Muhammad Tawalbeh

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Personal Information:

- Marital status: Married
- Nationality: Canadian and Jordanian
- Languages spoken/written: English and Arabic

Research Interest:

1- Renewable energy
2- Fuel cells
3- Membrane synthesis and separation
4- Adsorption
5- Carbon dioxide capture
6- Modeling and simulation
7- Desalination and wastewater treatment
8- Nano fluids

Academic Qualifications:

Ph.D. - University of Ottawa, Ottawa, Ontario, Canada **2007 – 2013**
Department of Chemical and Biological Engineering
Thesis title: "Silicalite-1 Membranes Synthesis, Characterization, CO_2/N_2 Separation and Modeling"
Courses: Adsorption Separations for Environmental Applications, Advanced Transport Phenomena, Membrane Separation Processes, Adsorption Separation Processes.

M. Sc. - Jordan University of Science and Technology, Jordan **1997 – 2000**
Department of Chemical Engineering
Thesis title: "Production of Activated Carbon from Jojoba Seed Residue by Chemical Activation Using a Static Bed Reactor"
Courses: Mathematical Methods in Chemical Engineering, Advanced Chemical Engineering Thermodynamics, Advanced Transport Phenomena, Advanced Chemical Reaction Engineering, Combustion, Process Analysis and Control, Advanced Mass Transfer, Wastewater Engineering.

B. Sc. - Jordan University of Science and Technology Jordan **1992 – 1997**
Department of Chemical Engineering.
Graduation Project: "Design of Acetic Acid Production Plant"
Elective Courses: Petroleum Refinery Engineering, Experimental design and Data Analysis, Extractive Metallurgy, Properties of Materials and Corrosion

Academic/Teaching Experience:

1. **Jan. 2022 – Present:** Associate professor at the Department of Sustainable and Renewable Energy Engineering at the University of Sharjah, Sharjah, UAE.
2. **Sep. 2015 – Jan. 2022:** Assistance professor at the Department of Sustainable and Renewable Energy Engineering at the University of Sharjah, Sharjah, UAE.

3. **Feb. 2015 – June 2015:** Adjunct professor at the Department of Sustainable and Renewable Energy Engineering at the University of Sharjah, Sharjah, UAE.
4. **Feb. 2014 – June 2014:** Adjunct professor at the Department of Chemical Engineering, Abu Dhabi University, Abu Dhabi, UAE.
5. **Sep. 2007 – May. 2012**: Teaching Assistant at the Department of Chemical and Biological Engineering, University of Ottawa, Canada, for the following courses:

   Chemical Engineering Practice, Adsorption Separations for Environmental Applications, Adsorption Separation Processes, Transport Phenomena, Heat Transfer Operations, Chemical Engineering Laboratory, Phase and Chemical Reaction Equilibria, Introduction to Nuclear Engineering.
6. **Sep. 2002 – Dec. 2004**: Research assistant at the Department of Mining, Metals and Materials Engineering, McGill University, Montreal, QC, Canada.
7. **Oct. 2001 – Aug. 2002**: Visiting scholar at the Department of Chemical Engineering, McGill University, Montreal, QC, Canada.
8. **Sep. 1997 - May 1999**: Teaching Assistant at the Department of Chemical Engineering, Jordan University of Science and Technology, Irbid, Jordan, for the following courses:

   Fluid Mechanics, Materials Science, Applied Mathematics of Chemical Engineers, Petroleum Engineering, Numerical Methods for Chemical Engineers. Chemical Engineering Thermodynamics, Equipment Design, Fluid Mechanics Laboratory, Unit Operations Laboratory, and Materials and Corrosion Laboratory.

Courses Taught:

Thermodynamics, Heat Transfer, Bioenergy, Statics and Dynamics, Introduction to Energy Science and Technology, Introduction to Chemical Engineering, Heat Transfer Lab, Fluid Mechanics Lab, Wind Energy Systems Lab, Senior Design Project I coordination, Senior Design Project II coordination.

Students Supervision:

1 PhD student, 3 master students, and 60 undergraduate senior design projects at University of Sharjah.

Industrial Experience:

1. May 1999 – Oct. 2001: Operation Engineer, Jordan Petroleum Refinery, Zarqa, Jordan.

2. July 1997 – Apr. 1999, Quality Control Engineer, Al Fawz for Detergents and Disinfectants Industries, Irbid, Jordan

Research Experience:

1- Development of composite membranes for direct hydrocarbon proton exchange membrane fuel cells.

