

CORPORATE BOOK

**AMTEC**

*Advanced Membrane Technology  
Research Centre*



**UTM**  
UNIVERSITI TEKNOLOGI MALAYSIA





## MESSAGE FROM **DIRECTOR**

AMTEC formerly known as Membrane Research Unit (MRU), Universiti Teknologi Malaysia (UTM), is a research center for advanced membrane technology and emerging membrane applications. Recently AMTEC has been awarded as the Higher Institution Centre of Excellence (HiCoE) of Malaysia. The mission and vision of AMTEC is to be a leader in membrane technology and applications especially in the Asia Pacific region and globally through innovation and creative technologies. The centre produces postgraduate students in addition to training engineers, scientists and technicians from Malaysia and abroad in membrane technology to enhance the nation human capital and productivity. AMTEC incorporates a business venture laboratory that is involved in the design, fabrication and commercialization of customized membrane module and membrane system for local and overseas applications. AMTEC is a platform for multidisciplinary research and development in the areas of science, engineering, industrial design, and commercialization in UTM and the Asia region. Therefore we welcome your support and involvement in the area of membrane technology research and please let us know how we can assist your endeavors in search of excellence as an undergraduate student, a PhD/Master research student, a visiting scholar, an industrial organisation and a community group.

We are pleased to have you as a visitor to our centre. For further information please feel free to contact us.



**ASSOC. PROF. DR. MOHD HAFIZ DZARFAN**  
Director of AMTEC







## ABOUT US

Advanced Membrane Technology Research Centre (AMTEC), previously known as Membrane Research Unit (MRU) was established in 1990 in Universiti Teknologi Malaysia Kuala Lumpur Campus (UTMKL). Upon the organisation restructuring, the research unit has been moved to UTM Skudai in 2002. In 2008, AMTEC has been upgraded as one of the centres of excellence (CoE) in UTM. AMTEC is known as a regional and international referral centre for advanced membrane technology and applications. The vision of AMTEC is to become a hub of membrane-based technology for nation human capital development and wealth creation and its mission is to establish as a world-renown centre of excellence in research development and commercialization. The centre is established to generate new and exciting research projects, to provide a centre for research activities related to membrane-based technology, to build research networks with research universities and industries in Malaysia and worldwide, to provide opportunities for research collaboration and facilities for visiting researchers, and to train new generations of postgraduate students in the field of membrane-based technology.

In November 2015, AMTEC has been officially recognized as the Higher Institution Centres of Excellence (HICoE) in the niche of Water Reclamation by the Ministry of Higher Education. With the acknowledgement as HICoE, extensive network and partnership with various institutions and agencies locally and internationally are established to contribute towards water reclamation development. AMTEC represents vehicles for researchers and postgraduate students to undertake multidisciplinary research that are internationally recognized and meeting global standard in the area of membrane technology for water reclamation. All members in AMTEC have initiated and lead several joint research projects with local and international universities and industries. The knowledge and findings from these collaboration research projects have contributed to the research findings that benefit to humankind and environment.

As part of the recognition to the efforts and outputs in research, development and innovation activities, several inventions of AMTEC members have been awarded in local and international level. In addition, AMTEC members have actively involved in translational research that has a positive impact to the community. This is to ensure that the outcome of the research can be a solution to the national and global issues. AMTEC is also one of the collaborative partners for the organization of the International Conference on Membrane Science & Technology (MST) which is held biannually. This event highlights the advances and new findings in membrane science & technology and their impacts on technology development, especially in South East Asia Region.

## RESEARCH AREAS

The research program in AMTEC is multidisciplinary in nature whereby the framework for research concentrates on the following fields:

- Fundamentals and study of membrane separation processes.
- Development of high performance membranes for gas & liquid separation.
- Fabrication of polymeric membrane for gas separation and water treatment applications.
- Fabrication of inorganic membrane (carbon and ceramic) for gas separation and water treatment applications.
- Development of membrane contactors for gas-liquid separation.
- Synthesis and production of carbon nanotubes.
- Development of proton exchange membrane for fuel cell application.
- Development of polymeric solar cell.
- Development of nanofiber membrane via electrospinning for water treatment, gas storage, and fuel cell applications.

## MISSION

TO ESTABLISH AMTEC AS A  
WORLD-RENOVN CENTRE  
OF EXCELLENCE IN R&D&C

## VISION

TO BE A HUB OF  
MEMBRANE TECHNOLOGY  
FOR NATION

# AMTEC HISTORY

2015

AMTEC has been awarded as national centre of excellence (HICoE).



2018

Appointment of Assoc. Prof. Dr. Mohd Hafiz Dzarfan Othman as the second Director of AMTEC.

2009

MRU has been upgraded to Advanced Membrane Technology Research Centre (AMTEC). Prof. Ahmad Fauzi Ismail was the First Director of AMTEC.



2002

Prof. Ahmad Fauzi Ismail had been entrusted to lead MRU-based in Skudai, Johor. Prof Ahmad Fauzi held the position as the Head of MRU until 2008.



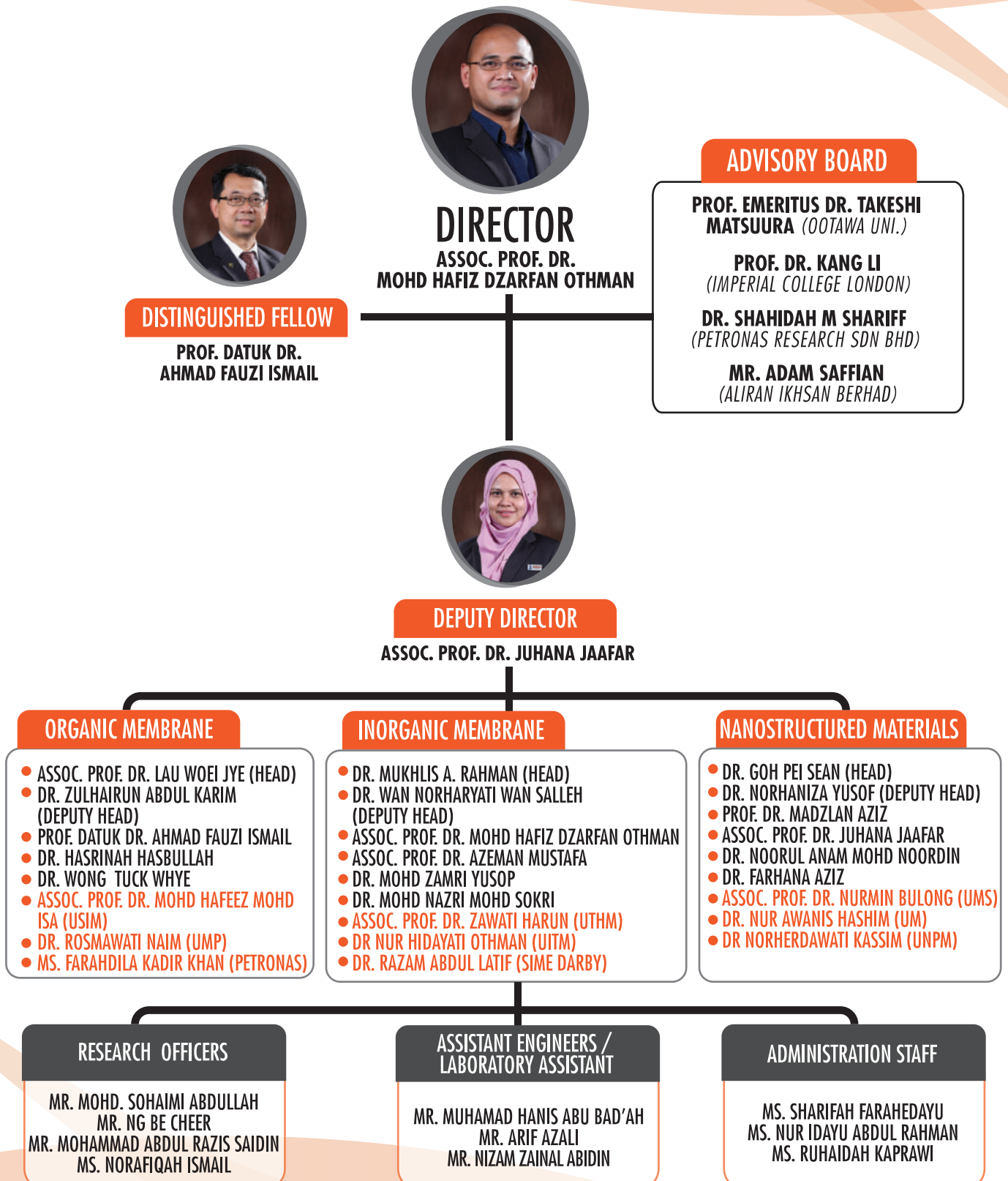
1990

Prof. Hamdani Saidi was the founder of Membrane Research Unit (MRU). He was the first Head of MRU, which was based in UTMKL.





# RESEARCH ORGANIZATION CHART





## Distinguished Fellow of AMTEC



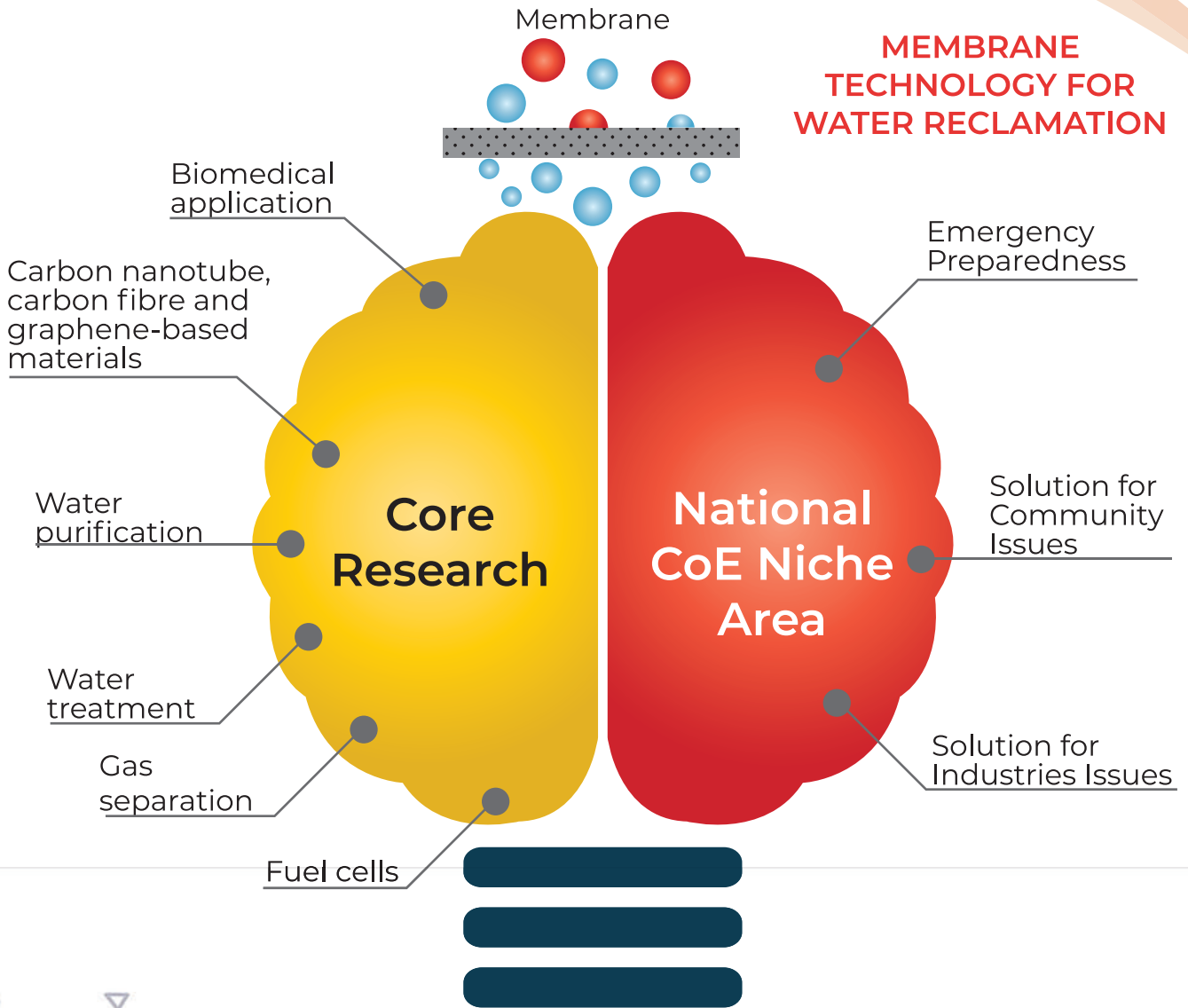
### **PROF. DATUK DR. AHMAD FAUZI BIN ISMAIL**

PhD., FASc., CEng., FICHEM E.

