Nur Amalina Mohamad Sukri[1]*

[1] Chemical Environmental and Engineering Department, Malaysia-Japan International Institute of Technology, Universiti Teknologi Malaysia, 53200 Kuala Lumpur, MALAYSIA
[2] Faculty of Chemical Engineering, UiTM Cawangan Terengganu, Bukit Besi Campus, 23200 Dungun, Terengganu, MALAYSIA
*Corresponding author: zatil.izzah@utm.my, roshafima@utm.my

ABSTRACT – Plastic packaging is widely used in food industry to protect and maintain food freshness. However, plastic packaging also contributes to solid waste problem and can become the contamination area of microbial activities which in turn affecting the shelf-life of the food product and may causing food-borne illness towards consumer. Thus, the demands on biodegradable polymer as plastic packaging has grown widely especially among the food industry. The employment of silver nanoparticles (AgNPs) can improve physical properties of biopolymer as well as promoting antimicrobial properties on the plastic packaging. The aim of this study is to synthesize of AgNPs by utilising acetylated starch (AS) as reducing agent with different parameters via microwave irradiation method. The effect of different ratio of acetylated starch and microwave time-varying exposure is evaluated. The synthesized silver nanoparticles were characterized via UV-VIS spectroscopy (UV-VIS), X-Ray Diffraction (XRD) and Fourier Transform Infrared (FTIR) analysis. The absorbance peak emerges at 420nm on UV-VIS shows that silver nanoparticles is successfully produced. 15 minutes microwave time exposure and 25:25 ratio is identified as the optimum condition to produce silver nanoparticles. The peak emerges on FTIR spectra shows the involvement of starch in reduction process in synthesizing AgNPs. The XRD results shows the amorphous structure of starch and crystalline peak of silver appear in 2Θ regions 37.4°, 43.4°, 63.1° and 75.7°. In conclusion, the significant outcome from the study is the AgNPs were successfully synthesized via microwave irradiation method and be a function of time varying exposure and acetylated starch ratio.

AP10-034

Fabrication of Self-cleaning Bio-based Plastic with Antimicrobial Properties via Solution Casting Technique

C Peter John[1], R R Ali[1], E D Mohamed Isa[1], Z I Tarmizi[1], M S N Salleh[1,2], J C Zhe[1], M A Mohd Mokhtar[1], M F B Burhanuddin[1], R M Kasmani[3] and D D Mohd Yunos[3]*

[1]Department of Chemical and Environmental Engineering, Malaysia-Japan International Institute of Technology, Universiti Teknologi Malaysia, Jalan Sultan Yahya Petra, 54100 Kuala Lumpur, Malaysia.
[2]School of Chemical Engineering, College of Engineering, Universiti Teknologi MARA Cawangan Terengganu, Bukit Besi Campus, 23200 Dungun, Terengganu, Malaysia.
[3]School of Chemical and Energy Engineering, Faculty of Engineering, Universiti Teknologi Malaysia, 81310

Johor Bharu, Malaysia.
*roshafima@utm.my

ABSTRACT – PLA/TiO_2 composite materials were created using solution casting approaches in this investigation. Water absorption and antimicrobial were examined by evaluating the interactions between the essential components of the film-forming materials. The overall performance of nanocomposites with varying TiO_2 concentration was investigated. Fourier Transform Infrared (FTIR) Spectroscopy, a water absorption test, and antimicrobial analysis were used to conduct the studies. The water absorption of bioplastics was shown to be reduced when TiO_2 concentration was increased up to 5.0 wt%, with the lowest water saturation point of 17.93%. This is because the interaction between PLA and TiO_2 lowers the number of free OH groups in the resultant bioplastics. As a consequence, there was a decrease in water absorption-related deterioration, such tensile property degradation of the bioplastics. Furthermore, antibacterial activity enhanced under UV-A irradiation with a TiO_2 nanoparticles concentration of 5.0 wt%, and 1.0 wt% of the nanofilms displayed inhibitory zones of 10.49 ± 0.22 and 12.61 ± 0.78 mm and 6.83 ± 0.19 and 6.96 ± 0.62 mm for E. coli and S. aureus, respectively. Overall, the performance of the nanofilm with a higher TiO_2 concentration outperformed the pure film. Nonetheless, both nanocomposite membranes complied with the requirements of food packaging films.