2- Studying the removal of biodegradable polymers and their nanocomposites from wastewater.

3- Investigating the use of combined electrocoagulation processes for enhanced pollutants removal.

4- Examining the treatment of olive mill wastewater treatment using ultrasound, adsorption, and advanced oxidation processes.

5- Inspecting the use of treatment of paper mill sludge and its use for bioethanol production.

6- Studying novel MSF desalination plant driven by parabolic trough collectors and a solar pond.

7- Investigating the use of membrane separation as a pre-treatment process for oily saline water.

8- Development of a novel solar desalination unit using integrated parabolic trough concentrated solar power (CSP) and membrane distillation (MD).

9- Investigation of the efficiency and performance enhancement of solar thermal collectors and solar photovoltaic (PV) systems using nano-fluids.

10- Investigation of thermal energy storage using adsorption technologies to utilize the benefits of renewable energy and waste heat recovery.

11- Development of polymer/zeolite nanocomposite Proton-Exchange membranes for fuel cell applications.

12- Investigation and development of new technologies for carbon dioxide capture and utilization.

13- Synthesis, characterization, and utilization of the new zeolite membranes in environmental sustainability applications.

14- Investigation of gas mixtures separation using zeolite membranes.

15- Modeling the pure and gas-mixtures permeation through adsorptive membranes.

16- Investigation of the adsorption of pure gases using volumetric and gravimetric systems.

17- Studying the formation of MgOHCl during the dehydration of magnesium chloride hydrates for the magnesium electrolytic production process for.

18- Studying the thermal properties of electrolytic magnesium production process feed.

19- Studying the kinetics of electrolytic magnesium feed dissolution and reactions.

20- Investigation of the deposition of diamond-like films using Arc Ion Plating (AIP) source.

21- Synthesis and characterization of new activated carbon from Jojoba seed residue using chemical activation.

22- Investigation of the effect of agricultural practices on runoff water quality.

Awards & Distinctions:

1- **2022 – 2023** The Sharjah Islamic Bank Award for Excellence in Scientific Research for the year 2022-2023 with a value of 10,000 AED.

2- **2021 – 2022** The University of Sharjah Annual Faculty Incentive Research Award for the year 2021-2022 with a value of 20,000 AED.

3- **2011 – 2012** Excellence Scholarship from University of Ottawa, Ottawa, Canada, of a value of $13,500 CAN/year.

4- **2011 – 2012** Ontario Graduate Scholarship (OGS) of a value of $ 15,000 CAN.

5- **2007 – 2011** PhD Admission Scholarship from University of Ottawa, Ottawa, Canada, of a value of $18,500 CAN/year.

6- **2002 – 2003** Horace G. Young Scholarship for the year 2002 from Mining, Metals and Materials Engineering Department, McGill University, Montreal, Canada, of a value of $ 2000 CAN.

7- **2001 – 2002** M.W. Welch **International Scholarship** for the year 2002 from International Union for Vacuum Science, Technology and Applications, of a value $ 15,000 US.

8- **1997 – 2000** Scholarship for the master's degree from Jordan University of Science and Technology, Jordan.

9- **1992 – 1997** Royal Scholarship for the bachelor's degree from the government of Jordan, Jordan.

Grants:

1- Composite membranes based on MXene-doped Zirconium phosphate/Lignin and Ionic Liquids for High-Temperature Direct Hydrocarbons PEM Fuel Cells. [Amount Secured: 200,000 AED] Targeted Research Grant 2023, University of Sharjah, United Arab Emirates.

2- Solar-induced advanced oxidation processes for removal of emerging contaminates (pharmaceuticals, pesticides, and personal care products) during water and wastewater treatment. [Amount Secured: 120,000 AED] Competitive Research Grant 2023, University of Sharjah, United Arab Emirates.

3- Next generation self-humidified MXene/Zirconium phosphate proton exchange membranes for high temperature operation. [Amount Secured: 483,700 AED] Faculty Research Grant 2022, American University of Sharjah, United Arab Emirates.