Ahmad Fauzi Ismail is known based on their contributions not only as academicians but also membrane technology scientist. He obtained his PhD. in Chemical & Process Engineering in 1997 from University of Strathclyde and MSc. and BSc. from Universiti Teknologi Malaysia in 1992 and 1989 respectively. Currently, he is record holder as the first Malaysian recipient for the ASEAN Young Scientist and Technologist Award in 2001. He received the Malaysian Young Scientist Award in 2000; the Grand Winner of the Malaysian Intellectual Property Award for Patent Category and he is the first Malaysian Scientist to won twice the National Innovation Award in Waste to Wealth and Product categories both in 2009 and 2011. In 2012, he has been awarded the Best Research Project award for his Fundamental Research Grant Scheme (FRGS) project by the Ministry of Education. In 2013, Malaysia Toray Science Foundation awarded him a special award for his involvement and contribution in research activities and innovations. Ministry of Education unanimously awarded him the Innovative Action Plan for Human Capital Development Tertiary Level award. Prof Fauzi also awarded the Nation Academic Award in 2013 in recognition to his remarkable commercialization activities. In addition to that, he also granted two international patents with the patent number of US Patent 6,521,025 B1 and WO00/27512 whereas 17 national patents disclosure being filed. His capability in carrying quality research work of international standards has been further supported by the publication of more than 500 technical or scientific papers in well-established and high impact factor international refereed journals. His current H-index value is 60 with total citation number of about 15788.



# AMTEC RESEARCH FRAMEWORK





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### RESEARCH EXPERTISE

Membrane And Carbon Nanostructured Materials Development For Gas Separation, Water and Wastewater Treatment, and Energy Application

### SELECTED PUBLICATIONS

- Samavati, A., Samavati, Z., Ismail, A.F., Othman, M.H.D., Rahman, M.A., Amiri, I.S., Effect of organic ligand-decorated ZnO nanoparticles as a cathode buffer layer on electricity conversion efficiency of an inverted solar cell, RSC Advances, 8 (3) (2018) 1418-1426.
- Goh, P.S., Ismail, A.F., A review on inorganic membranes for desalination and wastewater treatment, Desalination, 434 (2018) 60-80.
- Nasir, A.M., Goh, P.S., Ismail, A.F., Novel synergistic hydrous iron-nickel-manganese (HINM) trimetal oxide for hazardous arsenite removal, Chemosphere, 200 (2018) 504-512.
- Nasir, A.M., Md Nordin, N.A.H., Goh, P.S., Ismail, A.F., Application of two-dimensional leaf-shaped zeolitic imidazolate framework (2D ZIF-L) as arsenite adsorbent: Kinetic, isotherm and mechanism, Journal of Molecular Liquids, 250 (2018) 269-277.
- Goh, P.S., Lau, W.J., Othman, M.H.D., Ismail, A.F., Membrane fouling in desalination and its mitigation strategies, Desalination, 425 (2018) 130-155.
- Rasel Das, Chad D Vecitis, Agnes Schulze, Bin Cao, Ahmad Fauzi Ismail, Xianbo Lu, Jiping Chen, Seeram Ramakrishna, Recent advances in nanomaterials for water protection and monitoring, Chemical Society Reviews, 46 (2017) 6946-7020.
- Mashallah Rezakazemi, Abtin Ebadi Amooghin, Mohammad Mehdi Montazer-Rahmati, Ahmad Fauzi Ismail, Takeshi Matsuura, State-of-the-art membrane based CO<sub>2</sub> separation using mixed matrix membranes (MMMs): an overview on current status and future directions, Progress in Polymer Science, 39 (2014) 817-861



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### RESEARCH EXPERTISE

Electrochemical Materials and Processes

### SELECTED PUBLICATIONS

- Ajeigbe, S.O., Basar, N., Maarof, H., Al-Fakih, A.M., Hassan, M.A., Aziz, M., Evaluation of Alpinia galanga and its active principle, 1'-acetochavicol acetate as eco-friendly corrosion inhibitors on mild steel in acidic medium, Journal of Materials and Environmental Science, 8 (6) (2017) 2040-2049.
- Algamal, Z.Y., Lee, M.H., Al-Fakih, A.M., Aziz, M.; High-dimensional QSAR classification model for anti-hepatitis C virus activity of thiourea derivatives based on the sparse logistic regression model with a bridge penalty, Journal of Chemometrics, 31 (6) (2017) Article number e2889.
- Suhaimin, N.S., Aziz, M., Jaafar, J.; Methanol permeability and properties of polymer electrolyte membrane based on graphene oxide-sulfonated (Polyether ether) ketone, Malaysian Journal of Analytical Sciences, 21 (2) (2017) 435-444.
- Ajeigbe, S.O., Basar, N., Maarof, H., Al-Fakih, A.M., Hassan, M.A., Aziz, M.; Evaluation of Alpinia galanga and its active principle, 1'-acetochavicol acetate as eco-friendly corrosion inhibitors on mild steel in acidic medium, Journal of Materials and Environmental Science, 8 (6) (2017) 2040-2049.
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- Al-Fakih, A.M., Algamal, Z.Y., Lee, M.H., Abdallah, H.H., Maarof, H., Aziz, M., Quantitative structure-activity relationship model for prediction study of corrosion inhibition efficiency using two-stage sparse multiple linear regression, Journal of Chemometrics, 30 (7) (2016) 361-368.

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### RESEARCH EXPERTISE

Ceramic and Polymeric Membranes For Fluid Separation and Fuel Cell

### SELECTED PUBLICATIONS

- Mohd Hafiz Dzarfan Othman, Nicolas Droushiotis, Zhentao Wu, Geoff Kelsall, and K. Li, High performance anode-supported micro-tubular SOFC prepared from single-step fabricated dual-layer hollow fibres, *Advanced Materials*, 23 (21) (2011) 2480-2483.
- Hazlini Dzinun, Mohd Hafiz Dzarfan Othman, A. F. Ismail, Mohd Hafiz Puteh, Mukhlis A. Rahman, Juhana Jaafar, Morphological study of co-extruded dual-layer hollow fibre membranes incorporated with different TiO<sub>2</sub> loadings, *Journal of Membrane Science*, 479 (123-131) (2015).
- Mohammed Abdulmunem Abdulhameed, Mohd Hafiz Dzarfan Othman, Ahmad Fauzi Ismail, Takeshi Matsuura, Zawati Harun, Mukhlis A Rahman, Mohd Hafiz Puteh, Juhana Jaafar, Masoud Rezaei, Siti Khadijah Hubadillah, Carbon dioxide capture using a superhydrophobic ceramic hollow fibre membrane for gas-liquid contacting process, *Journal of Cleaner Production*, 140 (1731-1738) (2017).
- Siti Khadijah Hubadillah, Mohd Hafiz Dzarfan Othman, Takeshi Matsuura, Mukhlis A Rahman, Juhana Jaafar, A.F. Ismail, Siti Zulaikha Mohamad Amin, Green silica based ceramic hollow fibre membrane for seawater desalination via direct contact membrane distillation, *Separation and Purification Technology*, 205 (2018) 22-31.
- Nur Hamizah Mohtor, Mohd Hafiz Dzarfan Othman, Suriani Abu Bakar, Tonni Agustiono Kurniawan, Hazlini Dzinun, Muhammad Noorul Anam Mohd Norrdin, Zanariah Rajis, Synthesis of Nanostructured Titanium Dioxide Layer onto Kaolin Hollow Fibre Membrane via Hydrothermal Method for Decolourisation of Reactive Black 5, *Chemosphere*, 208 (2018) 595-605.
- Siti Khadijah Hubadillah, Mohd Hafiz Dzarfan Othman, A.F Ismail, Mukhlis A. Rahman, Juhana Jaafar, Yuji Iwamoto, Sawao Honda, Mohd Irfan Hatim Mohd Dzahir, Mohd Zamri Mohd Yusop, Fabrication of low cost, green silica based ceramic hollow fibre membrane prepared from waste rice husk for water filtration application, *Ceramic International*, 44 (2018) 10498-10509.



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### RESEARCH EXPERTISE

Polymeric Membrane, Polymer-Inorganic Nanocomposite Membrane & Nanofibers for Fluid Separation and Energy Applications

### SELECTED PUBLICATIONS

- N. H. Alias, J. Jaafar, S. Samitsu, N. Yusof, M. H. D. Othman, Mukhlis A. Rahman, A. F. Ismail, F. Aziz, W. N. W. Salleh, N. H. Othman, Photocatalytic degradation of oilfield produced water using graphitic carbon nitride embedded in electrospun polyacrylonitrile nanofibers, *Chemosphere*, 204 (2018) 79-86.
- Nuha Awang, Juhana Jaafar, A. F. Ismail, Thermal stability and water content study of void-free electrospun SPEEK/Cloisite membrane for direct methanol fuel cell application, *Polymers* 10 (2018) 194.
- Salim, N. E., Jaafar J., A. F. Ismail, M. H. D. Othman, Mukhlis A. Rahman, N. Yusof, W. N. W. Salleh, F. Aziz, T. Matsuura, M. Qtaisyat, Preparation and characterization of hydrophilic surface modifier macromolecule modified poly (ether sulfone) photocatalytic membrane for phenol removal, *Chemical Engineering Journal*, 335 (2018) 236-247.
- Mohamed, M. A., Jaafar, J., M. F. M. Zain, Lorna Jeffery Minggu, Mohammad B. Kassim, Mohamad Saufi Rosmi, Nur Hashimah Alias, Nor Azureen Mohamad Nor, W. N. W. Salleh, M. H. D. Othman, In-depth understanding of core-shell nanoarchitecture evolution of g-C<sub>3</sub>N<sub>4</sub>@C, N co-doped anatase/rutile: Efficient charge separation and enhanced visible-light photocatalytic performance, *Applied Surface Science*, 436 (2018) 302-318.
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- Nor. N. A. M., Juhana Jaafar, A. F. Ismail, M. H. D. Othman, Mukhlis A. Rahman, N. Yusof, Effects of heat treatment of TiO<sub>2</sub> nanofibers on the morphological structure of PVDF nanocomposite membrane under UV irradiation, *Journal Of Water Process Engineering*, 20 (2017) 193-200.
- Nuha Awang, Juhana Jaafar, A. F. Ismail, M. H. D. Othman, Mukhlis A. Rahman, N. Yusof, F. Aziz, W. N. W. Salleh, S. S. Suradi, Hamid Ilbeygi, W. E. N. Wan Mohd Nor Al Azman, G. Arthanareeswaran, Development of dense void-free electrospun SPEEK-Cloisite15A membrane for direct methanol fuel cell application: Optimization using response surface methodology, *International Journal of Hydrogen Energy*, 42 (2017) 26496-26510.

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### RESEARCH EXPERTISE

Ceramic Membrane for Gas Separation, Water Purification & Energy Generation, Photocatalytic Membrane

### SELECTED PUBLICATIONS

- Setiawan, H., Khairani, R., Rahman, M.A., Septawendar, R., Mukti, R.R., Dipojono, H.K., Purwasasmita, B.S., Synthesis of zeolite and  $\gamma$ -alumina nanoparticles as ceramic membranes for desalination applications, Journal of the Australian Ceramic Society, 53 (2) (2017) 531-538.
- Makhtar, S.N.N.M., Rahman, M.A. Email Author, Ismail, A.F., Othman, M.H.D., Jaafar, J.; Preparation and characterization of glass hollow fiber membrane for water purification applications, Environmental Science and Pollution Research, 24 (19) (2017) 15918-15928.
- Samavati, A., Samavati, Z., Ismail, A.F., Othman, M.H.D., Rahman, M.A., Zulhairun, A.K. Efficient visible photoluminescence from self-assembled ge QDs embedded in silica matrix, Chinese Physics Letters, 34 (6) (2017) Article number 068102.
- Khan, M.Z.H.a, Rahman, M.A., Yasmin, P., Tareq, F.K., Yuta, N. or, Komeda, T.c Email Author, Jahan, R.A. Formation and Characterization of Copper Nanocube-Decorated Reduced Graphene Oxide Film, Journal of Nanomaterials, (2017) Article number 5702838.
- Abdullah, N., Rahman, M.A., Othman, M.H.D., Ismail, A.F., Jaafar, J.; Preparation and characterization of dual layer thin layer lanthanum strontium cobalt ferrite /alumina hollow fiber membrane using dip-coating and brush-coating techniques, Sains Malaysiana, 45 (11) (2016) 1715-1721.
- Abdullah, N., Rahman, M.A., Othman, M.H.D., Ismail, A.F., Jaafar, J., Aziz, A.A., Preparation and characterization of self-cleaning alumina hollow fiber membrane using the phase inversion and sintering technique, Ceramics International, 42 (10) (2016) 12312-12322.



