

CURRICULUM VITAE

Doctor of Philosophy (28 August 2015-14 April 2018)
 Advanced Membrane Technology Research Centre
 (AMTEC),
 School of Chemical and Energy Engineering,
 Faculty of Engineering, Universiti Teknologi Malaysia
 (UTM),
 81310 Skudai, Johor Darul Takzim, Malaysia.
**Pro-chancellor award recipient; Doctor of Philosophy
 Program, Field of Research: Gas Engineering**



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ORCID: 0000-0003-3235-9416

PROFESSIONAL QUALIFICATION

Sept 2015 - April
2018



Doctor of Philosophy (4.00/4.00)

Advanced Membrane Technology Research Centre (AMTEC),
 School of Chemical and Energy Engineering,
 Faculty of Engineering, Universiti Teknologi Malaysia (UTM),
 81310 Skudai, Johor Darul Takzim, Malaysia.

Status: Ended

*Project title: Development of Polyimide-based carbon membrane
 for carbon dioxide separation.*

*Develop new class of carbon membrane for CO₂ separation. The
 project includes preparing carbon tubular membrane and
 membrane module, characterization, testing, and assessing
 their applications in industrial.*

May 2015 - August
2015



Research Assistant (RA)

Advanced Membrane Technology Research Centre (AMTEC),
School of Chemical and Energy Engineering,
Faculty of Engineering, Universiti Teknologi Malaysia (UTM),
81310 Skudai, Johor Darul Takzim, Malaysia.

Status: Ended

Project title: Development of Carbon Membrane for gas separation performance

Develop new class carbon membrane for CO₂ separation using alumina support.

Dec 2013 - April
2015



Master in Mechanical Engineering with Manufacturing Engineering-Research (4.00/4.00)

Advanced Manufacturing and Materials Centre (AMMC),
Faculty of Mechanical and Manufacturing Engineering,
University Tun Hussein Onn Malaysia (UTHM),
86400 Parit Raja, Johor, Malaysia

Status: Ended

Project title: Gas permeation properties and characterization of Polymer- based carbon tubular membrane

Carbon membranes offer high potential in gas separation industry due to its highly selective. Therefore, this study aims to investigate the effect of carbonization parameter such as polymer composition, carbonization temperature, and carbonization environment on the gas separation properties.

Sept 2012 - Sept
2013



Research Assistant (RA)

Advanced Membrane Technology Research Centre (AMTEC),
School of Chemical and Energy Engineering,
Faculty of Engineering, Universiti Teknologi Malaysia (UTM),
81310 Skudai, Johor Darul Takzim, Malaysia.

Status: Ended

Project title: Carbon membranes for gas separation

The shortcomings of commercial polymeric membranes have motivated researchers to study for other alternatives, especially

inorganic membranes due to their higher thermal stability, good chemical resistance to solvents, high mechanical strength and long lifetime.

June 2008 - June
2012



Bachelor in Mechanical Engineering with Manufacturing Engineering

Faculty of Mechanical Engineering (FKM),
Universiti Malaysia Pahang,
26600 Pekan,
Pahang, Malaysia.

Status: Ended

Project title: Synthesis and Characterizing of Green Machining Using TiO_2 Based Nanocoolant

In this study, TiO_2 nanoparticles were produced by using sol-gel technique and TiO_2 the nanoparticles were suspended in a specified volume of the base fluid. The present study summarizes the effect of nanofluid with TiO_2 nanoparticles on the performance of the cutting tools.

May 2007 - May
2008



Mallaca Matriculation College (1-year foundation program)

Kolej Matrikulasi Melaka Kementerian Pendidikan Malaysia,
78300 Masjid Tanah,
Melaka, Malaysia.

Science: Physical Science

Status: Ended



Peperiksaan Menengah Rendah (PMR-2004)
Sijil Pelajaran Malaysia (SPM-2006)
 SMK Dato Penggawa Barat,
 J49, Kampung Duku, 82000 Pontian District,
 Johor, Malaysia.
Status: Ended