SUSTAINABLE ENERGY (SE)

SE1-004

Cat Swarm Optimization for Sizing Photovoltaic-Battery based Stand-Alone System

Hanta E[1], Sulaiman S I[1] and Othman Z[1]

[1] School of Electrical Engineering, College of Engineering, Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia

ABSTRACT – Stand-Alone Photovoltaic (SAPV) systems have been a popular mode of electricity generation especially in remote areas which deprived of grid electricity. However, one of the main challenges in the development of such systems is optimal system sizing. An undersized system causes failure of meeting the load demand. Thus, this paper presents Cat Swarm Optimization (CSO) for optimal sizing of an SAPV system. A single objective function was formulated for the sizing optimization problem in which models of system components, i.e. PV module, battery, charge controller and inverter, each represented in integer codes, were transcribed as decision variables whereas the Loss of Power Supply Probability (LPSP) was set as the objective function that needs to be minimized. Prior to the optimization, an Iterative Sizing Algorithm (ISA) was initially developed to produce the optimal sizing solution using non-computational intelligence approach. The solution from ISA served as benchmark for CSO. Later, CSO was used to select the optimal model of PV module, battery, charge controller and inverter such that the LPSP was minimized. The results showed that CSO was able to yield similar LPSP as recommended by ISA. Besides having computation time of approximately 3.65 times lower than ISA, CSO was also found to e superior by producing lower LPSP when compared with Evolutionary Programming (EP).

SE2-005

Environmental Impact Hotspots of an Integrated Wet Anaerobic Digestion Through Life Cycle Assessment for Food Waste Management

R Abu[1], M A A Aziz[1,2], C H C Hassan[3], Z Z Noor[1,3*] and R A Jalil[4]*

[1]School of Chemical and Energy Engineering, Faculty of Engineering, University Technology Malaysia (UTM), 81310 UTM Johor Bahru, Johor, Malaysia.
[2]Centre of Hydrogen Energy, Institute of Future Energy, University Technology Malaysia (UTM), 81310 UTM Johor Bahru, Johor, Malaysia.
[3]Centre for Environmental Sustainability and Water Security (IPASA), Research Institute of Sustainable Environment (RISE), University Technology Malaysia (UTM), 81310 UTM Johor Bahru, Johor, Malaysia.
[4]Real Estate Department, Faculty of Built Environment and Surveying, University Technology Malaysia, 81310 UTM Johor Bahru, Johor, Malaysia.
*zainurazn@utm.my

ABSTRACT – Wet anaerobic digestion (AD) is one of the most widely implemented systems that valorize food waste (FW) for biogas production. Despite the undeniable AD benefits, the environmental impact of AD could differ depending on the biogas systems used. This article examines the hotspots on environmental impact of FW management such as global warming and ozone depletion based on integrated wet AD by utilizing a life cycle assessment approach. The integrated wet AD scenario in this study is a technology that combines wet AD, aerobic windrow composting and a landfill. The scenario modelling was accomplished by applying GaBi v6.0 software with 1 ton of pre-treated FW as a functional unit, and the analysis was based on the ReCiPe (H) v1.07 characterization technique. At the midpoint level, it was observed that the integrated wet AD presented the most significant environmental impact in terms of ionizing radiation ($1.4x10^0$ kg U235-eq), followed by water depletion ($1.11x10^3$ m^3-eq), global warming ($6.27x10^2$ kg CO_2-eq), fossil depletion ($2.18x10^2$ kg oil-eq) and human toxicity ($2.89x10^1$ kg 1,4-DB-eq). The disadvantages of the integrated wet AD in global warming were associated with CO_2, CH_4, and N_2O emissions from the energy used for process treatment and fossil fuels during transportation, primarily in landfill activities, followed by wet AD and aerobic windrow composting stages. Regarding single-score indicators, integrated wet AD presented the most resource damaging impact ($3.50x10^3$ Pt), mainly due to fossil depletion. This study emphasizes the necessity of reducing the life cycle consequences related to CH_4, N_2O and NH_3 emissions throughout the decomposition process in integrated wet AD, particularly landfill activities.

SE3-008

Synthesis of Potassium Hydroxide-Treated Activated Carbon Via One-Step Activation Method

G E Harimisa[1], N W C Jusoh[1,2], L S Tan[1], K Shameli[1], N A Ghafar[1] and A Masudi[3]*

[1]Department of Chemical and Environmental Engineering, Malaysia-Japan International Institute of Technology (MJIIT), Universiti Teknologi Malaysia, Jalan Sultan Yahya Petra, 54100, Kuala Lumpur, Malaysia.
[2]Advanced Materials Research Group, Center of Hydrogen Energy, Universiti Teknologi Malaysia, Jalan Sultan Yahya Petra, 54100, Kuala Lumpur, Malaysia.
[3]Clean Energy Research Centre, Korea Institute of Science and Technology, P.O. Box 131, Cheongryang, Seoul 136-791, Republic of Korea.

*E-mail: nurfatehah@utm.my

ABSTRACT – Physicochemical activation has been popular currently due to the incredible surface area of activated carbon produced. In the process, the step of activation has a significant role in influencing the characteristics of activated carbon. Previously, several studies conducted one-step activation in which potassium hydroxide (KOH) was impregnated with the precursors derived from agricultural biomass and wastes. Currently, the materials have been interesting due to their renewable and low-cost properties. This paper reviews the recent studies regarding the variables and the effect of one-step activation towards properties of KOH-impregnated adsorbents which were synthesized from agricultural biomass and wastes. The variables of one-step activation and pore development are compared in this paper. It was found that the increase of pore characteristics follows the increased amount of KOH concentration, ratio, carbonizing temperature and time until reaching the optimum level of variables. One-step activation has been proved by the studies to the successful activation of activated carbon with different excellent surface area, even up to approximately 2800 m^2/g. In the future, it will be a great challenge to develop the efficient processes of synthesizing activated carbon with improved optimization to achieve incredible and maximum results of the surface area.