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### RESEARCH EXPERTISE

Nanofiber Materials For Gas and Water Adsorption, Nanocomposite Membranes For Water Treatment and Gas Separation Application

### SELECTED PUBLICATIONS

- Wan Ikhsan, S.N., Yusof, N., Aziz, F., Misdan, N., Ismail, A.F., Lau, W.J., Jaafar, J., Salleh, W.N.W., Hayati Hairom, N.H., Efficient separation of oily wastewater using polyethersulfone mixed matrix membrane incorporated with halloysite nanotube-hydrous ferric oxide nanoparticle, Separation and Purification Technology, 199 (2018) 161-169.
- Othman, F.E.C., Yusof, N., Hasbullah, H., Jaafar, J., Ismail, A.F., Nasri, N.S., Physicochemical properties and methane adsorption performance of activated carbon nanofibers with different types of metal oxides, Carbon Letters, 24 (1) (2017) 82-89.
- Che Othman, F.E., Yusof, N., Hasbullah, H., Jaafar, J., Ismail, A.F., Abdullah, N., Md Nordin, N.A.H., Aziz, F., Salleh, W.N.W., Polyacrylonitrile/magnesium oxide-based activated carbon nanofibers with well-developed microporous structure and their adsorption performance for methane, Journal of Industrial and Engineering Chemistry, 51 (2017) 281-287.
- Abdullah, N., Gohari, R.J., Yusof, N., Ismail, A.F., Jaafar, J., Lau W.J., Matsuura, T., Polysulfone/hydrous ferric oxide ultrafiltration mixed matrix membrane: Preparation, characterization and its adsorptive removal of lead (II) from aqueous solution, Chemical Engineering Journal, 289 (2016) 28-37.
- Yusof, N., Ismail, A.F., Rana, D., Matsuura, T., Effects of the activation temperature on the polyacrylonitrile/acrylamide-based activated carbon fibers, Materials Letters 82 (2013) 16-18.
- Yusof, N., Ismail, A.F., Post spinning and pyrolysis processes of polyacrylonitrile (PAN)-based carbon fiber and activated carbon fiber: A review, Journal of Analytical and Applied Pyrolysis 93 (2012) 1-13.

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### RESEARCH EXPERTISE

Thin Film (Nano)Composite Membranes for Nanofiltration and Reverse Osmosis Process, Forward Osmosis Process for Brackish and Seawater Desalination, Functionalized Ultrafiltration Membranes Water and Wastewater Treatment

### SELECTED PUBLICATIONS

- G.S. Lai, W.J. Lau, P.S. Goh, A.F. Ismail, Y.H. Tan, C.Y. Chong, R. Krause-Rehberg, S. Awad, Tailor-made Thin Film Nanocomposite Membrane Incorporated with Graphene Oxide using Novel Interfacial Polymerization Technique for Enhanced Water Separation, Chemical Engineering Journal, 344 (2018) 524–534.
- C.Y. Chong, W.J. Lau, N. Yusof, G.S. Lai, N.H. Othman, T. Matsuura, A.F. Ismail, Studies on the properties of RO membranes for salt and boron removal: Influence of thermal treatment methods and rinsing treatments, Desalination, 428 (2018) 218–226.
- G.S. Lai, W.J. Lau, S.R. Gray, T. Matsuura, R. Jamshidi Gohari, M.N. Subramanian, S.O. Lai, C.S. Ong, A.F. Ismail, D. Emazadah, M. Ghanbari, A practical approach to synthesize polyamide thin film nanocomposite (TFN) membrane with improved separation properties for water/wastewater treatment, Journal of Materials Chemistry A, 4 (2016) 4134–4144.
- W.J. Lau, Stephen Gray, T. Matsuura, D. Emadzadeh, J. Paul Chen, A.F. Ismail, A review on polyamide thin film nanocomposite (TFN) membranes: History, applications, challenges and approaches, Water Research, 80 (2015) 306–324.
- C.S. Ong, W.J. Lau, P.S. Goh, B.C. Ng, A.F. Ismail, C.M. Choo, The impacts of various operating conditions on submerged membrane photocatalytic reactor (SMPR) for organic pollutant separation and degradation: A Review, RSC Advances, 5 (2015) 97335–97348.
- W.J. Lau, A.F. Ismail, N. Misdan, M.A. Kassim, A recent progress in thin film composite membrane: A review, Desalination, 287 (2012) 190–199.



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### RESEARCH EXPERTISE

Polymer Based Membrane For Gas Separation Process

### SELECTED PUBLICATIONS

- Sulaiman, S.Z., Kasmani, R.M., Mustafa, A., Abdul Mudalip, S.K., Che Man, R., Shaarani, S.M., Mohd Arshad, Z.I., Noor Azmi, N.S., Harinder Khan, N.A.M., Effect of pipe size on acetylene flame propagation in a closed straight pipe, Journal of Mechanical Engineering and Sciences, 11 (4) (2017) 3095-3103.
- Zaidi, N.H.F.M., Kasmani, R.M., Mustafa, A., Ibrahim, N., Ali, R.R., Hasbullah, H., Shokri, M.N.M., Samsudin, M.D.M.; Numerical investigation on flame propagation in vented gas explosion, Chemical Engineering Transactions, 56 (2017) 1357-1362.
- Fosi-Kofal, M., Mustafa, A., Ismail, A.F., Rezaei-Dasht Arzhandi, M., Matsuura, T.; PVDF/CaCO<sub>3</sub> composite hollow fiber membrane for CO<sub>2</sub> absorption in gas-liquid membrane contactor, Journal of Natural Gas Science and Engineering, 31 (2016) 428-436.
- Sulaiman, S.Z., Kasmani, R.M., Mustafa, A., Experimental study on flame propagation in a straight pipe, Jurnal Teknologi, 78 (2016) 71-75.
- Kusworo, T.D., Ismail, A.F., Mustafa, A.; Experimental design and response surface modeling of PI/PES-zeolite 4A mixed matrix membrane for CO<sub>2</sub> separation, Journal of Engineering Science and Technology, 10 (9) (2015) 1116-1130.
- Zaidi, N.H.F.M., Kasmani, R.M., Mustafa, A.; Numerical investigation on laminar burning velocity of hydrogen-methane/air mixtures: A review, Journal of Engineering Science and Technology, 10 (5) (2015) 40-49.

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### RESEARCH EXPERTISE

Membrane Science and Engineering; Carbon Membrane; Membrane for Gas Separation; Membrane for Water & Wastewater Treatment; Visible Light Photocatalyst; Photocatalytic Membrane

### SELECTED PUBLICATIONS

- Mohamed, M.A., M. Zain, M.F., Jeffery Minggu, L., Kassim, M.B., Saidina Amin, N.A., Salleh, W.N.W., Salehmin, M.N.I., Md Nasir, M.F., Mohd Hir, Z.A., Constructing bio-templated 3D porous microtubular C-doped g-C<sub>3</sub>N<sub>4</sub> with tunable band structure and enhanced charge carrier separation, *Applied Catalysis B: Environmental*, 236 (2018) 265-279.
- Ismail, N.H., Salleh, W.N.W., Szali, N., Ismail, A.F., Yusof, N., Aziz, F., Disk-Supported Carbon Membrane via Spray Coating Method: Effect of Carbonization Temperature and Atmosphere, *Separation and Purification Technology*, 195 (2018) 295-304.
- Salleh, W.N.W., Ismail, A.F., Matsuura, T., Abdullah, M. S., Precursor selection and process conditions in the preparation of carbon membrane for gas separation: A review, *Separation & Purification Reviews*, 40 (2011) 261-311.
- Mohamad, M.A., Salleh, W.N.W., Jaafar, J., Ismail, A.F., Mutalib, M.A., Sani, N.A.A., M. Asri, S.E.A., Ong, C.S., Physicochemical characteristic of regenerated cellulose/N-doped TiO<sub>2</sub> nanocomposite membrane fabricated from recycled newspaper with photocatalytic activity under UV and visible light irradiation, *Chemical Engineering Journal*, 284 (2016) 202-215.
- Mohamed, M.A., Salleh, W.N.W., Jaafar, J., Asri, S.E.A.M., Ismail, A.F., Physicochemical properties of "Green"-Nanocrystalline Cellulose isolated from recycled newspaper, *RSC Advances*, 5 (38) (2015) 29842 - 29849.
- Mohamed, M.A., Salleh, W.N.W., Jaafar, J., Ismail, A.F., Mutalib, M., Jamil, S.M., Incorporation of N-doped TiO<sub>2</sub> nanorods in regenerated cellulose thin films fabricated from recycled newspaper as a green portable photocatalyst, *Carbohydrate Polymers*, 133 (2015) 429-437.



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### RESEARCH EXPERTISE

Materials Engineering, Membrane for Fluid Separation, Polymer Chemistry

### SELECTED PUBLICATIONS

- Said, N., Hasbullah, H., Ismail, A.F., Goh, P.S., Zainol Abidin, M.N., Sheikh Abdul Kadir, S.H., Kamal, F., Abdullah, M.S., Ng, B.C., Enhanced hydrophilic polysulfone hollow fiber membranes with addition of iron oxide nanoparticles, *Polymer International*, 66 (11) (2017) 1424-1429.
- Said, N., Hasbullah, H., Ismail, A.F., Abidin, M.N.Z., Goh, P.S., Othman, M.H.D., Kadir, S.H.S.A., Kamal, F., Abdullah, M.S., Ng, B.C., The effect of air gap on the morphological properties of PSf/PVP90 membrane for hemodialysis application, *Chemical Engineering Transactions*, 56 (2017) 1591-1596.
- Mohamed, F., Hasbullah, H., Jamian, W.N.R., Salleh, W.N.W., Ibrahim, N., Ali, R.R., Effect of coagulant bath on the gas permeation properties of cellulose acetate asymmetric membrane, *IOP Conference Series: Earth and Environmental Science*, 36 (1) (2016) Article number 012009.
- Jamian, W.N.R., Hasbullah, H., Mohamed, F., Yusof, N., Ibrahim, N., Ali, R.R., Effect of evaporation time on cellulose acetate membrane for gas separation, *IOP Conference Series: Earth and Environmental Science*, 36 (1) (2016) Article number 012008.
- Jamian, W.N.R., Hasbullah, H., Mohamed, F., Yusof, N., Effects of shear rate on O<sub>2</sub>/N<sub>2</sub> gas separation performance of Mindel S-1000, *Journal of Engineering Science and Technology*, 10 (6) (2015) 9-18.

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### RESEARCH EXPERTISE

Semiconductor Materials for Solar Photovaltaic Cell Applications, Membrane for Fluid Separation. Photocatalyst for wastewater treatment

### SELECTED PUBLICATIONS

- Aziz, F., Ismail, A.F., Spray coating methods for polymer solar cells fabrication: A review, Materials Science in Semiconductor Processing, 11 (2015) 416-425.
- Aziz, F., Ismail, A.F., Aziz, M., Soga, T., Effect of solvent annealing on the crystallinity of spray coated ternary blend films prepared using low boiling point solvents, Chemical Engineering and Processing, 79 (2014) 48-55.
- Aziz, F., Ismail, A. F., Preparation and characterization of cross-linked Matrimid (R) membranes using para-phenylenediamine for O<sub>2</sub>/N<sub>2</sub> separation, Separation and Purification Technology, 73 (2010) 421-428.
- Mutalib, M.A., Aziz, F., Jamaludin, N.A., Yahya, N. Ismail, A.F., Mohamed, M.A., Mohd Yusop, M.Z., Salleh, W.N.W., Jaafar, J., Yusof, N., Enhancement in photocatalytic degradation of methylene blue by LaFeO<sub>3</sub>-GO Integrated Photocatalyst-Adsorbents under visible light irradiation, Korean Journal of Chemical Engineering, 35 (2018) 548-556.
- Yahya, N., Aziz, F., Jamaludin, N.A., Mutalib, M.A., Ismail, A.F., Salleh, W.N.W., Jaafar, J., Yusof, N., Ludin, N.A., A Review of Integrated Photocatalyst Adsorbents for Wastewater Treatment, Journal of Environmental Chemical Engineering, 2018.
- Ismail, A.F., Aziz, F., Chemical cross-linking modifications of polymeric membranes for gas separation applications. Membrane Modification, Edited by Nidal Hilal, Mohamed Khayet, Chris J. Wright, 06/2012: pages 363-383; CRC Press.