AWARDS AND ADMINISTRATIVE EXPERIENCES

- | | |
|------|---|
| 2018 | Pro-chancellor award recipient; Doctor of Philosophy Program, Field of Research: Gas Engineering |
| 2018 | Best student award recipient; Doctor of Philosophy Program, Field of Research: Gas Engineering |
| 2018 | -Registration Committee for National Congress on Membrane Technology (NaTCoM 2018) |
| 2018 | -Participant for Pertubuhan Project Kasih 2018 |
| 2018 | -Participant for Dialog Antara Penganut Agama |
| 2017 | -Judge of Energy Click Photography, Regional Summit on Energy Security for Next Generation; Reality and Challenges 2017 |
| 2017 | -Participant for ACS Global Chemist's Code of Ethics |
| 2017 | -Committee for Regional Post-graduate Conference on Environmentally Sustainable Technology (RCET) 2017 |
| 2016 | -Participant for SAKURA Exchange Program in Science 2016 |
| 2016 | -Special Task Committee for National Congress on Membrane Technology (NaTCoM 2016) |
| 2016 | -Participant for Elsevier Author Workshop 2016: How to get published |
| 2015 | -Certificate for Induction Course for new M&E Engineers |
| 2015 | -Participant for UICW 6023 2015 Seminar |

- 2014 -Board of Engineer Malaysia (Mechanical Engineering)
- 2014 -Participant for Bengkel Sehari Penulisan Tesis Pantas & Pengurusan Artikel Mendeley
- 2013 -Committee for 11th International Conference on Membrane Science & Technology; Committee for Nanomaterials Specialized Conference

RESEARCH INTEREST

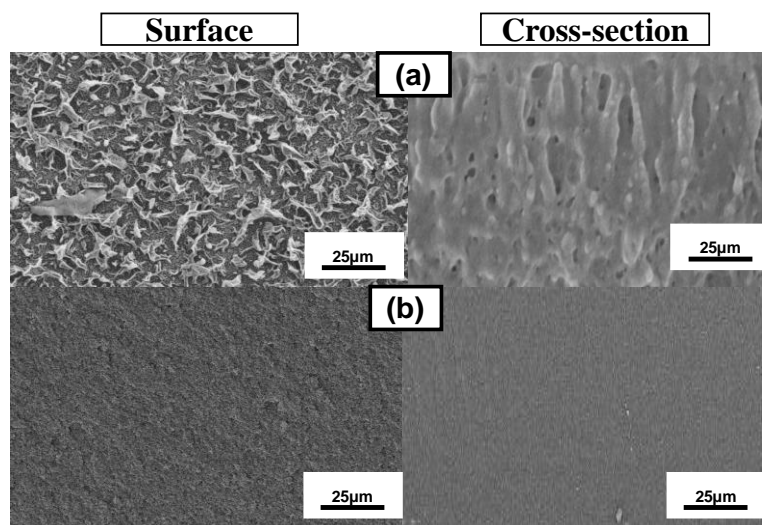
- Mixed Matrix Membrane (MMM)
- Gas separation
- Carbon membrane
- Polymeric membrane
- Renewable Energy
- Multifunctional Material
- Manufacturing processes
- Mechanics and materials
- Membrane Technology
- Mechanical testing
- Machining (Coolant tools)
- Ni-based super alloy
- Oxidation resistant
- Coating technology
- Fluid mechanics
- Heat and energy

RESEARCH GRANTS

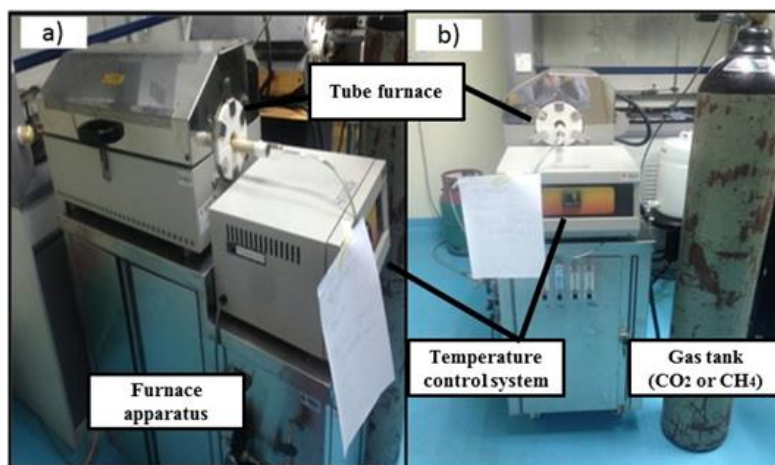
1. *Carbon Membrane for Gas Separation, Research University Grant, Dec 2012 - Dec 2014. Fundamental Research Grant Scheme (FRGS), As a project member. (Grant writer)*
2. *Development of polyimide-based carbon tubular membrane for CO₂ separation, Research University Grant, May 2015 - July 2016. Fundamental Research Grant Scheme (FRGS), As a project member (Grant Writer).*
3. *Development and gas separation performance of disk supported carbon membranes, Feb 2016 - Jan 2018. Fundamental Research Grant Scheme (FRGS), As a project member (Grant Writer).*

RESEARCH EXPERIENCE

Sept 2015 – April 2018 Development of Polyimide-based carbon membrane for carbon dioxide separation.



