

# Mohammad Ali Abdelkareem

## Minia University, faculty of Engineering, Chemical Engineering department

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### Professional Profile

#### PhD:

Dr. Mohammad spent 7 years in one of the pioneer labs in Japan in the field of electrochemical energy devices, i.e., fuel cells. During his PhD study, Dr Mohammad developed a novel electrode structure for Direct Methanol Fuel Cell (DMFC), thereby; the methanol concentration which can be used efficiently in DMFC has been increased from 7 to 100 weight%. Moreover during the PhD study he has investigated all the parameters affecting the performance of this novel type of fuel cells.

As the high cost of the electrodes of the direct methanol fuel cells is one of the main obstacles facing their commercialization, Dr Mohammad has started preparation of cheap cathode material, i.e., oxygen reduction reaction (ORR) catalyst, to replace the current expensive platinum catalyst. Using the electrospinning as a Nano-technological approach for the preparation of nanofibers, he has prepared poly-acrylonitrile, PAN, based carbon nanofibers to replace the Pt catalyst of the cathode for the fuel cell. Moreover, Dr Mohammad has used electrospinning for the preparation of a composite nanofibers as a catalyst support, and a non-precious catalyst for the direct alcohol fuel cells. During this period, Dr Mohammad got very good experience in the different electrochemical techniques used for the evaluation of the different prepared materials as well as the electrospinning.

Dr Mohammad back to Egypt at the end of 2012 where he worked as an assistant professor for around one year then he promoted the associate professor in October 2013. During this period Dr Mohammad built up two pioneer labs in the field of the Solid Oxide Fuel Cells and Microbial Fuel Cells.

Right now he is working on developing energy conversion/storage devices such as fuel cells and supercapacitors.

During these studies, Dr Mohammad has got strong experience in:

1. Fuel cell fabrication from electrodes, anode and cathode, and the membrane electrode assembly, MEA. The evaluation of the different materials Ex-Situ and In-Situ. Using the three electrode cell structure and the MEA assembly in the actual fuel cell application
2. Using of the different electrochemical techniques for the evaluation of the different prepared catalyst such as cyclic voltammetry, and impedance as well as other common electrochemical techniques.
3. The analysis of the XRD, FE-SEM, XPS and FE-TEM for the characterization of the different prepared materials.
4. Professional in using the electrospinning for the fabrication of the nanofibers of the different materials and composites. Moreover, using the sol. Gel. method for the preparation of the nanoparticles.

### Current research:

#### Dr Mohammad currently supervise several master students

1. Development of nanosized catalyst, i.e., nanoparticles, nanofibers and graphene, for the application in DMFC, Urea fuel cells, microbial fuel cell, and supercapacitors.
2. The application of the nanosized materials in the Hydrogen release.
3. Development of an integrated system for electricity production from biogas and solid oxide fuel cell.

## Establishment of laboratories:

During 2013-2015, Dr Mohammad used the available funds from the different projects in the preparation of two advanced laboratories for the preparation of the different nano-catalysts for the application in the different types of the fuel cells and their electrochemical evaluation.

## Career Summary

### June, 1999- Jan., 2000

Chemical Engineer, Egyptian Fertilizer Company

### Feb., 2000-March, 2002

Demonstrator, El-Minia University, Faculty of Engineering, Chemical Engineering Department, Egypt

### April, 2002- Dec., 2004

Teaching Assistant, El-Minia University, Faculty of Engineering, Chemical Engineering Department, Egypt

### July, 2008- Jan., 2009

Lecturer, El-Minia University, Faculty of Engineering, Chemical Engineering Department, Egypt

### Feb., 2008- March, 2011

Post doctor fellowship in Advanced Technology Center (ATEC), Gunma University, Gunma, Japan

### June, 2011- March, 2012

Researcher in Graduate school of Eng., Gunma University, Gunma, Japan

### April, 2012 – March 2013

JSPS fellowship in Gunma University, Gunma, Japan

### Oct., 2013 – till now

Associate Professor, , El-Minia University, Faculty of Engineering, Chemical Engineering Department, Egypt