SE4-010

Environmental Impacts of Utilization of Ageing Fixed Offshore Platform for Ocean Thermal Energy Conversion

M.A.R. Zulkifli[a], M.K. Abu Husain[a], N.I. Mohd Zaki[a], A.B. Jaafar[a], N.A. Mukhlas[a], S.Z.A. Syed Ahmad[a,b] E. Mat Soom[c] and N. U. Azman[d]

[a]Razak Faculty of Technology and Informatics, Universiti of Teknologi Malaysia, Jalan Sultan Yahya Petra 54100 Kuala Lumpur, Malaysia
[b]Faculty of Ocean Engineering Technology and Informatics, Universiti Malaysia Terengganu, 21030 Kuala Nerus, Malaysia
[c]Repsol Oil and Gas Malaysia Limited, Jalan Ampang, 54450 Kuala Lumpur, Malaysia
[d]Brunei Shell Petroleum Company Sendirian Berhad, Jalan Utara, Penaga Seria KB2933. Brunei Darussalam

ABSTRACT – Most Malaysian jacket platforms have outlived their design life. As these old platforms have outlived their design life, other alternatives must be considered. As several offshore oil and gas extraction installations approach the end of their operational life, many options such as decommissioning and development of a new source of energy such as wind farms are introduced. The environmental impact of utilising an ageing fixed offshore platform as an Ocean Thermal Energy Conversion (OTEC) source is discussed. OTEC produces energy by taking advantage of temperature variations between the ocean surface water and the colder deep water through cold-water intake piping, which requires a seawater depth of 700 metres. The findings of this study show that OTEC is envisioned to preserve marine life, becoming a new and reliable source of energy, assist clean water production, and reduce the negative impact of climate change. OTEC platforms utilising ageing platforms may lead to 44 % of fish catch in the ocean, remove 13 GW of surface ocean heat for every GW of electricity production per year, generate 1.3105 tonnes of hydrogen per year for each GW of electricity generated, reduce approximately 5106 tonnes of carbon dioxide from the environment for 1 GW of electricity generated per year, and supply 2 million litres of water per day for a 1 MW platform. Since Malaysia's seawater profile allows for the

installation of a fixed offshore platform as an OTEC power plant, Malaysia has many potentials to profit from the OTEC process.

SE5-016

Optimization of Algae Residues Gasification: Experimental and Theoretical Approaches

M.S.N. Atikah[1], Taufiq Yap Y.H.[2] Razif Harun[1,]*

[1]Department of Chemical and Environmental Engineering, Faculty of Engineering, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia.
[2]Catalysis Science and Technology Research Centre, Faculty of Science, Universiti Putra Malaysia, Serdang, Selangor, Malaysia.
[*]Corresponding author: mh_razif@upm.edu.my

ABSTRACT – Gasification is one of the thermochemical pathways of biomass conversion that produces synthesis gas, tar, and char. This study aims to convert algal residues via gasification at different operating conditions; temperature, equivalence ratio, and biomass loading. The outcomes from experimental and simulated gasification were compared to obtain optimized conditions that produce high H_2 yield. The data were validated using root mean square error. The optimized temperature, loading, and equivalence ratio were found for both algal residues that produced 36.38mol% and 13.28mol% of H_2 and CO, respectively for LEA and 47.99mol% and 26.05mol% of H_2 and CO, respectively for FES. Huge variation was found between experimental and simulated data due to the simulation and experimental limitations. The average Carbon Conversion Efficiencies of the algal residues were 80.42% and 66.36%, respectively. In conclusion, the gasification of LEA produced more H_2 while FES produced more CO.

SE6-017

A Short Review on Ni-Based Catalyst Supporter for Carbon Monoxide (CO) Methanation Process

A.H. Hatta,[1] A.A. Jalil,[1,2], N.S. Hassan,[1] M.Y.S. Hamid,[1,2]*
A.F.A. Rahman,[1] M.A.H. Aziz,[3]

[1]School of Chemical and Energy Engineering, Faculty of Engineering, Universiti Teknologi Malaysia, 81310 UTM Skudai, Johor, Malaysia
[2]Centre of Hydrogen Energy, Institute of Future Energy, Universiti Teknologi Malaysia, 81310 UTM Skudai, Johor, Malaysia
[3]Faculty of Science, Universiti Teknologi Malaysia, 81310 UTM Skudai, Johor, Malaysia
*Corresponding author: aishahaj@utm.my