Micrographs for (a) PI/NCC polymeric membrane, (b) PI/NCC carbon membrane.

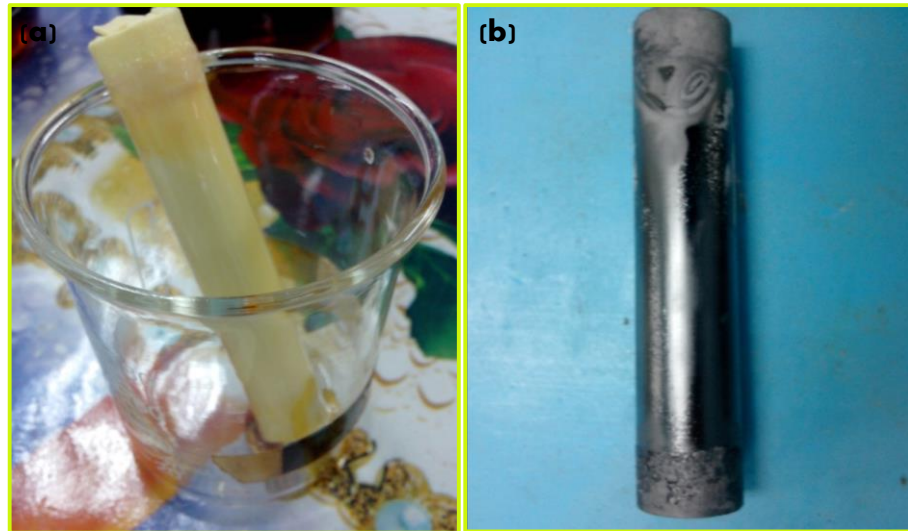


(a) Furnace operation, (b) Complete furnace operation.

Advanced Membrane Technology Research Centre (AMTEC),
School of Chemical and Energy Engineering,
Faculty of Engineering, Universiti Teknologi Malaysia (UTM).

Supervisor: Dr Wannorharyati Wan Salleh
Co-Supervisor: Prof. Datuk Dr. Ahmad Fauzi Ismail

May 2015 – August 2015 **Development of Carbon Membrane for gas separation performance**