4- Ionic Liquids/Graphene oxide/Polyethersulfone Composite Membranes for High Temperature Direct hydrocarbon PEM Fuel Cells. [Amount Secured: 120,000 AED] Competitive Research Grant 2022, University of Sharjah, United Arab Emirates.

5- Novel proton conductors based on silicalite-1 zeolites/heteropolyacids for high temperature proton exchange membrane (PEM) fuel cells operating at 200^{o}C. [Amount Secured: 200,000 AED] Targeted Research Grant 2020, University of Sharjah, United Arab Emirates.

6- Development of novel composite membranes to be used in direct hydrocarbon fuel cells. [Amount Secured: 40,000 AED] Seed Research Grant 2017, University of Sharjah, United Arab Emirates.

Publications:

1- W. N. Bahutair1, A Alhajar, A. Al Othman, **M. Tawalbeh**, MXenes and MXene composites in dye-sensitized solar cells, Process Safety and Environmental Protection, Accepted. Sep. 2024.

2- **M. Tawalbeh**, I. Shomope, A. Al-Othman, H. Alshraideh, Prediction of Hydrogen Production in Proton Exchange Membrane Water Electrolysis Via Neural Networks, International Journal of Thermofluids, Accepted, Sep. 2024.

3- **M. Tawalbeh**, A. Ali, B. Aljawrneh, A. Al-Othman, Progress in safe nano-structured electrolytes for sodium ion batteries: A comprehensive review, Nano-Structures & Nano-Objects 39 (2024) 101311.

4- **M. Tawalbeh**, W. Nimir, A. Al-Othman, A. Ka'ki, High proton conduction in zirconium silicate/lignin/ionic liquids based- membranes for high temperature PEM fuel cells, Process Safety and Environmental Protection 190 Part A (2024) 779-791.

5- A. Al-Othman, **M. Tawalbeh**, A. Ka'aki, I. Shomope, Muhammad Faheem, Novel zirconium phosphate/MXene/ionic liquid membranes for PEM fuel cells operating up to 145°C, Process Safety and Environmental Protection 189 (2024) 1368-1378.

6- A.A. Ali, A. Al-Othman, **M. Tawalbeh**, Exploring natural polymers for the development of proton exchange membranes in fuel cells, Process Safety and Environmental Protection 189 (2024) 1379-1401.

7- R. Al Shaikh, A. Al-Othman, **M. Tawalbeh**, A. Shamayleh, P. Nancarrow, Development of MXene incorporated PVDF based membranes for an enhanced performance in higher temperature PEM fuel cells, Process Safety and Environmental Protection 189 (2024) 985-994.

8- W. Nimir, A. Al-Othman, **M. Tawalbeh**, Unveiling Zirconium Phytate-Heteropolyacids-Ionic Liquids Membranes for PEM Fuel Cells Applications up to 150°C, International Journal of Hydrogen Energy, In Press, June 2024.

9- **M. Tawalbeh**, I. Shomope, A. Al-Othman, Comprehensive Review on Non-Newtonian Nanofluids, Preparation, Characterization, and Applications, International Journal of Thermofluids 22 (2024,)100705.

10- H.A. Khan, **M. Tawalbeh**, B. Aljawrneh, W. Abuwatfa, A. Al-Othman, H. Sadeghifar, A.G. Olabi, A comprehensive review on supercapacitors: Materials, applications, and challenges, Energy (2024) 131043.

11- **M. Tawalbeh**, A. Al-Othman, A. Ka'ki, S. Mohamad, M. Faheem, Starch-chitosan-ionic liquids-based composite membranes for high temperature PEM fuel cells applications, International Journal of Hydrogen Energy, In Press, https://doi.org/10.1016/j.ijhydene.2023.12.161.

12- M.F. Hassan, A. Al-Othman, **M. Tawalbeh**, A. Ka'ki, S. Mohamad, Novel Chitosan-ionic liquid immobilized membranes for PEM fuel cells operating above the boiling point of water, International Journal of Hydrogen Energy 53 (2024) 592-601.

13- N. Abdelwahab, A. Al-Othman, **M. Tawalbeh**, M. El Haj Assad, K. Khanafer, The effect of the membrane thickness on the performance of direct methanol fuel cell: Factorial design, Journal of Porous Media 27 (2) (2024) 21-41. https://doi.org/10.1615/JPorMedia.2023025528.

