University of Birmingham

Mr Ahmad El-kharouf BSc (Hons)

Doctoral Researcher

Contact details

Telephone +44 (0) 121 414 5283 (tel:+44 121 414 5283)

Email axe902@bham.ac.uk (mailto:axe902@bham.ac.uk)

School of Chemical Engineering
University of Birmingham
Edgbaston
Birmingham
B15 2TT
UK

About

Ahmad graduated from the University of Jordan in 2008 with a Bachelor degree in Mechatronics engineering. He worked in solar heating systems for a year before starting his PhD in the study of Polymer Electrolyte Fuel Cells (PEFCs) at the University of Birmingham.

Ahmad's PhD focuses on understanding and optimization of Gas Diffusion Layers (GDL) for PEFCs. A wide range of commercially available GDL materials have been characterised ex-situ and in-situ to achieve an understanding of the effect of GDL properties on PEFC performance and establish a base line for GDL development for increasing fuel cell performance and efficiency.

Qualifications

- BSc (Hons) Mechatronics Engineering

Biography

Ahmad graduated from the University of Jordan with a degree in Mechatronics Engineering (2008). In his graduation project, he was part of a team for designing and building an Automated and GSM controlled hybrid solar and diesel boiler space heating system. The project was funded by CADDB and won the prize of the best project in Jordan for the year 2008, and the best undergraduate project in the Arab world (Egypt, 2009) . Then, Ahmad worked for a year with "Hanania Solar systems" as a design and maintenance engineer.

Interested in exploring new types of clean and sustainable energy resources, Ahmad started his PhD at the University of Birmingham with the Centre for Hydrogen and Fuel Cell research in the Chemical Engineering department.

Ahmad's research focuses on the role of GDL properties and their effect on PEMFCs performance. This is explored both experimentally and using CFD modelling. Some of Ahmad's PhD work was done in collaboration with UCL university and the University of Loughborough in the UK and University of South Wales in Australia. During Ahmad's PhD he has presented numerous posters at conferences and events within the UK and internationally. Selected oral presentations include:

- Fuel cell systems applications and efficiency, Global Green Techies Forum & Exhibition (GTFE) (Amman, Jordan) – September 2010
- GDL Properties and Their Effect on PEM Fuel Cell Performance- Ex-situ Characterisation of Commercial GDLs and MEA Modelling, Hydrogen and Fuel Cells conference, Zing conferences (Cancun, Mexico) – December 2011

Teaching

Ahmad has been facilitating the tutorial for the foundation year physical chemistry module for the semesters; spring and autumn 2012 and spring 2013.

Research

Supervisors: Dr Waldemar Bujalski and Dr Neil Rees

The project aims to enhance the performance of PEFCs through the development of GDL materials. As part of the research, a better understanding of the effect of GDL properties on the PEFC performance is established and an optimization method for MEA clamping pressure is developed. Moreover, Carbon Nano-tubes (CNT) Bucky papers are used as a novel MPL material. The research activity and tests include:

- *Ex-situ* characterization of GDL materials; SEM, interferometry, Porosimetry, Sessile water contact angle, and Electrical In-plane and Through-plane resistance.
- Membrane Electrode Assembly (MEA) fabrication, *In-situ* single celltesting and optimization, and characterization using Electrochemical Impedance Spectroscopy (EIS)
- CFD modelling of the GDL and MEA using COMSOL multiphysics software.

Other activities

Ahmad is volunteering as a sub-regional coordinator for a community development programme (the junior youth spiritual empowerment programme) for centre and south west of England

Publications

Chandan, A., Hattenberger, M., El-kharouf, A., Du, S., Bujalski, W., Dhir, A., Self, V., Pollet, B.G., & Ingram, A. High Temperature (ht) polymer electrolyte membrane fuel cells (PEMFC) - a review. *Journal of Power Sources, manuscript accepted.*

El-kharouf, A., Mason, T. J., Brett, D. J. L., & Pollet, B. G. (2012). Ex-situ characterisation of gas diffusion layers for proton exchange membrane fuel cells. *Journal of Power Sources*, *218*, 393–404.

Mason, T. J., Millichamp, J., Neville, T. P., El-kharouf, A., Pollet, B. G., & Brett, D. J. L. (2012). Effect of clamping pressure on ohmic resistance and compression of gas

diffusion layers for polymer electrolyte fuel cells. *Journal of Power Sources*, *219*, 52–59.

El-kharouf, A., & Pollet, B. G. (2012). Chapter 4 - Gas Diffusion Media and their Degradation. *Polymer Electrolyte Fuel Cell Degradation* (pp. 215–247).

El-kharouf, a, Chandan, a, Hattenberger, M., & Pollet, B. G. (2012). Proton exchange membrane fuel cell degradation and testing: review. *Journal of the Energy Institute*, *85*(4), 188–200.