## STAFF PROFILE



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### RESEARCH EXPERTISE

Polymer-Inorganic Membranes, Microstructurally-Tuned Hollow Fiber For Water and Gas Separation

### SELECTED PUBLICATIONS

- Hebbar, R.S., Isloor, A.M., Zulhairun, A.K., Sohaimi, M.A., Ismail, A.F., Efficient treatment of hazardous reactive dye effluents through antifouling polyetherimide hollow fiber membrane embedded with functionalized halloysite nanotubes, Journal of the Taiwan Institute of Chemical Engineers 72 (2017) 244-252.
- Zulhairun, A.K., Subramaniam, M.N., Samavati, A.a Ramli, M.K.N., Krishparao, M., Goh, P.S., Ismail, A.F.; High-flux polysulfone mixed matrix hollow fiber membrane incorporating mesoporous titania nanotubes for gas separation, Separation and Purification Technology, 180 (2017) 13-22.
- Kajekar, A.J., Dodamani, B.M., Isloor, A.M., Karim, Z.A., Cheer, N.B., Ismail, A.F., Shilton, S.J.; Preparation and characterization of novel PSf/PVP/PANI-nanofiber nanocomposite hollow fiber ultrafiltration membranes and their possible applications for hazardous dye rejection, Desalination, 365 (2015) 117-125.
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### RESEARCH EXPERTISE

Nanostructured Materials Synthesis and Fabrication, Polymeric And Nanocomposite Membranes Fabrication, Desalination and Wastewater Treatment, Gas Separation, Hemodialysis

### SELECTED PUBLICATIONS

- Goh, P.S., Ismail, A.F., Matsuura, T., Perspective and Roadmap of Energy-Efficient Desalination Integrated with Nanomaterials, Separation and Purification Reviews 47 (2) (2018) 124-141.
- Wan Azelee, I., Goh, P.S., Lau, W.J., Ismail, A.F., Facile acid treatment of multiwalled carbon nanotube-titania nanotube thin film nanocomposite membrane for reverse osmosis desalination, Journal of Cleaner Production, 181 (2018) 517-526.
- Abidin, M.N.Z., Goh, P.S., Ismail, A.F., Othman, M.H.D., Hasbullah, H., Said, N., Kadir, S.H.S.A., Kamal, F., Abdullah, M.S., Ng, B.C., Development of biocompatible and safe polyethersulfone hemodialysis membrane incorporated with functionalized multi-walled carbon nanotubes, Materials Science and Engineering C, 77 (2017) 572-582.
- Subramaniam, M.N., Goh, P.S., Abdullah, N., Lau, W.J., Ng, B.C., Ismail, A.F., Adsorption and photocatalytic degradation of methylene blue using high surface area titanate nanotubes (TNT) synthesized via hydrothermal method, Journal of Nanoparticle Research, 19 (6) (2017) Article number 220.
- Subramaniam, M.N., Goh, P.S., Lau, W.J., Tan, Y.H., Ng, B.C., Ismail, A.F., Hydrophilic hollow fiber PVDF ultrafiltration membrane incorporated with titanate nanotubes for decolourization of aerobically-treated palm oil mill effluent, Chemical Engineering Journal, 316 (2017) 101-110.
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### RESEARCH EXPERTISE

Porous Material, Inorganic –Organic Materials, Gas Adsorption

### SELECTED PUBLICATIONS

- Hubadillah, S.K.a, Dzarfan Othman, M.H.a Email Author, Harun, Z.b, Ismail, A.F.a, Iwamoto, Y.c, Honda, S.c, Rahman, M.A.a, Jaafar, J.a, Gani, P.d, Mohd Sokri, M.N.ac; Effect of fabrication parameters on physical properties of metakaolin-based ceramic hollow fibre membrane (CHFM), *Ceramics International*, 42 (4) (2016) 15547-15558.
- Mohd Sokri, M.N., Onishi, T.a, Daiko, Y., Honda, S., Iwamoto, Y.; Hydrophobicity of amorphous silica-based inorganic-organic hybrid materials derived from perhydropolysilazane chemically modified with alcohols, *Microporous and Mesoporous Materials*, 215 (2015) 183-190.
- Sokri, M.N.M., Daiko, Y., Honda, S., Iwamoto, Y.; Synthesis of microporous amorphous silica from perhydropolysilazane chemically modified with alcohol derivatives, *Nippon Seramikkusu Kyokai Gakujutsu Ronbunshi/Journal of the Ceramic Society of Japan*, 123 (2015) 292-297.
- Mohd Sokri, M.N., Onishi, T., Mouline, Z., Daiko, Y., Honda, S., Iwamoto, Y.; Polymer-derived amorphous silica-based inorganic-organic hybrids having alkoxy groups: Intermediates for synthesizing microporous amorphous silica materials, *Nippon Seramikkusu Kyokai Gakujutsu Ronbunshi/Journal of the Ceramic Society of Japan*, 123 (2015) 732-738.

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### RESEARCH EXPERTISE

Multi-Functional Material, Stimuli-Responsive Materials, Bio-Based Material

### SELECTED PUBLICATIONS

- Chen, D., Xia, X., Wong, T.W., Bai, H., Behl, M., Zhao, Q., Lendlein, A., Xie, T.; Omnidirectional Shape Memory Effect via Lyophilization of PEG Hydrogels, Macromolecular Rapid Communications, 38 (7) (2017) Article number 1600746.
- Soheilmoghaddam, M., Adelnia, H., Sharifzadeh, G., Wahit, M.U., Wong, T.W., Ali Yussuf, A.; Bionanocomposite regenerated cellulose/single-walled carbon nanotube films prepared using ionic liquid solvent, Cellulose, 24 (2) (2017) 811-822.
- Yang, M., Wu, J., Bai, H., Xie, T., Zhao, Q., Wong, T.-W.; Controlling three-dimensional ice template via two-dimensional surface wetting, AIChE Journal, 62 (12) (2016) 4186-4192. Sharifzadeh, G.aEmail Author, Wahit, M.U.bEmail Author, Soheilmoghaddam, M.c, Whye, W.T.d, Pasbakhsh, P.e; Kappa-carrageenan/halloysite nanocomposite hydrogels as potential drug delivery systems, Journal of the Taiwan Institute of Chemical Engineers, 67 (2016) 426-434.
- Tham, W.H.a, Wahit, M.U.abEmail Author, Abdul Kadir, M.R.c, Wong, T.W.a, Hassan, O.d ; Polyol-based biodegradable polyesters: A short review, Reviews in Chemical Engineering, 32 (2) (2016) 201-221.



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### RESEARCH EXPERTISE

Membrane Processes For Fuel Cells Application

### SELECTED PUBLICATIONS

- Norddin, M.N.A., Daud, S.S., Rosli, S.E., Jaafar, J., Sudirman, R., Catalyst loading in electrode of SPEEK/cSMM electrolyte for DMFC, ISESD 2016, 7886689 (2016) 41-45.
- Rajis, Z., Norddin, M.A.M., Mustafa, A., Ismail, A.F, Preparation and structural characterization of binary catalyst for dye wastewater, Jurnal Teknologi 79 (1-2), pp. 65-71 2017.
- Hanifah, M.F.R., Jaafar, J., Aziz, M., Ismail, A.F., Othman, M.H.D., Rahman, M.A., Norddin, M.N.A.M., Yusof, N., Salleh, W.N.W.; Efficient reduction of graphene oxide nanosheets using Na<sub>2</sub>C<sub>2</sub>O<sub>4</sub> as a reducing agent, Functional Materials Letters 8 (2), 1550026 2015.
- Junoh, H., Jaafar, J., Mohd Norddin, M.N.A., Ismail, A.F, Othman, M.H.D., Rahman, M.A., Yusof, N, Wan Salleh, W.N., Ilbeygi, H; A Review on the fabrication of electrospun polymer electrolyte membrane for direct methanol fuel cell, Journal of Nanomaterials 2015, 690965
- Rosli, S.E., Mohd-Norddin, M.N.A., Jaafar, J., Sudirman, R.; Study of the variation of catalyst loading in cathode for SPEEK/CSMM membrane in direct methanol fuel cell (DMFC), Jurnal Teknologi (Sciences and Engineering) 69 (9), pp. 57-60 2014.
- Kusworo, T.D., Dewi, E.L., Arti, D.K., Dhuhita, A., Ismail, A.F., Mohd Norddin, M.N.A., Budiyo; Preparation of poly ether ether keton as alternative membrane for direct methanol fuel cell (DMFC), Middle East Journal of Scientific Research 18 (9), pp. 1240-1252 2013.

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### RESEARCH EXPERTISE

Graphene, Fundamental Carbon Nanomaterials Synthesis, Materials Characterization, In Situ TEM/SEM Works.

### SELECTED PUBLICATIONS

- Sharma, S., Rosmi, M.S., Yaakob, Y., Yusop, M.Z.M., Kalita, G., Kitazawa, M., Tanemura, M., In situ TEM synthesis of Y-junction carbon nanotube by electromigration induced soldering, Carbon, 132 (2018) 165-171.
- Liu, H., McBride, J.W., Yusop, M.Z.M.; Surface characterization of a Au/CNT composite for a MEMS switching application, Nanotechnology - IEEE NANO 7751537 (2016) 751-754.
- Rosmi, M.S., Yaakob, Y., Sharma, S., Yusop, M.Z., Kalita, G., Tanemura, M.; In situ TEM visualization of Pd assisted graphene growth in nanoscale, Nanotechnology - IEEE NANO 7751486 (2016) 622-623.
- Wang, Z., Ogata, H., Morimoto, S., Fujishige, M., Takeuchi, K., Muramatsu, H., Hayashi, T., Ortiz-Medina, J., Mohd Yusop, M.Z., Tanemura, M., Terrones, M., Hashimoto, Y., Endo, M.; Microwave plasma-induced graphene-sheet fibers from waste coffee grounds, Journal of Materials Chemistry A, 3 (28) (2015) 14545-14549.
- Rezazadeh Shirdar, M., Sudin, I., Taheri, M.M., Keyvanfar, A., Yusop, M.Z.M., Kadir, M.R.A., A novel hydroxyapatite composite reinforced with titanium nanotubes coated on Co-Cr-based alloy, Vacuum, 122 (2015) 82-89.
- Khalajabadi, S.Z., Abdul Kadir, M.R., Izman, S., Mohd Yusop, M.Z., Facile fabrication of hydrophobic surfaces on mechanically alloyed-Mg/HA/TiO<sub>2</sub>/MgO bionanocomposites, Applied Surface Science, 324 (2015) 380-392.

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#### EXPERTISE

Commercializing Membrane Products and Industrial R&D  
Coordination



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#### EXPERTISE

Design & Manufacture Lab Scale/Commercialized  
Membrane Filtration System, Technical Support on  
Filtration Engineering and Industrial R&D Coordination



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#### EXPERTISE

Hollow Fiber Membrane Spinning, Water & Wastewater  
Membrane filtration, Atomic Absorption Spectroscopy (AAS)  
and Scanning Electron Microscopy (SEM)



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#### EXPERTISE

Mercury Intrusion Porosimetry (MIP), High Performance Liquid Chromatography (HPLC) and Atomic Absorption Spectroscopy (AAS).