ABSTRACT – Since the discovery of methane synthesis by the interaction between carbon oxide and hydrogen by Sabatier and Senderens in 1902, the methanation reaction has been extensively established and is frequently utilized in chemical manufacturing, comprising the elimination of trace quantities of CO from feed gas containing a rich amount of hydrogen, refining of the reformate gas for fuel cells, and production of new energy sources, which is synthetic natural gas (SNG). It is feasible for SNG to be carried and distributed using the present pipeline infrastructure, which is favourable from a cost-effectiveness standpoint. Since CO methanation is highly exothermic, the development of exceedingly effective

catalysts with promising activity in the CO methanation process is essential to address this problem. Because of their economical price and high catalytic performance, nickel-based catalysts have been extensively studied as CO methanation catalysts. Coke deposition and Ni sintering invariably occur on Ni-based catalysts, and these catalysts also have inadequate low-temperature activity and stabilities. So, the advancement of exceedingly effective nickel-based catalysts with outstanding low-temperature catalytic capabilities has emerged as the primary research attention as well as a significant technical encounter in this sector. This brief overview covers recent developments for a supporter for extremely efficient nickel-based catalysts for CO methanation.

SE7-019

Insight on the Development of Molybdenum Oxide-Based Photocatalyst Towards Pharmaceutical Pollutants Abatement: A Review

N.M. Izzudin, [1] A.A. Jalil,[1,2] M.S. Azami, [3] N.S. Hassan,[1] F.F.A. Aziz,[1] A.A. Fauzi,[1]*

[1]School of Chemical and Energy Engineering, Faculty of Engineering, Universiti Teknologi Malaysia, 81310 Skudai, Johor, Malaysia
[2]Centre of Hydrogen Energy, Institute of Future Energy, Universiti Teknologi Malaysia, 81310 Skudai, Johor, Malaysia
[3]Department of Chemistry, Faculty of Science, Universiti Teknologi Malaysia, 81310 Skudai, Johor, Malaysia
*Corresponding author: aishahaj@utm.my

ABSTRACT – The presence of a significant amount of pharmaceutical compounds in the environment has given an unparallel impact on the human and environment. Till the present day, several methods have been imposed for the pharmaceutical pollutants removal. However, these methods suffer from some drawbacks which limited their application in wastewater treatment. As a new advanced technology, the photocatalysis method has been considered as an efficient method to eliminate the pharmaceutical pollutants in the water matrix. Molybdenum oxide (MoO_3) photocatalyst has captivated global interest due to its non-toxicity, good thermal and chemical stability, and remarkable optical properties. However, the limitations of MoO_3 material have hindered its theoretical performance in eliminating distinct pharmaceutical pollutants. Some modification strategies have been proposed for MoO_3 photocatalyst which results in the development of several modified MoO_3 photocatalysts towards a broad range of pharmaceutical pollutants removal.

SE8-020

Impact of Recycling on the Feedstock Sustainability of Waste to Energy Plant in Kuala Lumpur

*Muhamad Iqbal Hakim Tahir[1] *, Mohd Rozainee Taib[1], Ho Wai Shin[1], M.A.A. Aziz[1]*

[1]School of Chemical and Energy Engineering, Department of Engineering, Universiti Teknologi Malaysia, 81300, Skudai, Johor, Malaysia
** E-mail: iqbalhakimtahir@gmail.com*

ABSTRACT – Malaysian government proposed to construct Waste to Energy (WtE) plant to solve the waste management problem in Kuala Lumpur. Recent implementation of compulsory separation at source (SAS) program might disrupt the sustainability of the waste supply. Sufficient feed rate of waste is required to

achieve the designated temperature and autothermic combustion. Results of the study showed that, the annual average daily generation rate was reduced by 105 tonnes/day or 5.5% after the implementation of separation at source program. The estimated maximum recycling rate from the program was 13.8. The annual average daily collection of recyclable materials was only about 1.3 tonnes/day, which might be due to illegal collection by recycling vendors, poor enforcement by the authority and selling of the recyclable materials by residents directly to vendors. 3 regression models were proposed to describe the overall correlation behaviour between waste generation and population density. The waste generation rate was forecasted to be 3072 tonnes/day or 1.4 kg/capita/day in 2043.

SE9-021

Surface Modification of Grafted Porous Polyvinylidine Fluoride Membrane with Graphene Oxide for Vanadium Redox Flow Battery

Noor Fatina Emelin, [1, 2], NurFatehah Wahyuny Che Jusoh [1, 2], Teo Ming Ting [4], Saidatul Sophia Md Sha'rani [1, 2], Arshad Ahmad [2, 3]*

[1] Malaysia–Japan International Institute of Technology, Universiti Teknologi Malaysia, Malaysia
[2] Center of Hydrogen Energy, Universiti Teknologi Malaysia, Malaysia
[3] Department of Chemical Engineering, Universiti Teknologi Malaysia, Malaysia
[4] Malaysian Nuclear Agency (MNA), 43000, Kajang, Selangor, Malaysia