(a) Polymeric membrane, (b) Carbon membrane

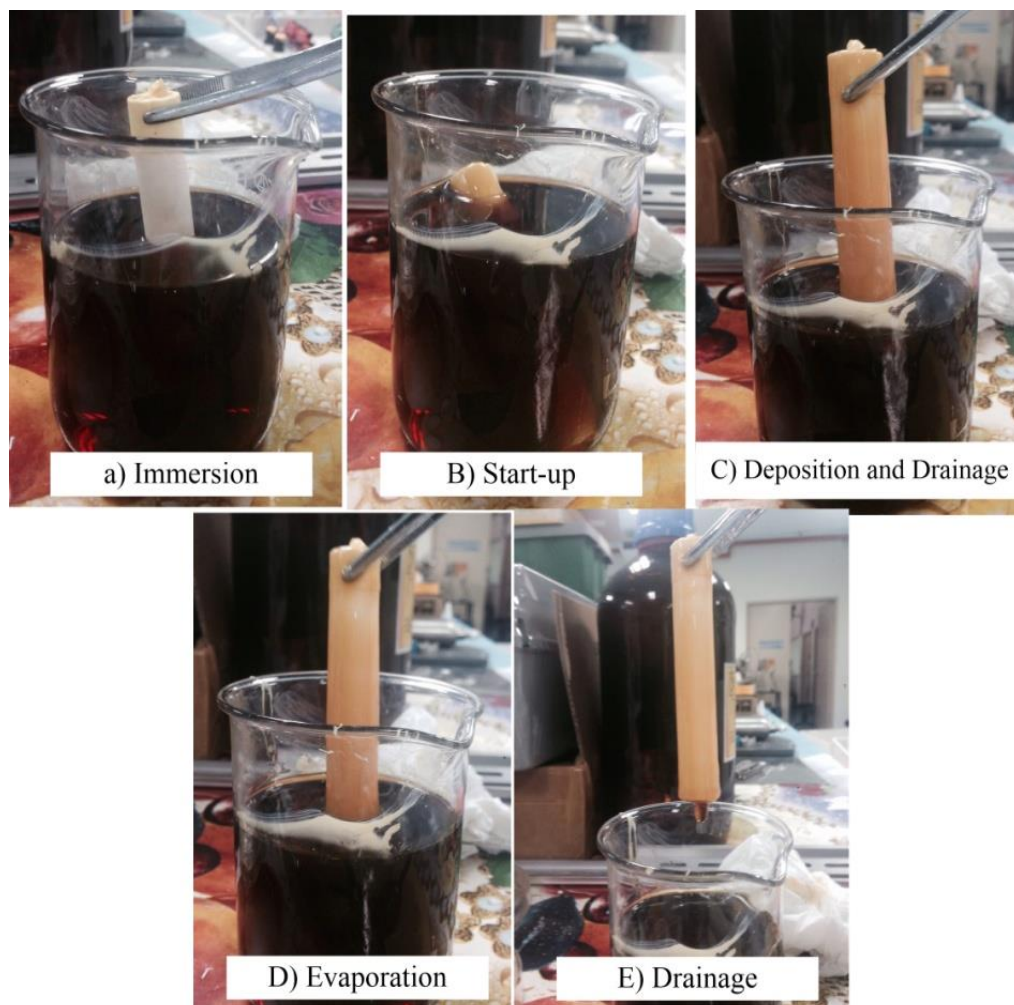


Gas Permeation Apparatus

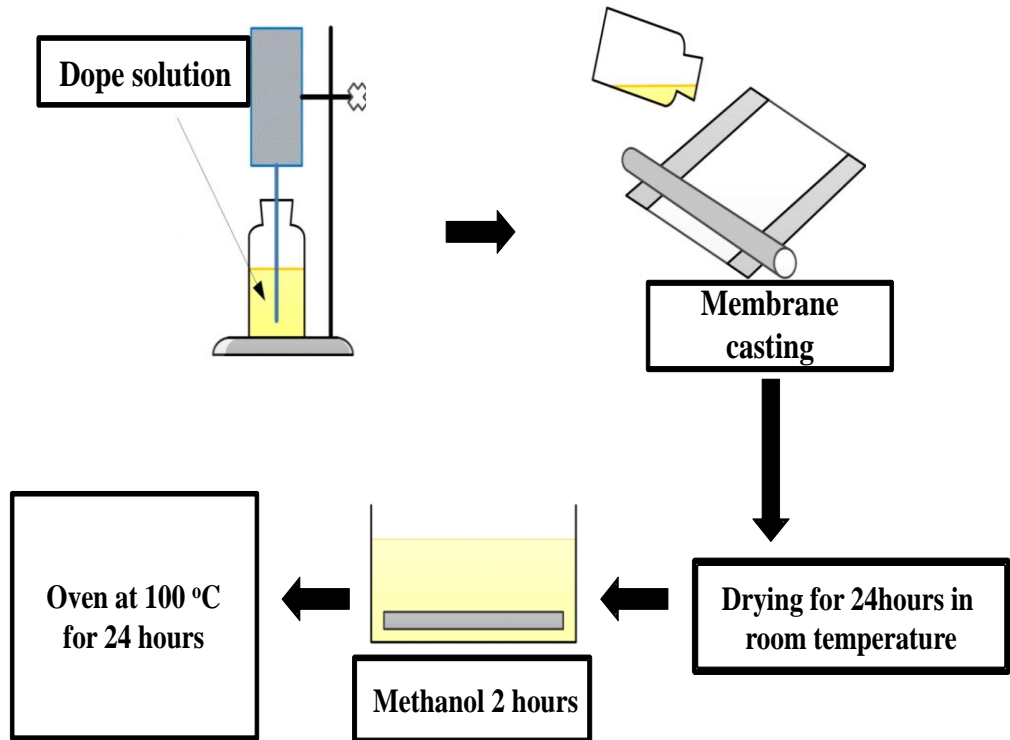
Advanced Membrane Technology Research Centre (AMTEC),
School of Chemical and Energy Engineering,
Faculty of Engineering, Universiti Teknologi Malaysia (UTM),
81310 Skudai, Johor Darul Takzim, Malaysia.

Supervisor: Dr Wannorharyati Wan Salleh
Co-Supervisor: Prof. Datuk Dr. Ahmad Fauzi Ismail

Dec 2013 – April 2015 **Gas permeation properties and characterization of Polymer- based carbon tubular membrane**



Dip-coating processes.