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#### EXPERTISE

Differential Scanning Calorimetry (DSC), Thermogravimetric Analysis (TGA) and Contact Angle (CA)

# MAJOR ACHIEVEMENTS OF AMTEC 2012-2018

## 2018

- Assoc. Prof. Dr. Mohd Hafiz Dzarfan : Recipient of Hitachi Scholarship Research Support Program 2018 Science Prize for Innovation, Research and Education (ASPIRE Prize)
- Assoc. Prof. Dr. Juhana Jaafar : Silver Award, 29th International Invention, Innovation & Technology Exhibition (ITEX 2018)
- Dr. Farhana Aziz : Bronze Award, 29th International Invention, Innovation & Technology Exhibition (ITEX 2018)
- Dr. Norhaniza Yusof : Silver Award, 29th International Invention, Innovation & Technology Exhibition (ITEX 2018)
- Assoc. Prof. Dr. Mohd Hafiz Dzarfan Othman : AMS11 New Member Special Award, The 11<sup>th</sup> Conference of the Aseanian Membrane Society, Brisbane, Australia

## 2017

- Prof. Dr. Ahmad Fauzi Ismail: Outstanding Inventor Award, The Invention and Innovation Award, Malaysia Technology Expo (MTE 2017)
- Assoc. Prof. Dr. Mohd Hafiz Dzarfan: Malaysia Representative for 2017 Asia-Pacific Economy Corporation (APEC) Science Prize for Innovation, Research and Education (ASPIRE Prize)
- Assoc. Prof. Dr. Mohd Hafiz Dzarfan: Asian Invention Excellence Award, 28th International Invention, Innovation & Technology Exhibition (ITEX 2017), K-Membrane: Smart Membrane For Oily-Wastewater Treatment.
- Assoc. Prof. Dr. Juhana Jaafar: Guest Scholar of Meiji University International Exchange Programs Fund 2017 Short Term Program
- Dr. Wan Norhayati Wan Salleh: Recipient of AUN/SEED-Net Short-term Research in Japan
- Dr. Farhana Aziz: Recipient of AUN/SEED-Net Short-term Research in Japan
- Dr. Norhaniza Yusof: Recipient of SAKURA Exchange Program in Science, Meiji University, Tokyo, Japan, October 2017
- Dr. Hasrinah Hasbullah: Invited to attend Global Chemists' Code of Ethics Science and Technology Leadership Institute Workshop in Melbourne Australia
- Dr. Mohd Zamri Yusop: Granted Private Research Grant CREST worth RM 780k for 3 years
- Dr. Mohd Zamri Yusop: Recipient of AUN/SEED-Net Short-term Visit Program in Asean

## 2016

- Prof. Dr. Ahmad Fauzi Ismail: Malaysia's Rising Star Award
- Prof. Dr. Ahmad Fauzi Ismail: Most Cited Researchers - Chemical Engineering
- AMTEC : Best Academia-Industry Collaboration
- Assoc. Prof. Dr. Mohd Hafiz Dzarfan : Kurita Water and Environment Foundation Research Grant Award
- Assoc. Prof. Dr. Mohd Hafiz Dzarfan: International Grant Award Nippon Sheet Glass Foundation for Materials Science and Engineering
- Dr. Naznin Sultana: Elsevier Reviewer's award
- Dr. Lau Woei Jye: Recipient of UI-RESOLV
- Dr. Juhana Jaafar: Recipient of AUN/SEED-Net Short-term Research in Japan
- Dr. Goh Pei Sean: INATEX Chancellor Award

## 2015

- AMTEC has been officially recognized as the Higher Institution Centres of Excellence (HiCoE) in the niche of Water Reclamation by the Ministry of Higher Education.
- Signing Memorandum of Agreement with PHILOS CO. LTD., KOREA
- Signing Memorandum of Agreement with Aliran Air Resources Sdn Bhd
- Signing Memorandum of Agreement with Foresight Industries Sdn Bhd

## 2014

- Prof. Dr. Ahmad Fauzi Ismail: Merdeka Award
- Prof. Dr. Ahmad Fauzi Ismail: IChemE (Malaysia) Innovator of the year 2014
- Prof. Dr. Ahmad Fauzi Ismail: Chemical Engineering Journal Top Cited Papers for 2011 and 2012 from Elsevier, a world-leading provider of Information solutions
- Dr. Lau Woei Jye: Endeavour Fellowship from Victoria University, Melbourne, Australia

## 2013

- Prof. Dr. Ahmad Fauzi Ismail: Anugerah Akademik Negara 2013
- Prof. Dr. Ahmad Fauzi Ismail: National Intellectual Property Award (Patent Category)
- Prof. Dr. Ahmad Fauzi Ismail :Science & Technology Award from Malaysia Toray Science Foundation
- Dr. Juhana Jaafar: Most Distinguish Award in PECIPTA
- Dr. Juhana Jaafar: Best of Invention Arts & Technology 2013 in PECIPTA

## 2012

- Prof. Dr. Ahmad Fauzi Ismail : Gold Medal Award in 23rd International Invention, Innovation & Technology Exhibition
- Prof. Dr. Ahmad Fauzi Ismail : Top Research Scientists Malaysia' (TRSM)
- Prof. Dr. Ahmad Fauzi Ismail : Brussels Eureka Award in 23rd International Invention, Innovation & Technology Exhibition
- Prof. Dr. Ahmad Fauzi Ismail : Diamond Award (Special Award) in British Invention Show (BIS)-London
- Prof. Dr. Ahmad Fauzi Ismail :Elected as Members of American Chemical Society

# RESEARCH INNOVATIONS/PRODUCTS

## 1. UTM MEMBRANE

Clean and safe water supply is identified as one of the most essential basic needs particularly during the occurrence of disasters. The integrated mobile reverse osmosis (RO) water purification system (UTM Membrane) is developed by AMTEC, UTM. Water resources that are used for the treatment of process water is obtained from river water and tube well. The UTM Membrane is intended to provide quality water support to small units where the distribution of water is not feasible during the occurrence of natural disaster. The system provides clean water support without committing large water production assets from the logistics support structure. The system tailors water production capacity to fulfil the demands of independent Special Operations Forces, detachments and units typically engaged in remote site missions. The research team monitors the quality of water supplied from the RO portable water treatment systems in several phases to ensure the constant supply of clean and safe water to the end users.



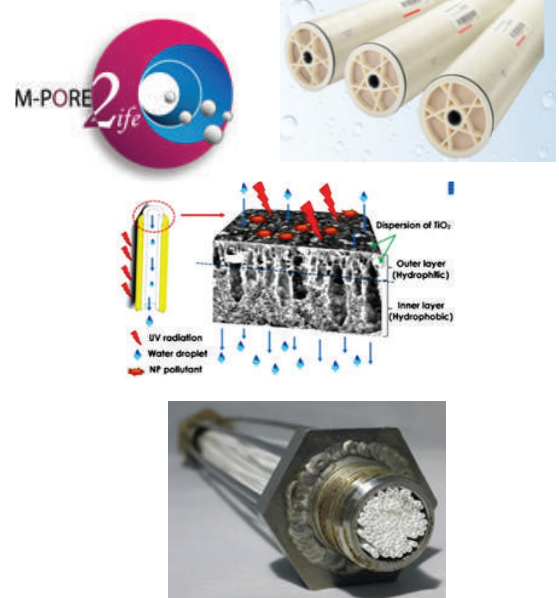
## 2. Hybrid Photocatalytic Dual Layer Membranes For Destruction Of Persistent Organic Pollutants

M-PORE2ife is a dual layer hollow fiber membranes which fabricated via a single step co-extrusion technique with immobilized titanium dioxide (TiO<sub>2</sub>) nanoparticles that embedded in their outer layer for hybrid photocatalytic application.

- M-PORE2ife membrane that capable to act for dual function, which is the outer layer for photocatalytic process and the inner layer for separation process.
- M-PORE2ife membrane is an innovative and cost effective solution for destruction of persistent organic pollutants in wastewater.

Simpler fabrication using single step co-extrusion process. No need coating process like other multilayer membrane.

- Consists of two layer with good adhesion
- Thin photocatalytic layer (up to 50µm) onto thick separation layer (about 200µm)
- High loading of photocatalyst (up to 70wt%) for better degradation properties.
- Symmetric structure with long finger-like voids from inner and outer layer
- M-PORE2ife membrane shows superior photocatalytic performance of nonylphenol (one of POPs compound) compared to single layer hollow fibre membranes due to the better dispersion of TiO<sub>2</sub> nanoparticles on the outer membrane surface.



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**Gold Medal in INATEX 2016**  
**Best Invention Award in INATEX 2016**



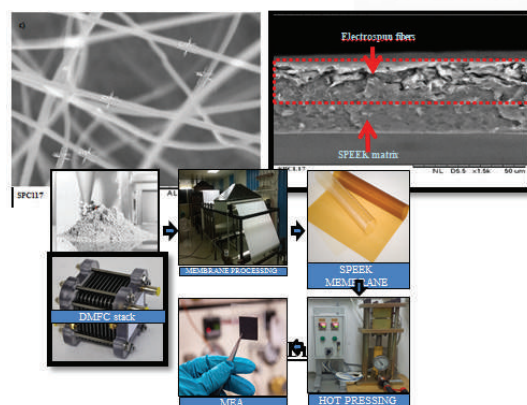
### 3. SPEEK NF-DMFC Portable Power Generator

Direct methanol fuel cell (DMFC) portable power generator is a new type of electrical generator which utilised fuel cell technology to develop a clean and green energy. DMFC is an energy conversion device that transform energy from chemical reaction of methanol fuel (cheap price RM1.16/litre and high energy density 3,800 kcal/L) directly to electrical energy using electrochemical principle.

At the heart of the fuel cell system, the in-house sulfonated polyetheretherketone (SPEEK)-based electrolyte membrane that was produced via novel formulation that consists of clay (Cloisite) in nanofiber form is used instead of commercial Nafion® membrane. The novelty of this innovation relies on the membrane's morphological structure in which the fabricated Cloisite clay nanofibers using electrospinning technique were uniformly distributed in the SPEEK polymer matrix.

This unique morphology has contributed to an exfoliated dispersion structure of inorganic in organic material that is very desirable structure to obtain high performance for a proton exchange membrane. The SPEEK-Cloisite nanofiber based membrane with 70% cheaper and 80% higher in performance than the commercial Nafion®. Owing to the significant features of the SPEEK-Cloisite nanofiber electrolyte membrane that has high fuel barrier properties, the SPEEK NF-DMFC power generator exhibited higher energy conversion efficiency, less waste heat, consume less fuel and emit much lesser CO<sub>2</sub> gas by-product. Due to its simplicity and small footprint system, SPEEK NF-DMFC power generator is a moving forward technology with high-performance, compact and portable energy generator.

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Gold Medal-MTE 2018  
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Gold Medal-PECIPTA 2013  
Best of the Best -PECIPTA 2013  
Most Distinguished Award-PECIPTA 2013  
Gold Medal-INATEX 2012



### 4. Adsorptive Ultrafiltration Mixed Matrix Membrane For Heavy Metals Removal (Aduf Membrane)

This product called AdUF membrane is a novel adsorptive membrane with unique dual features of simultaneous separation and adsorption which is produced via a simple physical mixing and phase inversion process. It comprised of a very promising additive (hydrous ferric oxide) responsible for improved heavy metals removal (performance) and reduces fouling (loss) that cannot be removed with the common UF membranes. In addition, the incorporation of the nanomaterial resulted to a porous membrane with superior hydrophilicity that improves the flux and adsorptive features of the UF membranes. The ultimate objectives of this product are to provide alternative and feasible method that can treat water laden with heavy metals in single step operation and to ease the fabrication technique with low cost materials.

- Dual functions adsorptive mixed matrix membrane for simultaneous heavy metal removal and purified water production
- Fabricated via a simple phase inversion process
- Effectively treat various contaminants including heavy metal ions in a single-step procedure
- Robust, stable and sustainable nanocomposite membranes that can deal with wide range of wastewater at minimal cost

**Dr. Norhaniza Yusof**  
norhaniza@petroleum.utm.my/  
norhaniza@utm.my



• Silver Medal MTE 2018 and Silver Medal ITEX 2018  
• Gold Medal Award in International Invention Innovation and Design Johor 2017  
• First Runner Up in Materials Lecture Competition 2017  
• Silver Medal Award in INATEX 2016

## 5. Nano-Enabled Membrane for CO<sub>2</sub> Capture

There has been an increasing research and industry interest in carbon capture through membranes technology, mainly driven by the need for simultaneously reducing greenhouse gas emissions and energy application. This invention involves CO<sub>2</sub> capture with a focus on the developments and breakthroughs in membrane material design and separation process engineering. The innovation of this product involves the design of membranes with desirable permeance and selectivity while having chemically and physically stable structures. This goal is achieved through the introduction of the start-of-the-art carbon based nanomaterials into the conventionally used polymer membrane. This membrane is endowed with excellent separation properties and durability for the development of membrane capture processes with optimal configurations to achieve the separation targets (e.g., CO<sub>2</sub> removal rate and product purity) at minimum capital and operational expenditures (CAPEX and OPEX). Some of the interesting features of this product are:

- Carbon nanotubes-enabled membrane with facilitated transport feature
- Tunable nanomaterial properties
- High selectivity and permeability
- Chemically stable
- Low fouling and maintenance
- Cost effective



**Dr. Goh Pei Sean**

gpsean@petroleum.utm.my/ gpsean@utm.my

- Gold Award and Vice Chancellor Award in INATEX 2016
- Silver Award in ITEX 2017

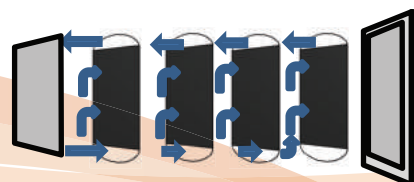
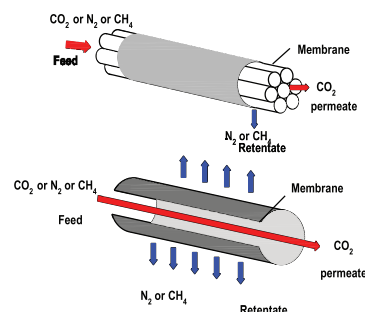
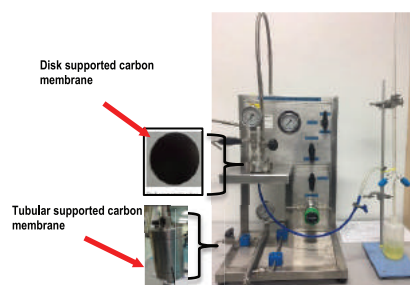