ABSTRACT – Vanadium Redox Flow Battery (VRFB) is an energy storage and key material for VRFB is the membrane that determines the cost and performance of the battery. Porous membranes have shown a great potential as a membrane due to their high stability, cheap and high selectivity. Poly(vinylidine fluoride) (PVDF) is a type of porous membrane and was extensively studied as potential material for surface modification due to its thermal and chemical stability, inexpensive and mechanical properties. This study aims to develop a highly selective, high performance modified PVDF membrane using surface grafting and functionalization for VRFB application using sonication method. Graphene oxide (GO) is a trending material in the field due to its excellent properties such as highly resistant to alkaline/acidic and strong mechanical strength, low cost and easily accessible. In this work, GO was functionalized on both sides of grafted PVDF using sonication technique. Hydrogen bond from modification with GO caused the membrane to be hydrophilic and FTIR results proved that new peaks appeared which relates to carbon bond from GO. Proton conductivity of modified membrane are recorded higher than commercial VRFB membrane Nafion.

SE10-022

Feasibility and Viability of Procuring Biohydrogen from Microalgae: An Emerging and Sustainable Energy Resource Technology

Anas Al-Dailami[1§], Imran Ahmad[1§], Norhayati Abdullah[1], Iwamoto Koji[1], Ali Yuzir[1]*

[1]*Malaysi*a Japan International Institute of Technology, Universiti Teknologi Malaysia, Jalan Sultan Yahya Petra, 54100, Kuala Lumpur, Malaysia
[§]First two authors have contributed equally
[*]mustafwibinqamar@gmail.com (Imran Ahmad)

ABSTRACT – As the world's population is increasing at an unprecedented rate, causing a severe impact on the limited and depleting petroleum reserves by their overexploitation and consumption. It is estimated that due to increasing socioeconomic and infrastructural advancements, we have already consumed about 50% of the petroleum reserves. Furthermore, the excessive usage of fossil fuels is believed to be a potential cause of global warming and a threat to environmental sustainability. This led the researchers to explore and study renewable and carbon-neutral sources of energy, which can be optimized as per the requirement and should be economically viable. Microalgae stand out momentous and materialized as feedstock to get all that we need at a single platform. Microalgae are the primary producers that utilize CO_2 and light for their growth. They can be grown in freshwater, saline water, and even in wastewaters due to their disparate biochemical metabolism. This urged microalgae to be exploited for obtaining various renewable energy-based fuels, as it has the following significant features: potential for CO_2 fixation; high biomass growth rate; its capacity to store carbon in lipids and carbohydrates to produce biofuels (bioethanol, biodiesel, biohydrogen, and biomethane). Hydrogen is regarded as one of the cleanest renewable fuels because water vapour is the only by-product during its combustion. It does not emit CO_2, while it can be converted to electricity using fuel cells. Energy content, energy density, cetane number, and yield as 120–142 MJ/Kg, 8.5–10.1MJ/L, 50–53, and 92–485 mL/gVS, respectively. It has high energy content (142 MJ/kg) as compared to gasoline (47 MJ/kg), methane (56 MJ/kg), and natural gas (54 MJ/kg). These features make hydrogen an emerging and sustainable selection for future fuel. This mini review provides an insight about the processes of biophotolysis, and fermentation utilized in the production of biohydrogen utilizing microalgae. It will incorporate the recent developments and innovations in biohydrogen production using microalgae. It will also give an overview of the challenges encountered in the production routes and the future perspectives.

SE11-023

Production and Characterization of Biodiesel from Canola Oil through Enzymatic Transesterification

M.I. Shamsudin[1], L S Tan[1], T Tsuji[1] and P L Kiew[1]

[1] Malaysia-Japan International Institute of Technology (MJIIT), Universiti Teknologi Malaysia, Kuala Lumpur, MALAYSIA
Email: tan.liansee@utm.my

ABSTRACT – Biodiesel, a promising type of biofuel, can be produced from various types of renewable feedstocks, ranging from animal fats to plant oil. It is mainly made up of fatty acid alkyl ester compounds as a result of the transesterification reaction. This work aims to synthesize and characterize biodiesel, known as fatty acid methyl esters, from canola oil using enzymatic reaction involving immobilized Novozym 435 and *Rhizomucor miehei* (RM IM) lipase enzymes. 4 g of canola oil was added to the reaction mixture consisting of 0.2 g immobilized lipase and 3:1 methanol to oil ratio. The enzymatic methanolysis reaction was conducted at the temperature of 35˚C and an agitation rate of 216 rpm for 24 hours. Next, the synthesized biodiesel was characterized using the Gas Chromatography-Mass Spectroscopy (GC/MS) analysis. Based on the analysis results, the main fatty acid methyl esters present in both products were hexadecanoic acid, 9-octadecenoic acid (z)-, 9,12,15-octadecatrienoic acid, (z,z,z)-, and 11,14-eicosadienoic acid. The transesterification of canola oil using both enzymes consistently revealed methyl oleate as the methyl ester with the highest composition, ranging from 67 to 71 %. In conclusion, canola

oil was successfully converted into fatty acid methyl ester via the enzymatic transesterification process in this study.