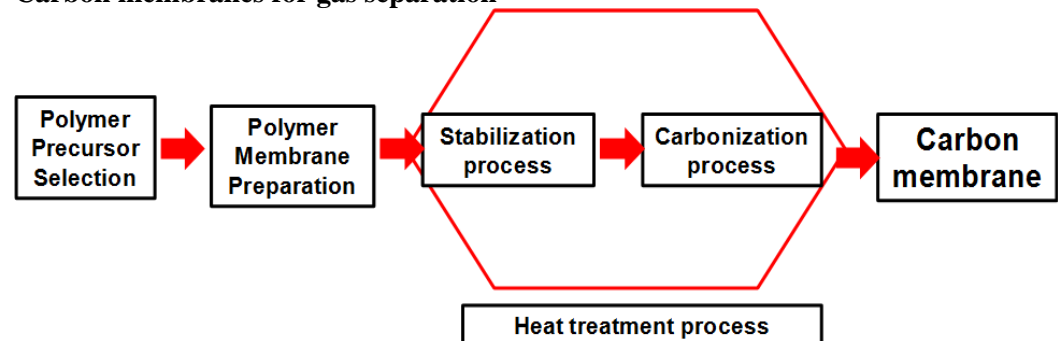
Fabrication protocols of flat-sheet membrane

Advanced Manufacturing and Materials Centre (AMMC),
 Faculty of Mechanical and Manufacturing Engineering,
 University Tun Hussein Onn Malaysia (UTHM),
 86400 Parit Raja, Johor, Malaysia

Supervisor: Prof. Dr. Zawati Harun
 Co-Supervisor: Dr Wannorharyati Wan Salleh

Sept 2012 –
 Sept 2013

Carbon membranes for gas separation





Tubular membrane module.

Advanced Membrane Technology Research Centre (AMTEC),
School of Chemical and Energy Engineering,
Faculty of Engineering, Universiti Teknologi Malaysia (UTM),

Supervisor: Dr Wannorharyati Wan Salleh
Co-Supervisor: Prof. Datuk Dr. Ahmad Fauzi Ismail

June 2008 –
June 2012

Synthesis and Characterizing of Green Machining Using TiO_2 Based Nanocoolant



Faculty of Mechanical Engineering (FKM),
Universiti Malaysia Pahang,
26600 Pekan,
Pahang, Malaysia.

Supervisor: Prof Kumaran Kadirgama.

PUBLICATION HIGHLIGHT

Since June 2015-October 2018; (Source: Research gate)

Research items: **30**, Total citation: **51**,

RG Score: 19.53, h-index: **5**,

(Journal Article: **27**; Review Article: **1**; Book Chapter: **2**)

ResearchGate link:

https://www.researchgate.net/profile/Norazlianie_Sazali

JOURNAL PUBLICATIONS

WEB of Science Journal

1. **Sazali, N.**, Salleh, W.N.W., Ismail, A.F., Wong, K.C., and Iwamoto, Y. (2018). Effects of pyrolysis atmosphere and thermal soak time on gas separation performance of tubular carbon membrane prepared from P84-copolyimide/Nanocrystalline cellulose. *Journal of Applied Polymer Science*. (Article in press, Impact factor: 1.860).
2. **Sazali, N.**, Salleh, W.N.W., Ismail, N., Ismail, A.F., Aziz, F., Yusof, N., and Jaafar, J. (2018). Effect of intermediate layer on gas separation performance of disk supported carbon membrane. *International Journal of Hydrogen Energy* (Article in press, 4.412).
3. **Sazali, N.**, Salleh, W.N.W., Ismail, N., Ismail, A.F., Aziz, F., and Yusof, N. (2018). PI/NCC-based tubular carbon membrane for hydrogen separation: Effect of different intermediate layers. *International Journal of Hydrogen Energy* (Article in press, 4.412).
4. **Sazali, N.**, Salleh, W.N.W., Ismail, A.F. (2017). Carbon tubular membranes from nanocrystalline cellulose blended with P84 co-polyimide for H₂ and He separation, *International Journal of Hydrogen Energy*, 42 9952-9957 (Impact Factor :4.412)
5. **Sazali, N.**, Salleh, W.N.W., Ismail, A.F., Nordin, N.A.H.M., Ismail, N., Mohamed, M.A., Aziz, F., Yusof, N., and Jaafar, J. (2017). Incorporation of thermally labile additives in carbon membrane development for superior gas permeation performance. *Journal of Natural Gas Science and Engineering*. (Impact Factor: 2.81)