## 6. Supported Carbon Membrane For CO<sub>2</sub> Capture

- Supported carbon membrane that capable to fabricate via a single step coating-carbonization cycle which can reduce production time and cost
- Can be easily fine tune by controlling the carbonization conditions
- Offer excellent thermal resistance and chemical stability
- Offer longer lifetime compare to unsupported carbon membrane
- Can be fabricated in the form of disk-supported or tubular-supported and up-scaled according to the industry needs

**Dr. Wan Norharyati Wan Salleh**  
hayati@petroleum.utm.my

**Silver Medal in INATEX 2017**

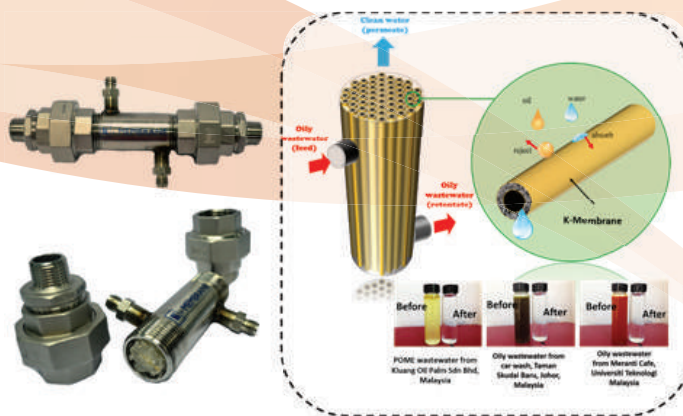


## 7. K-Membrane: Smart Membrane for Oily Wastewater Treatment

This product described the innovation of novel low cost, green ceramic hollow fibre membrane derived from Malaysian kaolin material and prepared via phase inversion and sintering technique for oily wastewater treatment, known as "K-Membrane". Ceramic suspension was prepared by mixing Malaysian kaolin powder as main material, NMP as solvent, Arlacel P135 as dispersant, PESf as binder and PEG 30000 as pore agent. As a result, robust, cheap, and superior membrane characteristic with estimated cost of only \$77/m<sup>2</sup> which is 549% lower than alumina membrane (\$500/m<sup>2</sup>) and almost similar with commercial polymeric membrane (\$50-\$70/m<sup>2</sup>) has been produced. The excellent performance of K-Membrane with 320 L/m<sup>2</sup> h flux and 99.99% rejection of TOC and turbidity, comparable with commercial polymeric membrane (57.3 L/m<sup>2</sup> h flux, 99.99% rejection). It should be noted here that K-Membrane possessed outstanding chemical and thermal resistant, thereby, had a lifetime of more than 5 years.

- High performance of inexpensive super-hydrophilic kaolin membrane separation for oily-wastewater separation application.
- Enhanced structure prepared via in house phase inversion and sintering system.

**Assoc. Prof. Dr. Mohd Hafiz Dzarfan Othman**  
hafiz@petroleum.utm.my

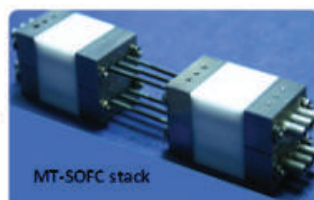
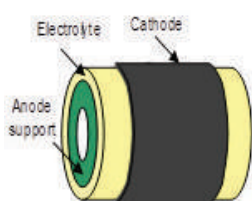


Gold Medal in MTE 2017  
Asian Invention Excellence Award in ITEX 2017  
Gold Medal in ITEX 2017  
Best Oral Presenter in ICMTA India 2017  
Second runner up for Material Lecture Competition (2017)  
Gold Medal PECIPTA2017  
Silver Medal SIIF2017  
Gold Medal in INATEX 2016



## 8. Single-step Fabricated Mt-sofc: Green Energy Converter

- Small size -> more compact.
- Novel single-step fabrication technique; combine 2 steps into 1.
- Higher volumetric output density (23.2 kWm<sup>-2</sup> vs 8k Wm<sup>-2</sup> by planar design).
- The global fuel cell market size is estimated to reach \$5.20 billion, by 2019 .
- Asia-Pacific is estimated to be the largest revenue-generating region for SOFC .
- It is targeted that at least 350 MW of Malaysia's energy demand is supplied by alternative energy sources.
- Development of novel electrolyte/anode dual-layer hollow fiber for micro-tubular solid oxide fuel cells (SOFCs) via a promising single-step co-extrusion/co-sintering technique.



**Assoc. Prof. Dr. Mohd Hafiz Dzarfan Othman**  
hafiz@petroleum.utm.my

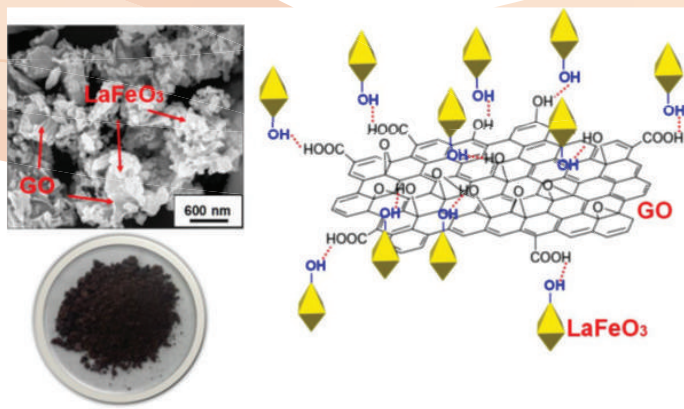
Best of the Best Award, INATEX 2017  
Gold Medal in INATEX 2016





## 9. Smart Integrated Photocatalyst Adsorbents for Degradation of Emerging Contaminants

Significant fractions of emerging contaminants may have adverse effects to human health and harmful to the aquatic environment where they may cause ecological risk such as interferences with endocrine system of higher organisms. The conventional water treatment technologies available nowadays such as adsorption or coagulation do not completely eliminate or destroy the pollutants. The objective of this innovation is to develop an advanced technology for the removal of emerging contaminants namely hybrid integrated photocatalyst adsorbents (IPCA). Such hybrid system are based on advanced oxidation processes (AOPs) and surface adsorption that will oxidize and mineralize almost any organic molecule, yielding  $\text{CO}_2$  and inorganic ions as the final products and providing high surface area for reaction. Lanthanum orthoferrite ( $\text{LaFeO}_3$ ) is a p-type semiconductor with narrow band gaps of 2.65 eV and one of the most common perovskite type oxides and often applied as photocatalyst slurry for water treatment. However, the  $\text{LaFeO}_3$  nanoparticles are easily agglomerated due to high surface energy, which leads to serious decrease of the performance. Immobilization of the photocatalyst on the surface of an appropriate adsorbent is one of the effective ways to overcome the agglomeration problem and increases the pollutants adsorption. Adsorbent supports the photocatalyst as well as concentrates the pollutants around it to increase the contact surface of the photogenerated reactive species. In this work, graphene oxide (GO) as the adsorbents were integrated with a photocatalyst,  $\text{LaFeO}_3$ , designated as integrated photocatalyst adsorbents (IPCA). Graphene oxide, with its unique structure of one-atom thick planar sheets of  $\text{sp}^2$ -bonded carbon atoms closely packed in a honeycomb crystal lattice, has attracted a great deal of scientific attentions because of its outstanding mechanical, electrical, thermal, surface, and optical properties.  $\text{LaFeO}_3/\text{GO}$  IPCA was prepared through the synthesis of  $\text{LaFeO}_3$  using the sol gel method and later GO is added using solution processing. Then, the synthesized  $\text{LaFeO}_3/\text{GO}$  IPCA showed an excellent performance in degrading the emerging contaminants.



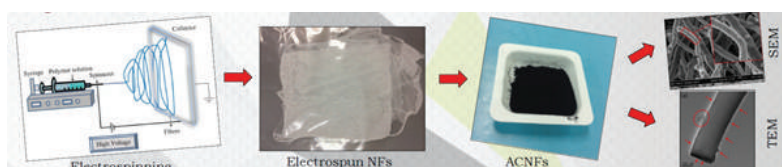
**Dr. Farhana Aziz**  
farhana@utm.my

Bronze Medal in INATEX 2016  
Bronze Medal in ITEX 2018

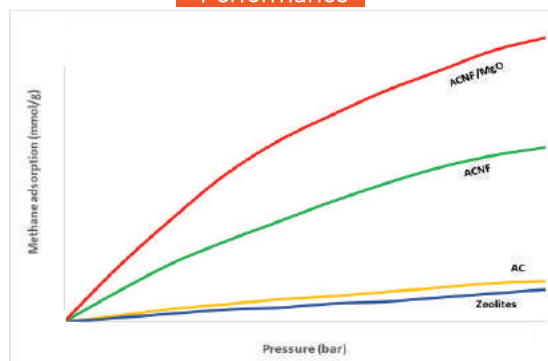


## 10. Smart Activated Carbon Nanofibers for Methane Adsorption

- Smart ACNFs is a modification of existing activated carbon (AC) and carbon nanofibers (CNFs) with structural improvement by adding magnesium oxide ( $\text{MgO}$ ).
- The unique and simple electrospinning approach and physical activation resulting ACNFs with larger SSA and higher adsorption, making it comparable with the complicated chemical activation method.
- This product also a cost-effective adsorbent as it can be mass-produced by simple electrospinning and physical activation.
- ACNFs in ANG tank can store over six times the amount of NG at 350 psi and 20% more NG at 3500 psi than in a conventional CNG tank.
- It also possible to use low pressure tanks that are lighter and can be conformed to fit in various areas of empty space in a vehicle



Performance



**Dr. Norhaniza Yusof**  
norhaniza@petroleum.utm.my/  
norhaniza@utm.my

- Special Best Invention Award INATEX 2017
- Gold Medal Award INATEX 2017
- Bronze Medal Award Malaysia Technology Expo (MTE 2018)



# FACILITIES

## AMTEC Main Building (N29A)



## Membrane Fabrication Equipments



Hollow Fiber Membrane Fabrication Machine



Electrospinning for Nanofiber Fabrication



Flat Sheet Membrane Casting Machine



Ceramic Membrane Sintering System

## AMTEC N09



Pyrolysis System



Membrane Coating and Drying System

## Analytical Instruments



GC-MS Chromatography



High Performance Liquid Chromatography (HPLC)

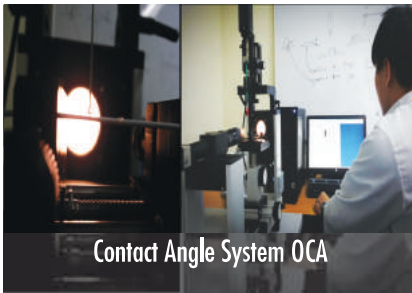


Uv-Vis Spectrometer

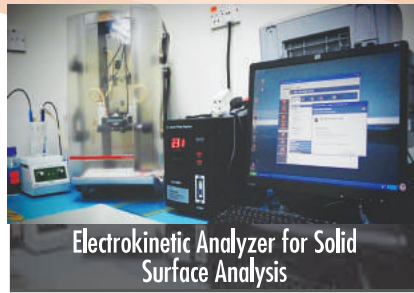


# ANALYTICAL INSTRUMENTS

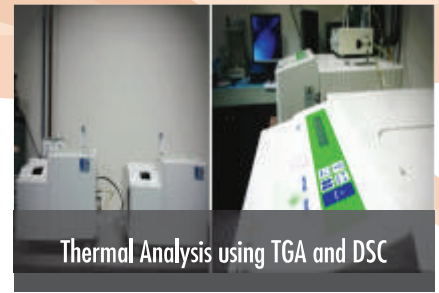
## Analytical Instruments



Contact Angle System OCA



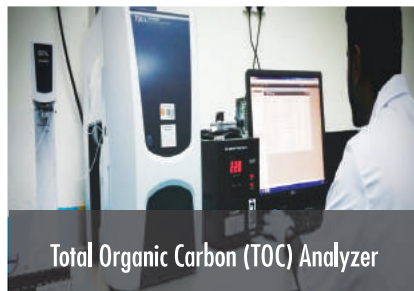
Electrokinetic Analyzer for Solid Surface Analysis



Thermal Analysis using TGA and DSC



Scanning Electron Microscopy (SEM)