## Awards

1. Best presented Paper  
Second International Conference for Energy, ICEE2010, Aswan, Egypt 27-29 Dec., 2010.  
Title of the paper "Role of Air Cathode Filter on the Intermediate Products in a Vapor Feed Passive DMFC Operated with High Methanol Concentration".
2. Minia University scientific reward for publishing, 2014 and 2015.
3. State price in advanced Engineering Applications, Egyptian government in 2015.  
جائزة الدولة التشجيعية في التطبيقات الهندسية ٢٠١٥
4. **First class ribbon of excellence by Egyptian president for research, 2017.**

## Education

### Ph.D. Degree: June, 2008 (Gunma University, Japan)

Ph.D. Degree in Fuel cells under the title "Novel Electrode Structure for the Reduction of Methanol Crossover in a Passive DMFC

### "M.Sc. Degree: May, 2002 (El-Minia University, Egypt)

M.Sc. Degree in Chemical Engineering, under the thesis title "Evaluation of Pack Aluminizing of Steel in Various Corrosive Media".

**B.Sc. Degree: May, 1998 (El-Minia University, Egypt)** B.Sc., Chemical Engineering Final year grade (Distinction, 90.5%), The average grade (Very good with honors degree, 78%)

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## Editorial Board of journals:

1. Carbon Resources Conversion.

<http://www.keaipublishing.com/en/journals/carbon-resources-conversion/editorial-board/>

**Referee in the following journals:**

1. Chemical Engineering Journal.
2. Applied Catalysis A.
3. Material letters
4. Industrial and Engineering Chemistry
5. Energy Technology
6. Ceramics International
7. Journal of electro-analytical Chemistry
8. Applied Surface science.
9. Desalination.

**Teaching experience:**

**Under Graduate courses:**

1. Introduction to Energy Science and Technology.
2. Fuel Cells.
3. Fluid Mechanics.
4. Principals of Chemical Engineering.
2. Fundamentals of Biochemical Engineering.
3. New and Renewable Energy.
4. White Cement Industry.
5. Equipment design for industrial wastes recycling.
6. Organic Engineering Industries.
7. Chemical Engineering for biomedical applications.
8. Electrochemical Engineering and Corrosion.
9. Principals of Chemical Industries.
10. Fluid and Heat Transfer.
11. Engineering Thermodynamics
12. Fluid Mechanics Lab.
13. Wind Energy System Lab.

**Postgraduate courses:**

1. Biological Processes for Pollution Removal
2. Energy polices and Economics
3. Hydrogen production and storage
4. Bioenergy technology