14- **M. Tawalbeh**, A. Farooq, R. Martis, A. Al-Othman, Optimization techniques for electrochemical devices for hydrogen production and energy storage applications, International Journal of Hydrogen Energy 52 Part C (2024) 1058-1092.

15- R.M.N. Javed, A. Al-Othman, P. Nancarrow, **M. Tawalbeh**, Zirconium silicate-ionic liquid membranes for high-temperature hydrogen PEM fuel cells, International Journal of Hydrogen Energy 52 Part C (2024) 894-908.

16- S.M. Asaad, **M. Tawalbeh**, A. Ali, S.R. Al Kindi, A. Al-Othman, Definition of bioenergy, Chapter 3.1, Renewable Energy— Volume 2: Wave, Geothermal, And Bioenergy, 1st Edition, ISBN: 978-0-323-95211-8, 215-243 (2024). https://doi.org/10.1016/B978-0-323-95211-8.00004-X.

17- **M. Tawalbeh**, S.M. Asaad, A. Ali, S.R. Al Kindi, A. Al-Othman, Developments of bioenergy, Chapter 3.2, Renewable Energy— Volume 2: Wave, Geothermal, And Bioenergy, 1st Edition, ISBN: 978-0-323-95211-8, 245-273 (2024). https://doi.org/10.1016/B978-0-323-95211-8.00006-3.

18- S.M. Asaad, **M. Tawalbeh**, A. Ali, A. Al-Othman, Applications of bioenergy, Chapter 3.3, Renewable Energy— Volume 2: Wave, Geothermal, And Bioenergy, 1st Edition, ISBN: 978-0-323-95211-8, 275-293 (2024). https://doi.org/10.1016/B978-0-323-95211-8.00001-4.

19- R. Darra, **M. Tawalbeh**, A. Ali, S.M. Asaad, A. Al-Othman, Review of bioenergy systems, Chapter 3.4, Renewable Energy— Volume 2: Wave, Geothermal, And Bioenergy, 1st Edition, ISBN: 978-0-323-95211-8, 295-316 (2024). https://doi.org/10.1016/B978-0-323-95211-8.00019-1.

20- A. Ali, **M. Tawalbeh**, S.M. Asaad, R. Darra, A. Al-Othman, Case studies and analyses of bioenergy systems, Chapter 3.5, Renewable Energy— Volume 2: Wave, Geothermal, And Bioenergy, 1st Edition, ISBN: 978-0-323-95211-8, 317-224 (2024). https://doi.org/10.1016/B978-0-323-95211-8.00008-7.

21- **M. Tawalbeh**, A. Ali, S.M. Asaad, R. Darra, A. Al-Othman, Simulation and modeling of bioenergy systems, Chapter 3.6, Renewable Energy— Volume 2: Wave, Geothermal, And Bioenergy, 1st Edition, ISBN: 978-0-323-95211-8, 335-355 (2024). https://doi.org/10.1016/B978-0-323-95211-8.00018-X.

22- **M. Tawalbeh**, A. Al-Othman, A. Ka'ki, S. Mohamad, A. Al-Jahran, V. Unnikrishnan, O. Zabihi, Q. Li, K. Shirvanimoghaddam, M. Naebe, High temperature studies of graphene nanoplatelets-MOFs membranes for PEM fuel cells applications, Key Engineering Materials 962 (2023) 93-98.

23- W. Nimir, A. Al-Othman, **M. Tawalbeh**, M.F. Hassan, Zirconium phytate-based proton conductors for high-temperature fuel cell applications, Key Engineering Materials 962 (2023) 99-104.

24- A.H. Alami, M. Ramadan, **M. Tawalbeh**, S. Haredy, S. Al Abdulla, H. Aljaghoub, M. Ayoub, A. Alashkar, M.A.Abdelkareem, A.G. Olabi, A critical insight on nanofluids for heat transfer enhancement, Scientific Reports 13, (2023) 15303.

25- N.M. Al-Ananzeh, K. Bani-Melhem, H.E. Khasawneh, **M. Tawalbeh**, Z. Al-Qodah, A. Al-Bodour, Investigating the potential of using solid waste generated from stone cutting factories for phenol removal from wastewater: A study of adsorption kinetics and isotherms, Results in Engineering 20 (2023) 101404.