Total Organic Carbon (TOC) Analyzer

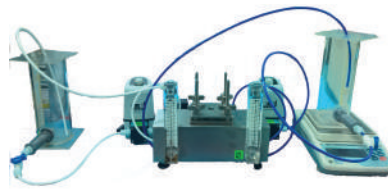


Fourier Transform Infrared Spectroscopy (FTIR)

## Membrane Testing Facilities



Membrane Filtration System



Forward Osmosis Permeation System



Membrane Dialysis System



Submerge Photocatalytic Membrane



Gas Permeation Test



Membrane Contactor System



Industrial Lab Scale Hybrid MF + UF + RO Membrane Testing system

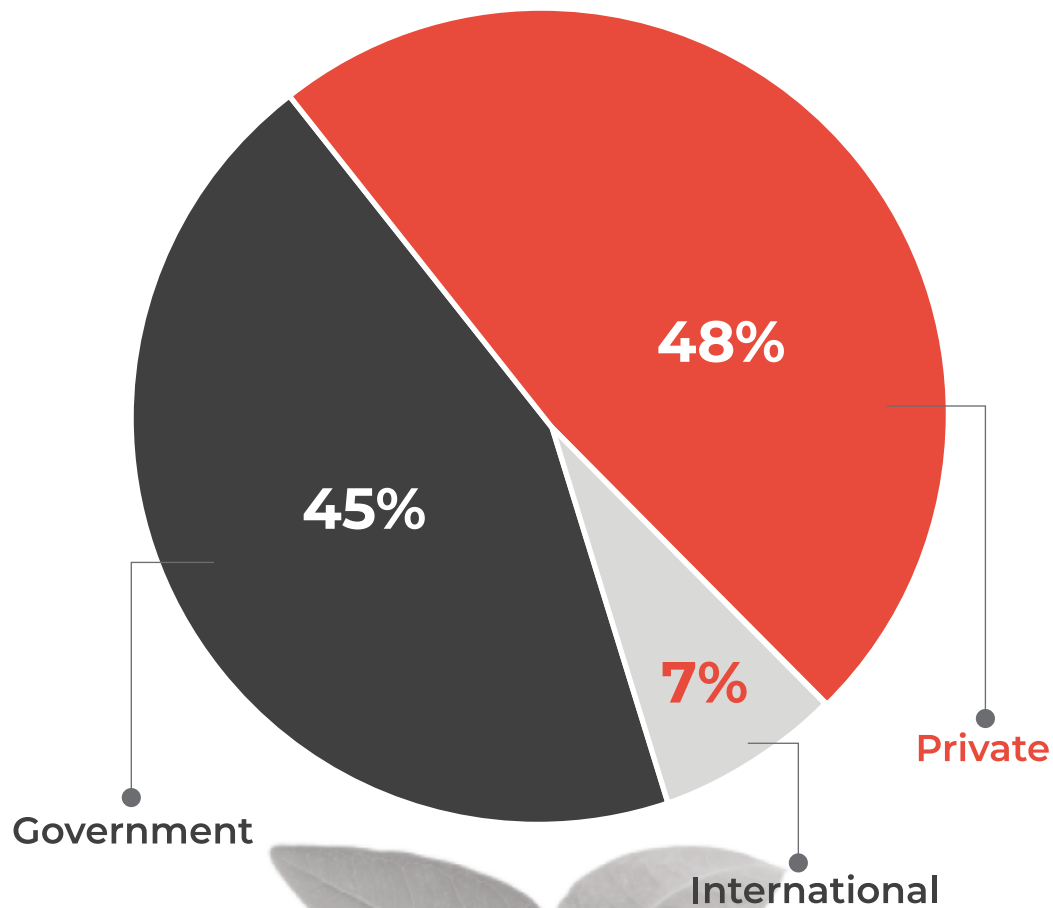


Industrial Lab Scale Hybrid MBR & RO Membrane Testing System



## RESEARCH FUNDING

Total grant secured between 2008-2017  
**RM31, 049, 598 ~ USD7, 762, 400**



### Grant awarded by year

YEAR	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
AMOUNT (RM)	1,473,578	3,231,325	416,865	4,747,000	7,780,880	2,011,000	2,011,000	997,700	8,380,250	8,857,211.75

# ROADMAP

2013-2014

SHORT TERM (1-2 years)

- Being recognise as HICoE
- Upgrading AMTEC lab in N09
- Contract strategies fundamental and applied researches of robust membrane for gas separation, water and wastewater treatments and energy applications.
- Research output :
  - H-index > **5** /staff
  - Total citation > **50**/year
  - **2** books published
  - **3** innovation awards/year
- Human capital resources :
  - **1** deputy director
  - **2** attachment students
  - **2** post-docs
  - Academic staff with PhD
  - **1** visiting researcher
- PG student enrolment : **30** /year

COMPLETED

2015-2017

MID TERM (3-5 years)

- High-end instrument for R&D characterization
- Establishment of N09 as advanced renewable energy lab
- Upgrading AMTEC as high-end lab
- Commercializing of membrane systems for gas, water and energy for indstutrial applications
- Strategic niche area collaboration with industries
- 1 international research grants/year
- Consultancy project with industry
- RM50k/year income from services and industries and training
- ISO standard certificate for all equipment
- Research output;
  - Total citation > **100** / year
  - **5** publication in high impact journal (IF>10)
  - H-index > **10** / staff
  - **2** books by international publisher
  - **3** patents / year
- Human capital resources :
  - **3** visiting researchers
  - **5** post-docs
  - **5** post graduate students/staff
  - **4** editor in journal
- PG student graduated : **10** / years

COMPLETED

2018-2022

LONG TERM (5-10 years)

- Organized high impact international conference /2 years
- Attain Journal of Applied Membrane Science as Scopus indexed/high impact factor journal.
- Securing rmM/year national research grants
- Securing RM1M/year income from R&D&C
- Generat RM500K/year income from consultancies
- Upgrading the AMTEC main building
- Well-structured organization :
  - 10 research officers
  - 1 assistance registrar
  - 1 engineer
  - 5 administration staffs
- Establishing a long term collaboration with prestigious institutions
- Research output;
  - **1** publication in prestigious journals(IF>20)
  - **20** international/national patents granted
  - **10** publications in high impact journal (IF>10)
- Human capital resources:
  - **4** visiting researchers
  - **3** research prestigious fellowships
  - **3** Professors
  - **6** Associate Professors
  - **5** Staff with PEng/CEng

ON-GOING

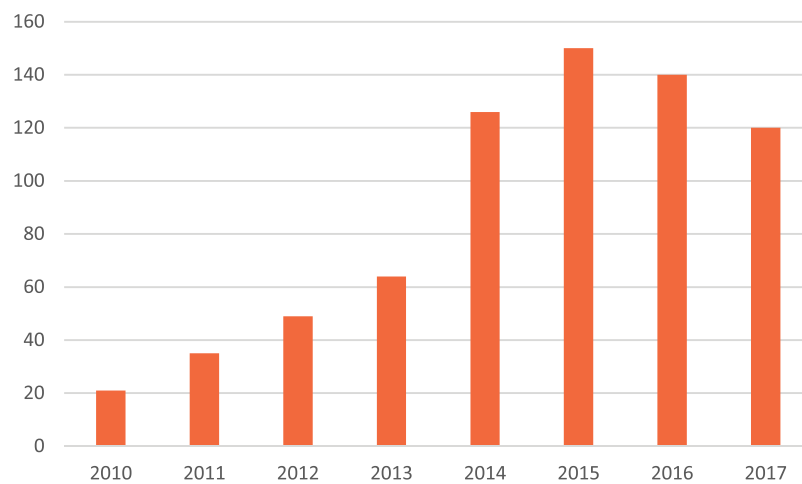
# IMPACT/OUTPUT AMTEC

## IMPACT TO PEERS/ACADEMIA

### Publication Output

	Overall
Publication in Scopus-indexed journal*	718
Cumulative citation in publications*	15,978
Number of research books	7
Patents granted	5
Patents filed	20

\*Data based on Scopus



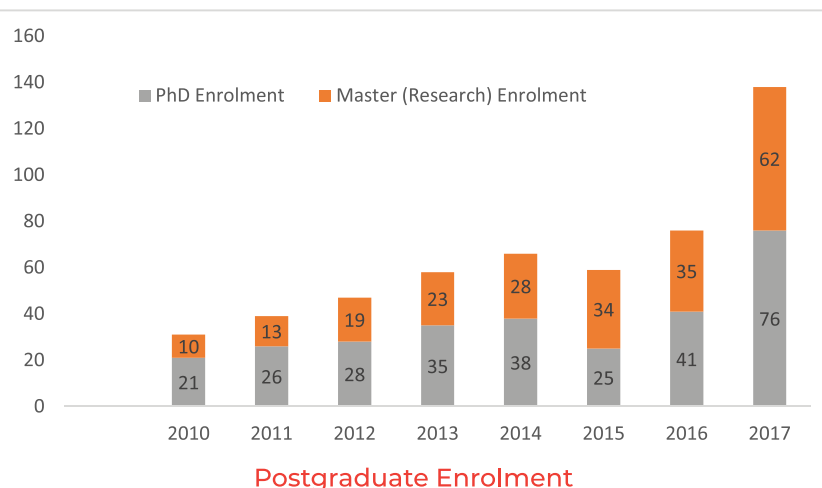
Number of publication in Scopus-indexed journal by AMTEC members

## IMPACT TO GOVERNMENT

### Talent Generation (2010-2017)

#### Postgraduate Graduated

Level	Total (2010-2017)
PhD Graduated	45
Master (by research) Graduated	40





# IMPACT/OUTPUT AMTEC

## IMPACT TO COMMUNITY

### Flood Relief at Kelantan



### Flood Relief at Pekan, Pahang



### Media Highlight On Flood Relief at Pekan, Pahang





## RO System At Kg. Sinarut, Ranau, Sabah



August 2015



### • Media Highlight On Ranau Project



### • Media Highlight On Haemodialysis Project



## Seawater Desalination plant in Kampung Senok, Bachok, Kelantan

### • Media Highlight On Seawater Desalination plant in Kampung Senok, Bachok, Kelantan

#### Loji nyahgaram akhiri beban 3,000 penduduk Kampung Pantai Senok



**BACHOK 3 Feb.** - Pembinaan sebuah loji nyahgaram air laut di Kampung Pantai Senok, Tawang di sini memberi kelegaan kepada lebih 3,000 penduduk yang dibebani masalah mendapatkan bekalan air bersih sejak 45 tahun lalu.

Projek Penyelidikan Translasi-loji Nyahgaram Air Laut berkenaan dipelopori sekumpulan 16 penyelidik tempatan dari Universiti Teknologi Malaysia (UTM) dengan kerjasama Universiti Malaysia Terengganu (UMT).

Menteri Pendidikan Tinggi, Datuk Seri Idris Jusoh berkata, projek tersebut bernilai RM5 juta dan dibiayai sepenuhnya oleh kementerian menerusi Skim Geran Penyelidikan Translasi-loji Nyahgaram Air Laut (STRGS) di bawah Program Penyelidikan Strategik KPT Jaminan Air Kebangsaan.

"Pembinaan loji dan keseluruhan projek mengambil masa selama lima bulan. Loji ini menggunakan kepakaran tempatan dan berkeupayaan menghasilkan bekalan air terawat daripada air laut dengan kapasiti 500,000 liter sehari untuk kegunaan 10,000

**Dengan adanya loji baharu ini, kami tidak perlu lagi meminta air di kampung sebelah atau menunggu lori AKSB."**

**ZAKARIA JUSOH**  
Penduduk

pengguna.

"Kita memilih Kampung Pantai Senok kerana penduduk di sini dilaporkan berdepan masalah mendapat bekalan air bersih dalam tempoh yang lama," katanya ketika ditemui selepas pelancaran Projek Penyelidikan Translasi-loji Nyahgaram Air Laut, di sini hari ini.

Yang turut hadir Ketua Pengarah Pendidikan Tinggi, Datin Dr. Siti Hamidah Tapsir, Pengerusi Mara, Datuk Dr. Awang Adek Husin dan Timbalan Naib Canselor (Penyelidikan dan Inovasi) UTM merangkap Ketua Projek, Prof. Dr. Ahmad Fauzi Ismail.

Sementara itu seorang penduduk, Zakaria Jusoh, 72, berka-

ta, dalam tempoh 45 tahun menetap di kampung itu, rata-rata penduduk terpaksa berulang alik ke kampung berhampiran atau membeli di kedai bagi mendapatkan bekalan air bersih.

"Keadaan tanah di sini menyebabkan air menjadi kurang bermutu dan tidak bersih untuk kegunaan harian. Biasanya saya ambil air dari peti rakan di Kampung Beris Kubur Besar.