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## Publications

### International journals:

1. T. Nakazato, N. Hirao, **M. A. Abdelkareem**, A. Nakazawa, and N. Nakagawa, "Methanol Diffusion through a Porous Plate in Anode Backing of a Passive Direct Methanol Fuel Cell under Closed Circuit Conditions", *Journal of Chemical Engineers of Japan*, 40 (2007) 1108-1112.
2. N. Nakagawa, **M. A. Abdelkareem**, "The role of carbon dioxide layer prepared by a porous carbon plate in a passive DMFC as a mass transport barrier", *Journal of Chemical Engineers of Japan*, 40 (2007) 1199-1204.
3. **M. A. Abdelkareem**, T. Yoshitoshi, T. Tsujiguchi and N. Nakagawa, "Vertical operation of passive DMFC employing a porous carbon plate", *Journal of Power Sources*, 195 (2010) 1821-1828.
4. T. Tsujiguchi, **M. A. Abdelkareem**, T. Kudo and N. Nakagawa, T. Shimizu, M. Matsuda, "Development of a passive DMFC stack for high methanol concentration", *Journal of Power Sources*, 195 (2010) 5975-5979.
5. **M. A. Abdelkareem**, T. Tsujiguchi and N. Nakagawa, "Effect of black catalyst ionomer content on the performance of passive DMFC", *Journal of Power Sources*, 195 (2010) 6287-6293.
6. **M. A. Abdelkareem**, and N. Nakagawa, "A key factor for the actual application of a vapor feed passive DMFC operated with high concentration of methanol", *Key Eng. Materials*, 459 (2011) 78-83.
7. N. Nakagawa, **M. A. Abdelkareem**, D. Takino, T. Ishikawa, and T. Tsujiguchi, "PAN based carbon nanofibers as an active ORR catalyst for DMFC" *Electrochemical society, ECS Transactions*, 41 (1) 2219-2229 (2011).
8. **M. A. Abdelkareem**, D. Takino, T. Ishikawa, T. Tsujiguchi and N. Nakagawa, "PAN based carbon nanofibers as an active ORR catalyst", *J. Key Eng. Material*, 497(2012) 73-79.
9. Yousef, N. A. M. Barakat, T. Amna, **M. A. Abdelkareem**, A. R. Unnithan, S. S. Aldeyab and H. Y. Kim, Activated Carbon/Silver-Doped Polyurethane Electrospun Nanofibres: Single Mat for Different Pollutants Treatment, *Macromolecular Research*, 20 (2012) 1243-1248.
10. M. H. Gabr, N. T. Phong, **M. A. Abdelkareem**, K. Okubo, K. Uzawa, I. Kimpara, and T. Fujii, Mechanical, thermal, and moisture absorption properties of nano-clay reinforced nano-cellulose biocomposites, *Cellulose* (2013) 20:819-826.
11. **M. A. Abdelkareem**, Y. Ito, T. Tsujiguchi, and N. Nakagawa, Carbon-TiO<sub>2</sub> Composite Nanofibers as a Promising Support for PtRu Anode Catalyst of DMFC, *ECS Trans.* 2013 50(2): 1959-1967.
12. B. M. Thamer, M. H. El-Newehy, S. Al-Deyab, **M. A. Abdelkareem**, H. Y. Kim, N. A. M. Barakat, Cobalt-incorporated, nitrogen-doped carbon nanofibers as effective non-precious catalyst for methanol electrooxidation in alkaline medium, *Applied Catalysis A: General*, 498 (2015) 230-240.
13. A. Yousef, R. M. Brooks, **M. A. Abdelkareem**, J. A. Khamaj, M. H. El-Halwany, N. A. M. Electrospun NiCu nanoalloy decorated on carbon nanofibers as chemical stable electrocatalyst for methanol oxidation, *ECS Electrochemistry Letters* 4 (2015) F51-F55.
14. A. Yousef, R. M. Brooks, M.M. El-Halwany, **M. A. Abdelkareem**, J. A. Khamaj, M. H. EL-Newehy, N. A. M. Baraka, H. Y. Kim, Fabrication of Electrical Conductive NiCu- Carbon Nanocomposite for Direct Ethanol Fuel Cells, *Int. J. Electrochem. Sci.*, 10 (2015) in press.
15. N.A.M Barakat, E.Ahmed, **M. A. Abdelkareem**, AA Farghali, MM Nassar, M. H El-Newehy, S. S Al-Deyab, Ag, Zn and Cd-doped titanium oxide nanofibers as effective photocatalysts for hydrogen extraction from ammonium phosphates, *Journal of Molecular Catalysis A: Chemical* 409 (2015) 117-126.
16. B. M Thamer, M. H El-Newehy, N. AM Barakat, **M. A. Abdelkareem**, S. S Al-Deyab, H. Y. Kim, In-situ synthesis of Ni/N-doped CNFs-supported graphite disk as effective immobilized catalyst for methanol electrooxidation, *J. Hydrogen Energy* 40 (2015) 14845-14856.
17. N. AM Barakat, H. M Moustafa, MM Nassar, **M. A. Abdelkareem**, MS Mahmoud, A. A Almajid, K. A. k Khalil, Distinct influence for carbon nano-morphology on the activity and optimum metal load-

ing of Ni/C composite used for ethanol oxidation, *Electrochimica acta* 182 (2015), Pages 143–155.