26- **M. Tawalbeh**, H. Aljaghoub, M. Qasim, A. Al-Othman, Surface modification techniques of membranes to improve their anti-fouling characteristics: Recent advancements and developments, Frontiers of Chemical Science & Engineering 17 (2023) 1837-1865.

27- S.A. Samrajyam, J.I.Sheikh, A. Al-Othman, **M. Tawalbeh**, Fuel cell technology for green energy generation, Book Chapter, Elsevier Book Chapter 18, Green Membrane

Technologies towards Environmental Sustainability, ISBN: 978-0-323-95165-4, 555-573 (2023). https://doi.org/10.1016/B978-0-323-95165-4.00023-9.

28- **M. Tawalbeh**, A. Al-Othman, M.F. Hassan, A. Ka'ki, S. Mohamad, F. Almomani, Novel chitosan-based composite membranes for fuel cells applications, 2023 Advances in Science and Engineering Technology International Conferences (ASET), Dubai, United Arab Emirates, 2023, pp. 1-4, https://doi.org/10.1109/ASET56582.2023.10180644.

29- N. Yusuf, F. Almomani, **M. Tawalbeh**, A. Al-Othman, Purifying of biogas produced from anaerobic digestions processes: an economical assessment, 2023 Advances in Science and Engineering Technology International Conferences (ASET), Dubai, United Arab Emirates, 2023, pp. 1-4, https://doi.org/10.1109/ASET56582.2023.10180765.

30- H. Mkacher, F. Almomani, **M. Tawalbeh**, A. Al-Othman, Economic analysis of upfront nitrogen removal from LNG plant, 2023 Advances in Science and Engineering Technology International Conferences (ASET), Dubai, United Arab Emirates, 2023, pp. 01-06, https://doi.org/10.1109/ASET56582.2023.10180743.

31- A. Al-Othman, **M. Tawalbeh**, A. Ka'ki, S. Mohamad, M.F. Hassan, F. Almomani, Strach/Chitosan membranes for PEM fuel cells applications, 2023 Advances in Science and Engineering Technology International Conferences (ASET), Dubai, United Arab Emirates, 2023, pp. 1-4, https://doi.org/10.1109/ASET56582.2023.10180456.

32- A. Al-Othman, **M. Tawalbeh**, O. El-Kadri, S. Mohamad, A. Ka'ki, F. Almomani, Proton conductivity studies on covalent organic frameworks (COFs) for the application of high-temperature fuel cells, 2023 Advances in Science and Engineering Technology International Conferences (ASET), Dubai, United Arab Emirates, 2023, pp. 1-5, https://doi.org/10.1109/ASET56582.2023.10180455.

33- **M. Tawalbeh**, S.T. Abuna'ous, A.A. Chehade, A.F. Chahade, Design and performance analysis of a phase change material thermal battery, 2023 Advances in Science and Engineering Technology International Conferences (ASET), Dubai, United Arab Emirates, 2023, pp. 1-5, https://doi.org/10.1109/ASET56582.2023.10180480.

34- K. Bani-melhem, M. Elektorowicz, **M. Tawalbeh**, A. Al Bsoul, A. El Gendy, M. Yusuf, H. Kamyab, Integrating of electrocoagulation process with submerged membrane bioreactor for wastewater treatment under low voltage gradients, Chemosphere 339 (2023) 139693.

35- **M. Tawalbeh**, R.N. Javed, A. Al-Othman, F. Almomani, S. Ajith, Unlocking the potential of CO_2 hydrogenation into valuable products using noble metal catalysts: a comprehensive review, Environmental Technology & Innovation 31 (2023) 103217.

36- **M. Tawalbeh**, R.M.N. Javed, A. Al-Othman, F. Almomani, Salinity gradient solar ponds hybrid systems for power generation and water desalination, Energy Conversion and Management 289 (2023) 117180.

37- S. Ong, A. Al-Othman, **M. Tawalbeh**, Emerging technologies in prognostics for fuel cells including direct hydrocarbon fuel cells, Energy 277 (2023) 127721.

38- **M. Tawalbeh**, S. Mohammed, A. Al-Othman, M. Yusuf, M. Mofijur, MXenes and MXene-based materials for removal of pharmaceutical compounds from wastewater: A critical review, Environmental Research 228 (2023) 115919.