SE12-024

Evaluation of Physically Modified Kenaf Core Adsorbent for Carbon Dioxide Adsorptive Study

A Nurhidayah[1], N Zaini[1], M S M Zulhaziman[2], N Zulbadli[3], M Noor Ashikin [4], S N Ezaty[1], N S Shafie[1], M S Dzulkarnain [1] and A M N Siti Sarah[5]

[1]Shizen Conversion & Separation Technology iKohza, Department of Chemical and Environmental Engineering (ChEE), Malaysia-Japan International Institute of Technology (MJIIT), Universiti Teknologi Malaysia (UTM) Kuala Lumpur, Jalan Sultan Yahya Petra, 54100 Kuala Lumpur, Malaysia
[2]Department of Chemical and Process Engineering, Faculty of Engineering and Built Environment, Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor, Malaysia
[3]Faculty of Engineering and Built Environment, SEGi University, Kota Damansara, 47810 Petaling Jaya, Selangor
[4]Advanced Material Research Group, Centre of Hydrogen Energy, Universiti Teknologi Malaysia (UTM) Kuala Lumpur, Jalan Sultan Yahya Petra 54100 Kuala Lumpur, Malaysia
[5]School of Chemical and Energy Engineering, Faculty of Engineering, Universiti Teknologi Malaysia, 81310 UTM, Johor Bahru, Johor, Malaysia
Corresponding Author: nurhidayah.alias8@gmail.com

ABSTRACT – This paper evaluates on the capability of kenaf core (*Hibiscus Cannabinus L*.) material as the proposed solid adsorbent for CO_2 adsorption study via physical treatment modification. The proposed physical treatment was successfully conducted by undergoing two stages of carbonization and activation treatment to improve the pore development structure of the material. The carbonized kenaf core (CKC) was prepared by carbonizing the raw kenaf core (RKC) at 800℃ with with constant nitrogen flow for 5 hours. Activation process took placed by impregnating KOH in the furnace with alternately switching to CO_2 up to 800℃ for 2 hours.The morphological and structural characterization studies were conducted using Field Emission Scanning Electron Microscope (FESEM) and Fourier Transform Infrared Spectroscopy (FTIR). The CO_2 adsorption process was carried in the gravimetric analyser by varying the effect of pressure and flowrate. This study revealed that the AKC has the highest CO_2 adsorption capacity of 1.70 mmol/g (1 bar) and 2.85 mmol/g (30 bar). Based on the morphology, ACK demonstrated better small micropore development that helps in providing a larger adsorption sites; hence attributes to the higher CO_2 adsorption capacity. This study contributes to the development of knowledge on enhancing the CO_2 adsorption on the physically-modified kenaf core material that would be used as an alternative material for CO_2 adsorbent.

SE13-027

Preliminary study on *Azolla* cultivation and characterization for sustainable biomass source

N Adzman[1], S J Goh[1], A Johari[1] , M N H Zainal Alam[2] and M J Kamaruddin[1]

[1]Center of Hydrogen Energy (CHE), School of Chemical & Energy Engineering, Faculty of Engineering, Universiti Teknologi Malaysia, 81310 Johor Bahru, Johor, Malaysia
[2]Department of Bioprocess and Polymer Engineering, School of Chemical & Energy Engineering, Faculty of Engineering, Universiti Teknologi Malaysia, 81310 Johor Bahru, Johor, Malaysia

E-mail: mjohari@utm.my

ABSTRACT – *Azolla* is a freshwater fern that belongs to the *Azollaceae* family. It is easy to grow and is highly productive. It can fix atmospheric nitrogen due to the presence of *Anabaena azolla*e. *Azolla* has been applied to the rice field as a classic fertilizer. It is a good source of protein and contains almost all essential amino acids and minerals. Various research has been done and is still ongoing to determine the capability of *Azolla* as a phytoremediator and to be used as a sustainable bioenergy source. This preliminary study investigated the ideal environment for *Azolla* cultivation in Malaysia (humid weather throughout the year with average daily temperature across Malaysia between 21°C and 32°C). To the best of our knowledge, there is no research conducted in Malaysia to study the optimum environment for *Azolla* cultivation. Therefore, determining the optimum condition for growing *Azolla* was done by manipulating parameters: water depth, nutrient concentration, pH, and sunlight exposure. Meanwhile, chemical compositions (moisture, crude protein, crude fat, ash, crude fibre, carbohydrate and energy) were determined using proximate analysis. Results obtained showed that *Azolla* growth was the best in water depth of 20 cm, the nutrient concentration of 812.5 ppm, pH of 7 and under 100% sunlight exposure. Dried *Azolla* had 6.38% moisture, 27.1% crude protein, 6.37% crude fat, 14.29% ash, 34.29% crude fibre, 45.86% carbohydrate and 349.17 kcal/100 g energy. Based on the result, *Azolla* cultivated in this experiment could be used as a sustainable biomass source to produce animal feed (high protein content) and bioenergy (high fibre content).