18. A. Allagui, **M. A. Abdelkareem**, A. Alwakil, H. Alawadi, Reduced Graphene Oxide Thin Film on Conductive Substrates by Bipolar Electrochemistry, *Scientific Reports*, 6 (2016) 21282.
19. A. Allagui, A. E. Rojas, T. Bonny, A. S. Elwakil, and **M. A. Abdelkareem**, Nonlinear time-series analysis of current signal in cathodic contact glow discharge electrolysis, *J. of applied physics* 119(2016) 203303.
20. **M. A. Abdelkareem**, A. Allagui, T. Tsujiguchi, N. Nakagawa, Effect of the Ratio Carbon Nano-fiber/Carbon Black in the Anodic Microporous Layer on the Performance of Passive Direct Methanol Fuel Cell, *J. Electrochem. Soc.* 163 (2016) F1011-F1016.
21. Allagui, J. M. Ashraf, M. Khalil, **M. A. Abdelkareem**, A. S. Elwakil, H. Alawadh, All-Solid-State Double-Layer Capacitors Using Binderless Reduced Graphene Oxide Thin Films Prepared by Bipolar Electrochemistry, *ChemElectroChem* 4 (2017) 1-8.
22. H. O. Mohamed, **M. A. Abdelkareem**, M. Obaid, S. Chae, M. Park, H. Y. Kim, N. A.M. Barakat, Cobalt Oxides-Sheathed Cobalt Nano flakes to Improve Surface Properties of Carbonaceous Electrodes Utilized in Microbial Fuel Cells, *Journal Chemical Engineering*, 326 (2017) 497-506.
23. H. O. Mohamed, **M. A. Abdelkareem**, M. Park, J. Lee, T. Kim, G. P. Ojha, B. Pant, S. Park, H. Kim, N. AM Barakat, Investigating the effect of membrane layers on the cathode potential of air-cathode microbial fuel cells, *International Journal of Hydrogen Energy*, 42 (2017) 24308-24318.
24. A. Allagui, Z. Said, **M. A. Abdelkareem**, A. S. Elwakil, M. Yang, H. Alawadhi, DC and AC Performance of Graphite Films Supercapacitors Prepared by Contact Glow Discharge Electrolysis, *Journal of The Electrochemical Society*, 164 (2017) A2539-A2546.
25. H. O. Mohamed, M. Obaid, E. T. Sayed, **M. A. Abdelkareem**, M. Park, Y. Liu, H. Y. Kim, N. A.M. Barakat, Graphite sheets as high-performance low-cost anodes for mediator-less microbial fuel cells using real food wastewater, *Journal Chemical Engineering Technology*, 40 (2017) 2243–2250.
26. N. AM Barakat, E. Ahmed, M. T Amen, **M. A. Abdelkareem**, AA Farghali, N-doped Ni/C/TiO<sub>2</sub> nanocomposite as effective photocatalyst for water splitting, *Materials Letters*, 210 (2018) 317–320.
27. **M. A. Abdelkareem**, M. E. Assad, E. T. Sayed, B. Soudan, Recent progress in the use of renewable energy sources to power water desalination plants, *Desalination*, 435 (2018) 97-113.
28. **M. A. Abdelkareem**, Y. Alhaj, M. Alajami, H. Alawadhi, N. AM Barakat, Ni-Cd Carbon Nanofibers as an Effective Catalyst for Urea Fuel Cell, *Journal of Environmental Chemical Engineering*, 6 (2018) 332–337.
29. H. Omar, M. Obaid, K. Poo, **M. A. Abdelkareem**, S. AboTalas, O A. Fadali, H. YongKim, K. Chae, Fe/Fe<sub>2</sub>O<sub>3</sub> nanoparticles as anode catalyst for exclusive power generation and degradation of organic compounds using microbial fuel cell, *Chemical Engineering Journal* 349 (2018) 800–807.
30. Z. Said, A. Allagui, **M. A. Abdelkareem**, H. Alawadhi, K. Elsaid, Acid-functionalized carbon nanobers for high stability, thermoelectrical and electrochemical properties of nanofluids, ***Journal of Colloid & Interface Science* 520 (2018), 50-57.**
31. A Allagui, TJ Freeborn, AS Elwakil, ME Fouda, BJ Maundy, Z. Said , AG Radwan, **M. A. Abdelkareem**, Review of fractional-order electrical characterization of supercapacitors, *Journal of Power Sources* 400 (2018) 457-467.
32. H. Rezk, A. S. Alsaman, M. Al-Dhaifallah, A. A. Askalany, **M. A. Abdelkareem**, A. M Nassef, Identifying optimal operating conditions of solar-driven silica gel based adsorption desalination cooling system via modern optimization, *Solar energy* 181 (2019) 475-489.
33. HM Moustafa, M Obaid, MM Nassar, **MA Abdelkareem**, MS Mahmoud, Titanium dioxide-decorated rGO as an effective electrode for ultrahigh-performance capacitive deionization, *Separation and Purification Technology* 235, 116178.
34. HM Moustafa, MM Nassar, **MA Abdelkareem**, MS Mahmoud, M Obaid, Synthesis and characterization of Co and Titania nanoparticle-intercalated rGO as a high capacitance electrode for CDI, *Journal of Environmental Chemical Engineering* 7 (6), 103441.