6. **Sazali, N.**, Salleh, W.N.W., Nordin, N.A.H.M., Ismail, A.F. (2015). Matrimid-based carbon tubular membrane: Effect of carbonization environment, *Journal of Industrial and Engineering Chemistry*, 32 167-171(**Impact Factor: 4.421**)
7. **N. Sazali**, W.N.W. Salleh, N.A.H.M. Nordin, Z. Harun, A.F. Ismail. (2015). Matrimid-based carbon tubular membranes: The effect of the polymer composition, *Journal of Applied Polymer Science*, 132 (33) (**Impact factor: 1.860**)
8. **Sazali, N.**, Salleh, W.N.W., Ismail, A.F., Ismail, N., Mohamed, M.A., Nordin, N.A.H.M., Sokri, M.N.M., Iwamoto, Y., and Honda, S. (2017). Enhanced gas separation performance using carbon membranes containing nanocrystalline cellulose and BTDA-TDI/MDI polyimide. *Chemical Engineering Research and Design* (**Article in press, Impact factor: 2.512**).
9. N. Sazali, N. H. Ismail, W.N.W. Salleh, Mohamad Azuwa Mohamed, A.F. Ismail. (2018) Carbon selective membranes from polymer blends: A review. *Journal of Membrane Science* (**Under review: 6.035**)
10. **Sazali, N.**, Salleh, W.N.W., Ismail, A.F., and Kumaran, K. Preparation and characterization of PI/NCC carbon membrane concerning several additives for hydrogen separation performance. *International Journal of Hydrogen Energy* (**Under review: 4.412**).
11. **Sazali, N.**, Salleh, W.N.W., M.A. Mohamed., and Kumaran, K. Degradation and stability of polymer: a comprehensive review. *Journal of Industrial and Engineering Chemistry*, (**Under review: 4.421**)
12. **Sazali, N.**, Salleh, W.N.W., and Kumaran, K. Effect of nanostructure on the thermal glass transition and physical aging in PI/NCC carbon membrane. *Carbon*, (**Under review: 7.220**)
13. **Sazali, N.**, Salleh, W.N.W., N.A.H.M. Nordin, Z. Harun, A.F. Ismail, and Kumaran, K. Recent advances in carbon membranes for CO₂ capture: A comprehensive review. *Chinese Journal of Chemical Engineering*, (**Under review: 2.451**)
14. **Sazali, N.**, Salleh, W.N.W., Ismail, N., Mohamed, M.A., Aziz, F., Yusof, N., and Jaafar, J. Carbon membrane materials: A new class of materials with enhanced properties. *Progress in Materials Science*, (**Under review: 4.421**)

Scopus Journal

15. **Sazali, N.**, Salleh, W.N.W., Nordin, N.A.H., Mohamed, M.A., Ismail, A.F., Yusof, N., Aziz, F., Jaafar, J. (2017). Influence of carbonisation temperature on gas permeation properties of matrimid-based carbon membrane, *Chemical Engineering Transactions*, 56 145-150. (**Scopus indexed**).
16. **Sazali, N.**, Salleh, W.N.W., Mohamed, M.A., Ismail, N.H., Rosman, N., Aziz, F., Ismail, A.F. (2017). The influence of carbonization temperature on the development of carbon membrane with superior CO₂/CH₄ separation performance, *Malaysian Journal of Analytical Sciences*, 21 (2) 409-415. (**Scopus indexed**).
17. **Sazali, N.**, Salleh, W.N.W., Ismail, A.F., Ismail, N., Sokri, M.N.M., Yusof, N., Aziz, F., Mohamed, M.A., and Nordin, N.A.H.M. (2017). CO₂ Selective Carbon Tubular Membrane: The Effect of Stabilization Temperature on BTDA-TDI/MDI P84 co-polyimide. *International Journal of Engineering (Scopus Indexed)*.
18. **Sazali, N.**, Salleh, W.N.W., Ismail, A.F., Ismail, N., Aziz, F., Yusof, N., and Hasbullah, H. (2018) Effect of stabilization temperature during pyrolysis process of P84 co-polyimide-based tubular carbon membrane for H₂/N₂ and He/N₂ separations. *IOP Conference Series: Materials Science and Engineering (Scopus Indexed)*.
19. **N.Sazali, W.N.W. Salleh, A.F. Ismail, K.Kadirgama, M.S.Moslan, F.E.C. Othman, N.H.Ismail, and Z. Harun.**(2018). Effect of heating rates on the microstructure and gas permeation properties of carbon membranes. *Malaysian Journal of Fundamental and Applied Sciences (MJFAS), (Scopus Indexed)*.
20. **N.Sazali, W.N.W. Salleh, A.F. Ismail, K.Kadirgama, and Z. Harun.**(2018). The performance of CO₂/N₂ separation on P84/NCC-based Tubular Carbon Membrane under different carbonization conditions. *Malaysian Journal of Fundamental and Applied Sciences (MJFAS), (Article in press: Scopus Indexed)*
21. **N.Sazali, W.N.W. Salleh, A.F. Ismail, K.Kadirgama, and F.E.C. Othman** (2018). P84 Co-Polyimide Based-Tubular Carbon Membrane: Effect of Heating Rates on Helium Separations.