SE14-029

Effect of Amine Head Group Imparted to Poly (Glycidyl Methacrylate) Grafted Fibrous Adsorbent for CO_2 Adsorption

Noor Ashikin Mohamad[a,b], Mohamed M. Nasef,[a,b], Tuan Amran Tuan Abdullah [b,c] , Arshad Ahmad[b,c],*

[a]Malaysia-Japan International Institute of Technology, Universiti Teknologi Malaysia, Jalan Sultan Yahya Petra, 54100 Kuala Lumpur, Malaysia
[b]Advanced Materials Research Group, Center of Hydrogen Energy, Universiti Teknologi Malaysia, Jalan Semarak 54100, Kuala Lumpur, Malaysia.
[c]Department of Chemical Engineering, Universiti Teknologi Malaysia, 81310 Johor Bahru, Malaysia.
*Corresponding Author: mahmoudeithar@cheme.utm.my

ABSTRACT – The demand to develop adsorbents for CO_2 capture with high performance continued to grow extensively. Adsorbents with covalently bonded amine groups based on fibrous substrate modified by radiation induced grafting copolymerization (RIGC) of glycidyl methacrylate (GMA) and amination treatment have emerged recently. In this study, GMA was grafted onto polyethylene/polypropylene (PE/PP) fibrous sheet and the grafted intermediate was used to incorporate two different amine-containing agents namely polyethyleneimine (PEI) and ethylenediamine (EDA) for CO_2 adsorption. The chemical structural and morphological changes in the two aminated adsorbents were evaluated using Fourier transform infrared spectroscopy (FTIR), X-ray diffraction (XRD) and scanning electron microscopy (SEM), respectively. A low and equal amination level of 20% was achieved in both PEI-containing and EDA-containing adsorbents. The CO_2 adsorption from a binary mixture of CO_2/N_2 (40:60 v/v) was not satisfactory despite a 30% higher adsorption capacity (50.44 mg/g) demonstrated by EDA-containing adsorbent compared to 34.51 mg/g for PEI-containing counterpart at 30 bar and room temperature. More

work is needed to elevate the CO_2 adsorption capacity levels in such adsorbents by increasing the amination level via optimization of reaction parameters.

SE15-030

Improving Proton Conductivity of Porous PBI Membrane Doped Acid

Nur Anati Bazilah Daud [1, 2], Roshafima Rasit Ali[1, 2], Mohamed M. Nasef [1, 2], Arshad Ahmad[1, 3].

[1]Center of Hydrogen Energy, Institute of Future Energy, Universiti Teknologi Malaysia, Malaysia.
[2]Malaysia-Japan International Campus, Universiti Teknologi Malaysia, Malaysia.
[3]Department of Chemical Engineering, Universiti Teknologi Malaysia, Johor Bahru, Malaysia.

ABSTRACT – This study will provide various condition for acid doped polybenzimidazole (PBI) membrane which giving the best proton conductivity result with respect to the High Temperature-Polymer Electrolyte Membrane Fuel Cell (HT-PEMFC). A highly phosphonated polymer membrane based on acid-base complex membrane system was introduced where phytic acid was chosen as a co-dopant acid of phosphoric acid (PA) due to its properties of having high phosphate group content and ability to participate in H bonding interactions with the functionalities in PBI matrix. By introducing this PBI/phytic acid membrane will help to overcome the issues arise from PBI/PA membrane system especially on acid leaching problem. In this study, a simple and cost effective technique on porous PBI membrane fabrication and acid doping condition were employed to search an optimum acid-doping level and to further improve the stability and durability of the membrane.

SE16-033

A short review on the promotional effects of ceria-based catalyst for dry reforming methane

S. Y. Liew[1], A. A. Jalil[1,2], N. Norazahar[1,2], J. S. Tan[1]*

[1] School of Chemical and Energy Engineering, Faculty of Engineering, Universiti Teknologi Malaysia, 81310 Johor Bahru, Johor, Malaysia.
[2] Centre of Hydrogen Energy, Institute of Future Energy, Universiti Teknologi Malaysia, 81310 Johor Bahru, Johor, Malaysia.
Corresponding author: aishahaj@utm.my

ABSTRACT – Dry reforming of methane (DRM) appears as a promising process for the industrial production of syngas in comparison to other conventional reforming technologies. However, DRM process suffers from catalyst deactivation induced by carbonaceous species which reduces the catalyst lifespan. Currently, catalytic designs in DRM have trended towards the incorporation rare-earth metals. As such, ceria (Ce) based catalyst has recently attracted research interest for its key feature to mitigate catalyst deactivation owing to its complementary redox properties. The present short review summarizes on the recent catalytic performance of Ce-based catalyst and impact of ceria redox on the DRM mechanism.