### **Book Chapters:**

35. E. T. Sayed, **M. A. Abdelkareem**, "Yeast as biocatalyst in microbial fuel cells", <http://dx.doi.org/10.5772/intechopen.70402>, <https://cdn.intechopen.com/pdfs-wm/56779.pdf>.
36. N. Nakagawa, **M. A. Abdelkareem**, T. Tsujiguchi, M. S. Masdar, "DMFC with a Fuel Transport Layer Using a Porous Carbon Plate for Neat Methanol", Nova publishers, 2017.

### **International Conference:**

1. M. A. Abdelkareem, M. S. Mahmoud, M. R. O. Ali, F. A. Hammad, N.A.M. Barakat, and I. A. Ashour, Cobalt-Doped Carbon nanofibers as an Effective ORR Catalyst, Proceedings of EFC2015, European Fuel Cell Technology & Applications Conference - Piero Lunghi Conference, December 16-18, 2015, Naples, Italy.
2. Allagui, M. A. Abdelkareem, H. Alawadhi, A. S. Elwakil, One step Preparation of Reduced Graphene Oxide Thin Films by Bipolar Electrochemistry in Deionized Water, Advances in Functional Materials August 2016, South Korea, accepted for Oral presentation.
3. M. Twalbeh., Amani Al-Othman, M. A. Abdelkareem, Halima Alnaqbi, Abrar Lenjawi, Rafeef Ihsun, Graphene/ZrP/PTFE composite membranes for passive DMFC, ICCST 11 American University of Sharjah, April 4-6, 2017.
4. M. Twalbeh., M. A. Abdelkareem, Amani Al-Othman, Olla Riad, Shima Al-Ali, Graphene Nafion composite membrane as an effective membrane for passive DMFC, ICCST 11 American University of Sharjah, April 4-6, 2017.

### **Local Conferences**

1. M. A. Abdelkareem, Kazuya Sekimoto, Nobuyoshi Nakagawa : MCO through a novel DMFC using porous carbon support and factors affecting on it, 15 to 17 September 37th Autumn Meeting Society of Chemical Engineers, G123, Okayama University, 2005
2. M. A. Abdelkareem, Kazuya Sekimoto, Nobuyoshi Nakagawa : Effect of porous plate and electrolyte membrane on methanol crossover through a novel passive DMFC, (16 to 18 November 2005) 46th battery debate, 1F-16, Nagoya, Japan.
3. H. Naoya, M. A. Abdelkareem, N. Nakagawa, Power generation characteristics of the DMFC using porous support, Chemical Engineering Society 71st Annual Meeting, 28 to 30 March M214, 2006 year Tokyo Institute of Technology, Japan.
4. Sekimoto Kazuya, MA Abdelkareem, Shin Nakagawa good, Methanol crossover of the DMFC using porous support, Chemical Engineering Society 71st Annual Meeting, 28 to 30 March M215, 2006 , Tokyo Institute of Technology, Japan.
5. M. A. Abdelkarim, S. Kazuya, N. Nakagawa, Separation of methanol and water in a passive DMFC using a porous plate at open circuit conditions, annual meeting separation technique, technology and research presentations, 2 to 3 June S7-01, 2006 , School of Science and Engineering, Waseda University, Japan.

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### **Personal Information**

**Name:** Mohammad Ali Abdelkareem

**Nationality:** Egyptian

**Birth Date:** Nov. 12, 1975

**Gender:** Male

**Marital Status:** Married

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