Solid State Phenomena" (formerly Part B of "Diffusion and Defect Data (**Article in press: Scopus Indexed**)

22. N.Sazali, W.N.W. Salleh, A.F. Ismail, K.Kadirgama, M.S.Moslan (2018). Tubular Carbon Membrane Prepared from PI/NCC: Effects of Carbonization Environment. *Chemical Engineering Transactions*. (**Article in press: Scopus Indexed**)
23. N. Sazali, W.N.W. Salleh, K. Kadirgama, A.F. Ismail (2018). PI/NCC-based carbon membrane: Influence of aging times towards O_2 separation performance. *Journal of Advanced Research in Fluid Mechanics and Thermal Sciences* (**Article in press: Scopus Indexed**)
24. N. Sazali, W.N.W. Salleh, A.F. Ismail, N.H. Ismail, N.Yusof, F.Aziz, and J. Jaafar (2018). Development Of PI/NCC-Based Tubular Carbon Membrane by Concerning Coating-Carbonization-Cycles for Oxygen Separation Performance. *Journal of Membrane Science and Research* (**Under review: Scopus Indexed**)
25. N. Sazali, W.N.W. Salleh, A.F. Ismail, K.Kadirgama, and M. Samykano (2018). Oxygen Separation Through PI/NCC Carbon Membrane: Effect of Heating Rates. *Journal of Membrane Science and Research* (**Under review: Scopus Indexed**)
26. N. Sazali, W.N.W. Salleh, A.F. Ismail, and K.Kadirgama (2018). Carbon membrane for gas separation: A short review. *Malaysian Journal of Fundamental and Applied Sciences (MJFAS)*, (**Under review: Scopus Indexed**)

Exhibition and Inventions

1. Dr. Wan Norharyati Wan Salleh, Nor Hafiza Ismail, **Norazlianie Sazali**, Prof. Dr. Ahmad Fauzi Ismail, Dr. Farhana Aziz, Dr. Norhaniza Yusof, Dr. Juhana Jaafar, Mohd Sohaimi Abdullah (2017); Industrial Art & Technology Exhibition (INATEX 2017); **SILVER AWARD**
2. Dr. Wan Norharyati Wan Salleh, Nor Hafiza Ismail, **Dr. Norazlianie Sazali**, Prof. Dr. Ahmad Fauzi Ismail, Dr. Farhana Aziz, Dr. Norhaniza Yusof, Dr. Juhana Jaafar, Mohd Sohaimi Abdullah (2018). Malaysia Technology Expo (MTE).
BRONZE AWARD

3. Dr Farhana Aziz, Prof Datuk Dr Ahmad Fauzi Ismail, Nursyazwani Yahya, **Dr Norazlianie Sazali**, Dr Wan Dr Norhayati Wan Salleh, Muhd Arif Aizat Marhalim, Dr Norhaniza Yusof Nur Aisyah Jamaludin, Dr Juhana Jaafar, Dr Lau Woei Jye, Mohd Sohaimi Abdullah (2018). The International Invention, Innovation & Technology Exhibition (ITEX).

BRONZE AWARD

Book Chapter

- (1) **N. Sazali**, W.N.W. Salleh, A.F. Ismail, N. H. Ismail. CO_2/CH_4 separation by using carbon membranes (2018). Elsevier Publisher
- (2) **N. Sazali**, W.N.W. Salleh, A.F. Ismail. Microporous Carbon Membrane: Structure, Preparation, Characterization, and Applications (Book for Dec 2018). Elsevier Publisher
- (3) **N. Sazali**, W.N.W. Salleh, A.F. Ismail. Synthetic Polymer-based Membranes for Acidic Gas Removal (Article in Press-2019). Elsevier Publisher
- (4) **N. Sazali**, W.N.W. Salleh, A.F. Ismail. Synthetic Polymer-based Membranes for Hydrogen Separation (Article in Press-2019). Elsevier Publisher

