

## Daniel Symes BEng (Hons) MRes

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## DTC Project - Design, Implementation and Testing of Low Temperature Electrolysers and Electrolyser Systems for Hydrogen Production in Various Applications

Supervisors: [Dr Bushra Al-Duri \(/staff/profiles/chemical-engineering/al-duri-bushra.aspx\)](/staff/profiles/chemical-engineering/al-duri-bushra.aspx), Dr Aman Dhir

Start Date: October 2010

End Date: October 2014

### About

Dan throughout his life has always enjoyed and had an underlying interest in science and its relevance in the real world. This led to him focusing his GCSEs and A-Levels on Mathematics, Physics and Chemistry. Upon achieving these qualifications Dan set about studying Chemical Engineering at University, which he saw was an excellent balance between the three subjects he studied at A-Level.

Dan graduated from the University of Birmingham with a 2.1 degree in Chemical Engineering in 2009. Dan has a keen interest in sustainability and future fuels so after his undergraduate studies decided to take up an MRes in the Centre for Hydrogen and Fuel Cell Research. Dan's research was focused on the use of ultrasound to improve the efficiency of electrolysis in aqueous solutions.

Upon completion of his MRes, Dan was accepted on the Doctoral Training Centre for Hydrogen, Fuel Cells, to complete a four year PhD with Integrated Studies in Hydrogen, Fuel Cells and their Applications. This project would be in the same research field as studied for his MRes.

In his spare time, Dan is a keen sportsman who can be regularly found on the golf course networking with colleagues, cheering on his beloved Manchester United, or having a bet or two on the horses. Dan is very outgoing person who enjoys socialising with friends and I like to keep up to date on world affairs.

### Interests

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### Project Details

Currently 50 million tonnes of Hydrogen are produced globally every year. It is predicted that the production will increase substantially over the coming decades. Currently 95-96% of global Hydrogen production is obtained from fossil fuels, which produces 90-99% purity Hydrogen with greenhouse gases (GHGs) as a by-product.

Water electrolysis represents only 4-5% of global Hydrogen production. The process involves passing an electrical current through water, to split water molecules into Hydrogen and Oxygen. The Hydrogen produced is very pure (>99.99%) and therefore will not poison the highly expensive platinum catalyst in Proton Exchange Membrane Fuel Cells (PEMFCs).

Dan's PhD primarily focuses on the design, build and testing of electrolyzers for alkaline and PEM technologies. These electrolyzers can then be incorporated into much larger systems for application on a much larger scale. Systems will be designed, built and tested for stationary and mobile applications.

These systems can incorporate renewable resources such as solar and wind energy to provide electrical energy to electrolyzers which produces no (GHG) emissions. Since water electrolysis produces no GHG emissions, 'Green' Hydrogen is produced since it has a zero carbon footprint.

### Papers

- Symes, D.; Al-Duri, B.; Bujalski, W.; Dhir, A. *Energy Procedia- WHEC Edition* **2012**, Submitted
- Symes, D.; Al-Duri, B.; Bujalski, W.; Dhir, A. *International Journal of Low Carbon Technologies* **2012**, Submitted

### Presentations

- World Hydrogen Energy Conference- Toronto, Canada June 2012- [Link \(http://www.whec2012.com/wp-content/uploads/2012/06/WHEC-2012-Daniel-Symes.pdf\)](http://www.whec2012.com/wp-content/uploads/2012/06/WHEC-2012-Daniel-Symes.pdf)
- 2nd DTC in Hydrogen in Fuel Cells Conference, September 2011
- South Bromsgrove High School – December 2010 - [Link \(http://www.bromsgrovetradvertiser.co.uk/news/8750371.Budding\\_boffins\\_enjoy\\_visit\\_from\\_top\\_scientists/\)](http://www.bromsgrovetradvertiser.co.uk/news/8750371.Budding_boffins_enjoy_visit_from_top_scientists/)

### Posters Presented

- 6th International Hydrogen and Fuel Cell Conference (NEC, Birmingham)
- Midlands Electrochemistry Group Conference (University of Leicester, Leicester)
- 7th International Hydrogen and Fuel Cell Conference (NEC, Birmingham)
- 2nd DTC in Hydrogen in Fuel Cells Conference, September 2011
- 8th International Hydrogen and Fuel Cell Conference (NEC, Birmingham)

## Other Events Attended

- Midlands Annual Fleet Managers Conference – University of Birmingham 2011
- Sustainability Live, NEC, Birmingham, UK, May 2010
- 1st DTC in Hydrogen and Fuel Cell Conference, September 2010
- Sustainability Live, NEC, Birmingham, UK, May 2011

## Outreach

- Answered questions about Hydrogen & Fuel Cell technology at the Centre's stand at Sustainability Live 2010.
- Presentation to 30+ 6th form students aged 16-18 on the need and state of Hydrogen and Fuel Cell technologies as a future energy source..
- Answered questions about Hydrogen & Fuel Cell technology at the Centre's stand at Sustainability Live 2011.
- Demonstrated Hydrogen & Fuel Cell technology to students and professionals at 10:10 event 2010 at the University of Birmingham.
- Supervised 20+ Summer Placement students at the University of Birmingham

## Courses Attended

- SPEED WM Business Summer School Programme
- Leading Academics Programme
- B-SEEN (Birmingham Skills for Enterprise and Employability Network)

## Awards

- University of Birmingham Entrepreneur and Innovation Plan B Competition Winner 2011- Plan B seeks people with ideas and vision, who can devise and communicate a plan to achieve that vision. - [Link \(https://intranet.birmingham.ac.uk/as/employability/ei/success/planb2011.aspx\)](https://intranet.birmingham.ac.uk/as/employability/ei/success/planb2011.aspx)