39- M. Al Murisi, **M. Tawalbeh**, R. Al-Saadi, Z. Yasin, O. Temsah, A. Al-Othman, M. Rezakazemi, A.G. Olabi, New insights on applications of quantum dots in electrochemical systems, International Journal of Hydrogen Energy, In Press https://doi.org/10.1016/j.ijhydene.2023.03.020.

40- H. Kazim, M. Sabri, A. Al-Othman, **M. Tawalbeh**, artificial intelligence application in membrane processes and prediction of fouling for better resource recovery, Journal of Resource Recovery 1 (2023) 1008.

41- **M. Tawalbeh**, H.A. Khan, A. Al-Othman, F. Almomani, S. Ajith, A comprehensive review on the recent advances in materials for thermal energy storage applications, International Journal of Thermofluids 18 (2023) 100326.

42- W. Elmobarak, F. Almomani, **M. Tawalbeh**, A. Al-Othman, R. Martis, K. Rasool, Current State of CO_2 Capture with Ionic Liquids: Development and Progress, Fuel 344 (2023) 128102.

43- **M. Tawalbeh**, L. Qalyoubi, A. Al-Othman, M. Qasim, M. Shirazi, Insights on the development of enhanced antifouling reverse osmosis membranes: Industrial applications and challenges, Desalination 553 (2023) 116460.

44- **M. Tawalbeh**, R.N. Javed, A. Al-Othman, F. Almomani, The novel contribution of non-noble metal catalysts for intensified carbon dioxide hydrogenation: Recent challenges and opportunities, Energy Conversion and Management 279 (2023) 116755.

45- **M. Tawalbeh**, H.A. Khan, A. Al-Othman, Insights on the applications of metal oxide nanosheets in energy storage systems, Journal of Energy Storage 60 (2023) 106656.

46- W. Nimir, A. Al-Othman, **M. Tawalbeh**, A. Al Makky, A. Ali, H. Karimi-Maleh, F. Karimi, C. Karaman, Approaches towards the development of heteropolyacid 1-based high temperature membranes for PEM fuel cells, International Journal of Hydrogen Energy 48 (17) (2023) 6638-6656. https://doi.org/10.1016/j.ijhydene.2021.11.174.

47- **M. Tawalbeh**, H. Aljaghoub, A.H. Alami, A.G Olabi, Selection criteria of cooling technologies for sustainable greenhouses: A comprehensive review, Thermal Science and Engineering Progress 38 (2023) 101666.

48- A. Ali, A. Al-Othman, **M. Tawalbeh**, Grand challenges in fuel cell technology towards resource recovery, Journal of Resource Recovery 1 (2023) 1004.

49- **M. Tawalbeh**, S. Mohammed, A. Alnaqbi, S. Alshehhi, A. Al-Othman, Analysis for hybrid photovoltaic/solar chimney seawater desalination plant: A CFD simulation in Sharjah, United Arab Emirates, Renewable Energy 202 (2023) 667-685.

50- F. Almomani, A. Al-Rababah, **M. Tawalbeh**, A. Al-Othman, A comprehensive review of Hydrogen generation by water splitting using 2D nanomaterials: photo vs electro-catalysis, Fuel 332 Part 1 (2023) 125905.

51- K. Bani-Melhem, M.R. Al-Kilani, **M. Tawalbeh**, Evaluation of scrap metallic waste electrode materials for the application in electrocoagulation treatment of wastewater, Chemosphere 310 (2023) 136668.

52- D. Al-Muqbel, M. Otifi, R. Aly, R. Darra, A. Al-Othman, **M. Tawalbeh**, N. Halalsheh, Bioremediation of petrochemical sludge from soils, Book Chapter, Elsevier Book Chapter 15, Metagenomics to Bioremediation, Applications, Cutting Edge Tools, and Future

Outlook, Developments in Applied Microbiology and Biotechnology, 1st Edition, ISBN: 978-0-323-96113-4, 379-402 (2023). DOI: 10.1016/B978-0-323-96113-4.00009-3.