Non-indexed Conferences

- (1) **Sazali, N.**, Harun, Z., Salleh, W.N.W., Ismail, A.F., Nordin, N.A.H.M. (2015). The Effect of Composition Different on the Gas Permeation properties of Tubular Membrane, *Journal of Applied Science and Agriculture*, 10 (5) 134-137. ISSN: 1816-9112
- (2) **Sazali, N.**, Salleh, W.N.W., Nordin, N.A.H.M., Harun, Z., Yusof, N., and Ismail, A.F. (2015). Gas permeation properties of the Matrimid based carbon tubular membrane: The effect of carbonization temperature, *International Journal of Conceptions on Mechanical and Civil Engineering*, 3 (1) 6-9. ISSN: 2357 - 2760

- (3) **Sazali, N.**, Salleh, W.N.W., Ismail, A.F., Nordin, N.A.H.M., Harun, Z. (2016). *CO₂ Separation through Carbon Tubular Membranes: Effect of Polymer Composition*, *Advances in Renewable Energy (ARE)*, (3) 7-10.
- (4) **N. Sazali**, W.N.W. Salleh, A.F. Ismail, N.H. Ismail, N.Yusof, F.Aziz, J. Jaafar, N.A.H.M.Nordin (2018). Controlled dip-coating times for improving CO₂ selective of PI/NCC-based supported carbon membrane. *Journal of Membrane Science and Technology*, 2018 8: 178.
- (5) **N. Sazali**, W.N.W. Salleh, A.F. Ismail, and K. Kadirgama. (2018). P84 co-polyimide/ Nanocrystalline cellulose (NCC)-based tubular carbon membrane: Effect of drying times for carbon dioxide separations at elevated carbonization temperature. *Applied Membrane Science & Technology (AMST)*. Vol 22, No 1 June 2018
- (6) **N. Sazali**, W.N.W. Salleh, Z. Harun, and K. Kadirgama (2018). P84 co-polyimide-based tubular carbon membrane: Effect of pyrolysis temperature. *Applied Membrane Science & Technology (AMST)*. **(Article in press)**
- (7) **N. Sazali**, W.N.W. Salleh, Z. Harun, and K. Kadirgama (2018). Precursor selection for carbon membrane fabrication: A review. *Applied Membrane Science & Technology (AMST)*. **(Article in press)**.

SKILLS

- (i) Microsoft Office (Word, PowerPoint, Excel)
- (ii) Programming (C++)
- (iii) AutoCad, Solid Work, Matlab.
- (iv) Skilled in gas permeation measurement and related laboratory equipment's

SPORT ACHIEVEMENTS

- | | |
|------|--------------------|
| 2017 | Run for Unity 2017 |
| 2016 | Southern Run 2016 |

2016	Campus Run (Runtactic) Vol.1
2016	Viper Challenge @ Medini
2015	Electric Run 2015
2015	UTM Night Run 2015
2015	Hari Sukan Negara 2015
2008-2012	Sukan Masum (Catur; First Board UMP Player)

COLLABORATORS

Prof Yuji Iwamoto (Nagoya Institute of Technology),

Prof Murakami Hideyuki (NIMS, Tsukuba),

Prof Dr Ahmad Fauzi Ismail (UTM),

Dr Wan Norharyati Wan Salleh (UTM),

Dr Norhaniza bt Yusof (UTM),

Dr Mohamad Azuwa Mohamed (UKM),

Prof Kumaran Kadirgama (UMP),

Dr Nadzirah Mokhtar (UMP),

Dr Noor Maizura (UMS),

Prof Zawati Harun (UTHM),

Dr Nik Abdul Hadi Nordin (UTP),

Dr Nooraina Nazri (UniKL, Micet).

REFEREES

Dr Wan Norharyati Binti Wan Salleh

PhD Supervisor, Senior Lecturer, Faculty of Chemical and Energy Engineering (FCEE), Universiti Teknologi Malaysia (UTM)

Email: hayati@petroleum.utm.my

Tel: +607- 5535388

Prof Dr Ahmad Fauzi Ismail

PhD co-Supervisor/Deputy Vice Chancellor (Research & Innovation), Universiti Teknologi Malaysia (UTM)

Email: fauzi.ismail@gmail.com

Tel: +607-5530244

Assoc Prof Zawati Harun

Master Degree Supervisor, Senior Lecturer, Fakulti Kejuruteraan Mekanikal dan Kejuruteraan Pembuatan (FKMP)

Email: zawati@uthm.edu.my

Assoc. Prof Dr. Kumaran A/L Kadingama,

Degree Supervisor, Senior Lecturer, Fakulti Kejuruteraan Mekanikal dan Kejuruteraan Pembuatan (FKMP), University Malaysia Pahang (UMP).

Email: kumaran@ump.edu.my

Tel: +609-4246232