SE17-035

Enhancement of Carbon Dioxide Adsorption Performances by Hydrazinolysis of Poly (N-VINYLFORMAMIDE) Grafted Fibrous Adsorbent

N. A. Zubair, [1,2] M. M. Nasef,[1,2] E. C. Abdullah,[1] A. Ahmad,[2]*
[1]Malaysia-Japan International Institute of Technology, Universiti Teknologi Malaysia, Jalan Sultan Yahya Petra, 54100 Kuala Lumpur, Malaysia
[2]Center of Hydrogen Energy, Institute of Future Energy, Universiti Teknologi Malaysia, Jalan Sultan Yahya Petra, 54100 Kuala Lumpur, Malaysia
*Corresponding author: mahmoudeithar@cheme.utm.my

ABSTRACT – Emission of CO_2 becomes a main concern in battling issues of global warming. The strategy to reduce the concentration of CO_2 could be achieved by implementing carbon capture and storage (CCS) technology such as adsorption by solid adsorbents. In this work, hydrazone containing adsorbent was prepared by radiation induced grafting of N-vinylformamide onto PE/PP fibrous sheets and subsequent hydrazinolysis for CO_2 capture. Hydrazinolysis of the amide group to hydrazone moieties was accelerated by the addition of ammonium salts. These newly prepared adsorbent was characterized by scanning electron microscope (SEM) and Fourier transform infrared spectroscopy (FTIR). The adsorption tests of pure CO_2 and N_2, and their mixture were carried using the gravimetric method. The result revealed that the obtained adsorbent was highly CO_2 selective and attained remarkably higher CO_2 sorption capacity of 3.1 mmol/g at 30 bar and room temperature compared to 0.3 mmol/g for amide-containing sample. The new adsorbent could be used for few repeated cycles with negligible loss in sorption capacity. Overall, the hydrazone-containing adsorbent has storing potential for CO_2 capture, and more studies need to be conducted for further development.

SE18-036

Application of Regenerated Spent Bleaching Earth as An Adsorbent for The Carbon Dioxide Adsorption by Gravimetric Sorption System

Melissa Low Phey Phey[a,b], Tuan Amran Tuan Abdullah[a,b,], Arshad Ahmad[a,b], Umi Fazara Md Ali[c,d] and Noor Ashikin Binti Mohamad[a]*

[a] Center of Hydrogen Energy, Institute of Future Energy, Universiti Teknologi Malaysia, 81310 Skudai, Johor, Malaysia
[b] School of Chemical and Energy Engineering, Faculty of Engineering, Universiti Teknologi Malaysia, 81310 Skudai, Johor, Malaysia
[c] Chemical Engineering Programme, Faculty of Chemical Engineering Technology, Universiti Malaysia Perlis, Kompleks Pusat Pengajian Jejawi 3, 02600 Arau, Perlis, Malaysia
[d] Centre of Excellence Biomass Utilization (COEBU), Universiti Malaysia Perlis, Kompleks Pusat Pengajian Jejawi 3, 02600 Arau, Perlis, Malaysia
* Corresponding author. Centre of Hydrogen Energy, Institute of Future Energy, Universiti Teknologi Malaysia, 81310 Skudai, Johor, Malaysia.
E-mail address: tuanamran@utm.my (T.A. Tuan Abdullah)

ABSTRACT – The atmospheric level of carbon dioxide (CO_2) is indicated to be alarming which in turn has contributed to the worldwide environmental issue such as global warming. The goal of this project was to study the adsorption of CO_2 onto regenerated spent bleaching earth (RSBE). Spent bleaching earth (SBE)

can be a good adsorbent but it has the weakness in surface area due to the organic impurities left in the pores after being generated from the edible oil processing. Thus, the regeneration processes of SBE by (a) direct heat treatment, and (b) heat treatment followed by nitric acid treatment were studied to enhance the surface area, thus increasing the CO_2 adsorption capacity. The SBE were calcined at four temperatures of 400, 500, 650 and 800 °C in the regeneration process. The surface properties of RSBE were characterized using Thermogravimetric Analysis (TGA), Fourier Transform Infrared (FTIR) analysis and Brunauer–Emmett–Teller (BET) surface area analysis. The CO_2 adsorption capacity on RSBE produced by heat treatment followed by nitric acid treatment was shown to be more effective than RSBE produced by direct heat treatment. RSBE_500_HNO3 offered highest surface area (192.81 m^2/g) and give highest CO_2 adsorption capacity of 86.67 mg CO_2/g. In comparison to the low pressure condition, the high pressure CO_2 adsorption values recorded for both RSBE were significantly better.

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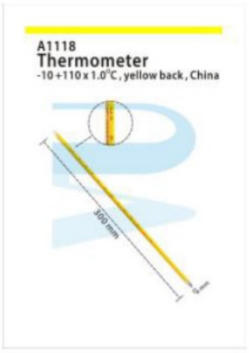

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Centre of Hydrogen Energy (CHE)
Institute of Future Energy (IFE)
Universiti Teknologi Malaysia
81310 Johor Bahru, Johor