53- R. Darra, M. Bin Hammad, F. Alshamsi, S. Alhammadi, W. Al-Ali, A. Aidan, **M. Tawalbeh**, N. Halalsheh, A. Al-Othman, Wastewater treatment processes and microbial community, Book Chapter, Elsevier Book Chapter 13, Metagenomics to Bioremediation, Applications, Cutting Edge Tools, and Future Outlook, Developments in Applied Microbiology and Biotechnology, 1st Edition, ISBN: 978-0-323-96113-4, 379-402 (2023). DOI: 10.1016/B978-0-323-96113-4.00009-3.

54- **M. Tawalbeh**, A. Al-Othman, A. Ka'ki, A. Farooq, M. Alkasrawi, Lignin/zirconium phosphate/ionic liquids-based proton conducting membranes for high-temperature PEM fuel cells applications, Energy 260 (2022) 125237.

55- N. Halalsheh, O. Alshboul, A. Shehadeh, R.E. Al Mamlook, A. Al-Othman, **M. Tawalbeh**, A.S. Almuflih, C. Papelis, Breakthrough curves prediction of selenite adsorption on chemically modified zeolite using boosted decision tree algorithms for water treatment applications, Water 2022, 14(16), 2519; https://doi.org/10.3390/w14162519.

56- **M. Tawalbeh**, S. Alarab, A. Al-Othman, R.M.N. Javed, The operating parameters, structural composition, and fuel sustainability aspects of PEM fuel cells: A mini review, Fuels 2022, 3(3), 449-474. https://doi.org/10.3390/fuels3030028 .

57- R.M.N. Javed, A. Al-Othman, **M. Tawalbeh**, A.G Olabi, Recent developments in graphene oxide materials for polymer electrolyte membranes fuel cells applications, Renewable and Sustainable Energy Reviews 168 (2022) 112836.

58- **M. Tawalbeh**, S. Murtaza, A. Al-Othman, A.H. Alami, K. Singh, A.G. Olabi, Ammonia: A versatile candidate for the use in energy storage systems, Renewable Energy 194 (2022) 955-977.

59- **M. Tawalbeh**, R.M.N. Javed, A. Al-Othman, F. Almomani, The novel advancements of nanomaterials in biofuel cells with a focus on electrodes' applications, Fuel 322 (2022) 124237.

60- M. Al-Murisi, D. Al-Muqbel, A. Al-Othman, **M. Tawalbeh**, Integrated microbial desalination cell and microbial electrolysis cell for wastewater treatment, bioelectricity generation, and biofuel production: Success, experience, challenges, and future prospects, Book Chapter, Elsevier Book Chapter 6 "Integrated Environmental Technologies for Wastewater Treatment and Sustainable Development". ISBN 978-0-323-91180-1, 145-165 (2022). DOI: 10.1016/B978-0-323-91180-1.00026-0.

61- A. Alhajar, **M. Tawalbeh**, D. Arjomand, N.A. Rahman, H. Khan, A.Al-Othman, Integrating forward osmosis into microbial fuel cells for wastewater treatment, Book Chapter, Elsevier Book Chapter 14 "Integrated Environmental Technologies for Wastewater Treatment and Sustainable Development". ISBN 978-0-323-91180-1, 321-335 (2022). DOI: 10.1016/B978-0-323-91180-1.00016-8

62- **M. Tawalbeh**, A. Al-Othman, A. Ka'ki, A. Farooq and M. Alkasrawi, "Highly proton conductive membranes based on lignin/ZrP/PTFE composite for high temperature PEM fuel cells," 2022 Advances in Science and Engineering Technology International Conferences (ASET), 2022, pp. 1-5, doi: 10.1109/ASET53988.2022.9734834.

63- **M. Tawalbeh**, S. M. Shafie, S. F. Alshehhi, A. A. Alnaqbi and A. Al-Othman, "A hybrid photovoltaic/solar chimney seawater desalination plant," 2022 Advances in Science and

Engineering Technology International Conferences (ASET), 2022, pp. 1-7, doi: 10.1109/ASET53988.2022.9735006.

64- **M. Tawalbeh**, A. Al Shibli, S. Ahli and F. Alawadhi, "Life cycle analysis for solar powered portable car shade," 2022 Advances in Science and Engineering Technology International Conferences (ASET), 2022, pp. 1-7, doi: 10.1109/ASET53988.2022.9734805.