"Selain itu kami menerima bantuan pengagihan air bersih dari Air Kelantan Sdn. Bhd. (AKSB) yang datang dengan lori. Dengan adanya loji baharu ini, kami tidak perlu lagi meminta air di kampung sebelah atau menunggu lori AKSB," katanya.

Seorang lagi penduduk, Mail Mat Said, 76, mengakui teruja menerima bekalan air bersih yang dihasilkan daripada loji nyahgaram terbahit setelah berpuluh tahun terpaksa membeli air khususnya untuk memasak di kedai.

"Diharap loji seperti ini dibangunkan lebih banyak di kawasan lain yang berdepan masalah sama," katanya.



## IMPACT TO INDUSTRY

### Research & Consultancy

# 01

## Consultancy Projects

### PETRONAS RESEARCH SDN. BHD. (PRSB)

- Utilization of Excess Production of CO<sub>2</sub> in West Malaysia Operation.
- Fuel Cell Development and Application
- Development of Membrane for High CO<sub>2</sub> Gas Field Separation

### SIME DARBY RESEARCH SDN. BHD.

- Development of Membrane and Membrane System for Single-Step Process for Degumming and De acidification of Crude Palm Oil

# 02

## Industrial Grant Scheme (IGS)

### ECOCOOL TECHNOLOGY SDN.BHD.

- R&D to Produce Commercially Viable and Truly Green Hydrocarbon Refrigerants as Substitutes to CFCs and Other Synthetic
- Refrigerants for the Air Conditioning & Refrigeration Industries.

### RANCANG INNOVATIVE SDN.BHD.

- Research and Development of Ultrahigh Purity Chemical Dispense System

# 03

## Cradle Research & Development Fund (CRDF)

### MEMSYS SDN.BHD.

- Development of A Pilot Plant Scale Membrane Separation System for Water Desalination.

# 04

## Contract Research

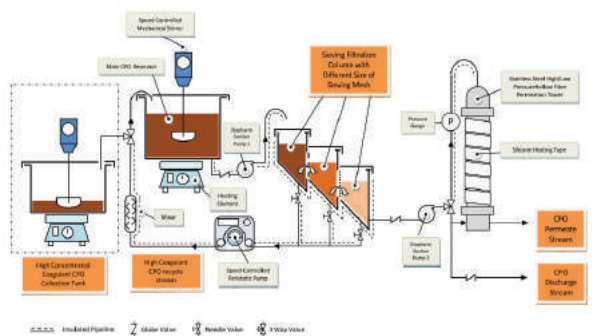
- Kajian dan Analisis kualiti Air di Loji Rawatan Air sekitar Daerah Batu Pahat dan Kluang. Grant approved by State of Johor
- Smart Optical Fibre Sensing System for Tracking Migration of Oil Flow, Petroleum Research Fund

### JOINT RESEARCH PROJECT-PETRONAS



### CONSULTATION SERVICE-SIME DARBY

CPO Filtration System Process Diagram





# Journal Applied Membrane Science And Technology JAMST

## Aims & Scope

Applied Membrane Science & Technology (AMST) provides an international forum for publications of original research, interpretative reviews and discussion of new developments in membrane science and technology. Papers which describe novel theory of membrane science and technology and its application to practice as well as reports of carefully executed experimental work which is soundly interpreted are most welcome.

AMST covers the following areas:

- Chemicals
- Pharmaceuticals
- Biotechnology
- Application of nanotechnology in membrane, food, water and waste water treatment
- Oil and gas
- Mineral extraction
- Renewable energy exploitation
- The journal accepts original research papers, reviews and short communications. Short communications should not exceed 4–6 printed pages and should be a concise and complete description of an investigation.

Audience:

Membrane Technologist, Chemical Engineer, Material Scientist, Civil Engineer, and Environmental Engineer.

Contact:

Please feel free to contact us for any comments, questions or feedback. Send all enquiries about the journal to

[piza@utm.my](mailto:piza@utm.my) (Pn Hapizah) / [lwoeijye@utm.my](mailto:lwoeijye@utm.my) ( Assoc. Prof. Dr. Lau Woei Jye)

Website:

For more information about this journal, please visit

<http://www.penerbit.utm.my/cgi-bin/bi/jamst/index.cgi>



## Latest Volume

Vol 22, No 1 : June 2018

Articles

[Microfiltration Membrane Assisted CO<sub>2</sub> Diffuser for Algae Cultivation](#)

[PDF](#)

U. A. Muhammad Idris Lutfi, S. M. Hizam, K. S. Lau, N. A. H. Md Nordin, M. R. Bilad, Z. A. Putra, M. D. H. Wirzal

[Development of Polysulfone/Activated Carbon Nanofibers Mixed Matrix Membrane for CO<sub>2</sub>/CH<sub>4</sub> Separation](#)

[PDF](#)

Z. Jamian, M. H. Tajuddin, N. Yusof, F. E. Che Othman

[Factors Affecting Membrane Distillation Process for Seawater Desalination](#)

[PDF](#)

Ngo Thi Tra My, Vo Thi Yen Nhi, Bui Xuan Thanh

[Structural Modification of Pristine Graphene Network Towards Nanoporous Graphene Membrane: A Review](#)

[PDF](#)

Mohd 'Azizir-Rahim Mukri, Mohd Syafiq Elias, Madzlan Aziz, Masaki Tanemura, Mohd Zamri Mohd Yusop

[Performance of Nanofiltration Membrane for Printing Wastewater Treatment](#)

[PDF](#)

D. W. Cheah, N. Ramlee, A. L. Desa, N. Misdan, N. H. H. Hairom

[P84 Co-polyimide/Nanocrystalline Cellulose \(NCC\)-based Tubular Carbon Membrane: Effect of Drying Times for Carbon Dioxide Separation at Elevated Carbonization Temperature](#)

[PDF](#)

N. Sazali, W. N. W. Salleh, K. Kadirgama

[Fabrication and Characterization of Low-Cost Poly \(Vinyl Alcohol\) Composite Membrane for Low Temperature Fuel Cell Application](#)

[PDF](#)

Ruhilin Nasser, Siti Khadijah Hubadillah, Mohd Hafiz Dzarfan Othman, Arif Akmal Mohamed Hassan

# National & International Collaborator

## List of International Institutions Collaborators

1. University of Ottawa Canada, Canada
2. Imperial College London, UK
3. Institut Teknologi Bandung, Indonesia
4. Universite Montpellier, France
5. University Prince of Songkhla, Thailand
6. Meiji University, Japan
7. Universiti Diponegoro, Indonesia
8. Nagoya Institute of Technology, Japan
9. University of Strathclyde, Scotland, UK
10. Institut Teknologi Sepuluh Nopember, Indonesia
11. Kobe University, Japan
12. Prime Biologics Ltd, Singapore

## List of Local Institutions Collaborators

1. Malaysian Palm Oil Board (MPOB)
2. SIRIM (AMREC)
3. Malaysia Nuclear Agency
4. Malaysian Agricultural Research and Development Institution (MARDI)
5. Local Public Universities – UKM, USM, UM, UMP, UMT, UTHM, UiTM
6. Local Private Universities – UTP, UTAR





**6 JAN 2017**  
MOU between  
Aliran Ihsan  
Resources Berhad  
and AMTEC, UTM



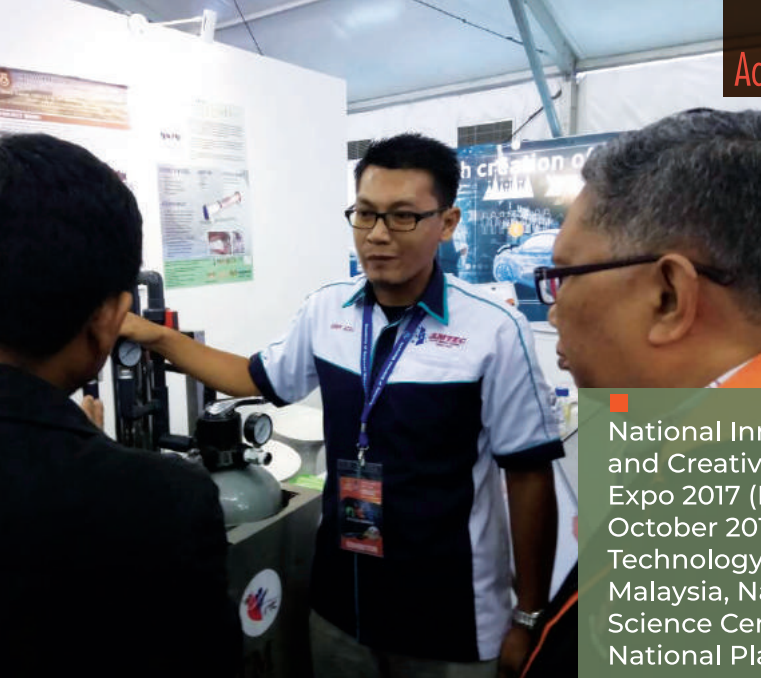
**3 Days Membrane Technology Practical Training on Water & Wastewater Separation Technology on 22<sup>nd</sup>-24<sup>th</sup> April 2018 for UPM Staff & Post Graduate Students**



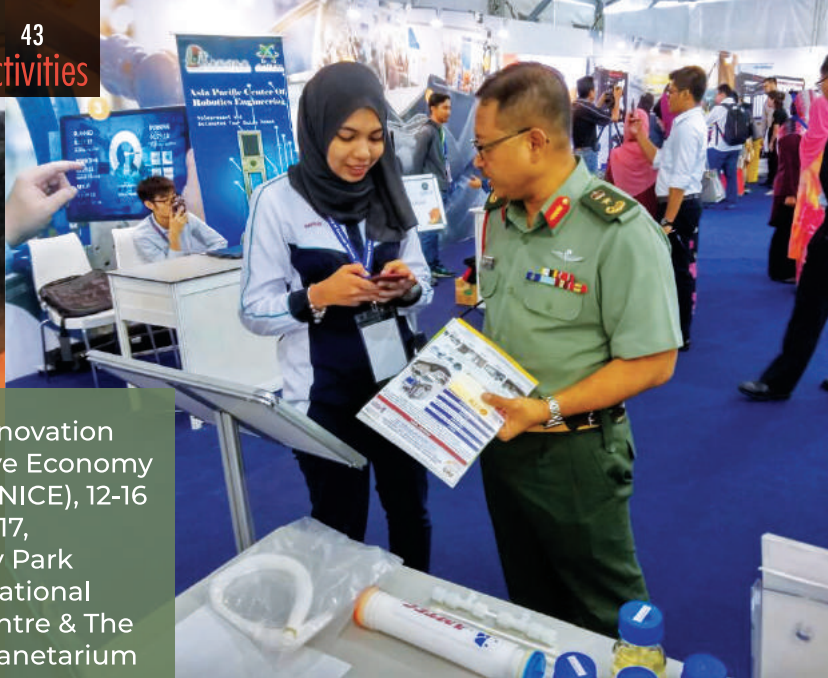
**16 - 25 OCT 2017**  
SAKURA Exchange Program in  
Science at Meiji University







National Innovation and Creative Economy Expo 2017 (NICE), 12-16 October 2017, Technology Park Malaysia, National Science Centre & The National Planetarium



26 FEB - 10 MARCH 2017  
SAKURA Exchange Program  
in Science at Kobe  
University



IEM Water Awareness Campaign (I-WAC),  
7 October 2017, Tasik Ilmu, UTM



Program World  
River Day At  
Kuala Lumpur,  
24 Sept 2017





6 MAY 2018

Department of Biological and  
Agricultural Engineering, Faculty  
of Engineering, UPM Serdang



29 APRIL 2018

ASSOC. PROF. DR.  
DIGANTA B. DAS  
from Loughborough  
University



1 NOV 2016

Sunway College



28 MARCH 2016

FORESIGHT IND. SDN. BHD.



25 JULY 2016

University of Mysore and Vishwas  
Analytics Singapore





**UTM**  
UNIVERSITI TEKNOLOGI MALAYSIA

Fakulti  
Kejuruteraan Petroleum  
& Kejuruteraan  
Tenaga Diperbaharui

45

Visitors

UNIVERSITI PENYELIDIKAN



**5 FEB 2017**

Malaysian Technology Development Corporation Sdn. Bhd., lead by Chief Executive Operation Dato' Norhalim Yunos, Puan Mariamah Hj. Daud, Director & Abdul Rahman Yasir, and Senior Vice President



**20 MARCH 2016**  
Asahi Kasei  
Corporation, Japan



**10 MARCH 2016**

Syarikat Air Johor & Aliran  
Ihsan Resources Berhad



**27 FEB 2017**

Prof Tetsuo Soga and Prof Tanemura Masaki from Nagoya Institute of Technology (NITech), Japan



**23 NOV 2016**

Qatar University



# Staffs & Students Achievements







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