65- A. Al-Othman, M. F. Hassan, **M. Tawalbeh** and A. Ka'ki, "Proton Conductivity Studies in Zirconium Phosphate/MXenes in PEM Fuel Cells," 2022 Advances in Science and Engineering Technology International Conferences (ASET), 2022, pp. 1-5, doi: 10.1109/ASET53988.2022.9735033.

66- H. Aljaghoub, A. Alashkar, A. H. Alami and **M. Tawalbeh**, "Prediction of Weather Patterns Using Linear Angstrom Model," 2022 Advances in Science and Engineering Technology International Conferences (ASET), 2022, pp. 1-3, doi: 10.1109/ASET53988.2022.9734942.

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Conference Presentations:

1. "Novel Chitosan Based Composite Membranes for High Temperature Fuel Cells Applications" 14th International Conference on Sustainable Energy & Environmental Protection (SEEP2022) 12th – 15th of September 2022, Brunel University London, Kingston Lane, Uxbridge, UB8 3PH, UK.
2. "Biodegradable Membranes for PEM Fuel Cells Applications" 14th International Conference on Sustainable Energy & Environmental Protection (SEEP2022) 12th – 15th of September 2022, Brunel University London, Kingston Lane, Uxbridge, UB8 3PH, UK.
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18. “Modeling the transport of CO_2, N_2 and their binary mixtures through thin silicalite-1 membrane using Maxwell−Stefan equations” 6th International Conference on Materials Science & Smart Materials (MSSM2019) Aston University, Birmingham, UK, July 24-26, 2019.
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24. “Experimental and numerical studies of heat transfer using three different types of nanofluid in concentric tube heat exchanger” 5th International Conference on Renewable Energy: Generation and Applications (ICREGA'18), Al Ain, Abu Dhabi, United Arab Emirates. Feb. 26th to 28th 2018.
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28. **“**Graphene Nafion composite membrane as an effective membrane for passive DMFC” 11TH International Conference on Composite Science and Technology (ICCST 11), 4th to 6th April 2017, Sharjah, UAE.
29. Design and modeling of a novel integrated CSP membrane distillation desalination system. The Fifth International Conference on Water, Energy and Environment (ICWEE/5), Sharjah, UAE, February 28- March 2 ,2017.
30. “Modeling the diffusion of CO_2, N_2 and their binary mixtures across silicalite-1 zeolite membrane using Maxwell-Stefan (M-S) Equations” 63rd Canadian Chemical Engineering Conference, Oct. 20th to 23rd, 2013 Frederiction, NB, Canada.
31. “Separation of greenhouse gases using MFI type silicalite-1 zeolite membranes” 63rd Canadian Chemical Engineering Conference, Oct. 20th to 23th, 2013 Frederiction, NB, Canada.
32. “Separation of CO_2/N_2 and CO_2/CH_4 Gas mixtures with new silicalite-1 adsorbent membranes synthesized on a novel support”, 11th Fundamentals of Adsorption Conference, May 19th to 24th, 2013, Baltimore, Maryland, USA.
33. “Silicalite Adsorbent Membranes for Separation of CO_2 and N_2 Gases” AICHE 2012 Annual Meeting Conference, Oct. 28th to Nov. 2nd, 2012, Pittsburgh, PA, USA.
34. “Synthesis, Characterization and Application of Novel Inorganic Membranes Derived from Sepiolite or Zeolite over Porous Support” EUROCLAY 2011 European Clay Conference June 26th to July 1st, 2011, Antalya, Turkey.
35. “Novel Inorganic Membranes for CO_2 and N_2 Separation” 3rd IUPAC Conference on Green Chemistry, August 15th to18th, 2010, Ottawa, Ontario, Canada.

36. “Synthesis, morphology characterization and gas permeation properties of new inorganic membrane” 16th International Zeolite Conference joint with the 7th International Mesostructured Materials (IZC16 – IMMS7) July 4th to 9th, 2010, Sorrento, Italy.
37. “Thermal properties of electrolytic magnesium production feed” 134 Minerals, Metals & Materials Society Annual Meeting & Exhibition (TMS 2005) Feb. 13th to 17th, 2005, San Francisco, California, USA.
38. “Formation of MgOHCl during dehydration of magnesium chloride hydrates by contacting with molten salt” Conference of Metallurgists (COM 2004) Aug. 22th to 25th, 2004, Hamilton, ON, Canada.