Utilisation of solid oxide fuel cells for conversion of biodiesel waste streams

*Matthew Drewery (a,^), Eric Kennedy (a), Bogdan Dlugogorski (b), Michael Stockenhuber (a, *)*
(a) University of Newcastle (b) Murdoch University

Presentation Preference: Oral

Career Level: Post Graduate Student

Aligned with Science Focus: general catalysed processes

Abstract:

The use of petroleum has recently come under scrutiny due to its adverse environmental effects and issues of sustainability, thus a more sustainable option in the form of biodiesel has been suggested, potentially reducing greenhouse emissions, deforestation and pollution. A by-product of this reaction is glycerol, which makes up approximately 10 wt% of the final product. Production of biodiesel has grown, making industrial synthesis of glycerol obsolete and causing the market price of glycerol to fall dramatically. With this surplus of glycerol, extensive research into the additional potential uses of glycerol is being conducted.

SOFC research has focussed largely on operation with H_2, CO and CH_4 due to the ease of use and lower likelihood of coking, however development of composite anodes which inhibit carbon deposition and difficulty in supplying H_2 and CO have led to the use of larger hydrocarbons. Glycerol can thus be used as a fuel source in conjunction with SOFCs either directly or through reaction derivatives.

This work focuses on the operation of a commercially available nickel-based solid oxide fuel cell utilising waste hydrocarbons as potential fuels. The cell is operated on propane, acrolein, allyl alcohol and glycerol to examine the viability of these fuels and further to investigate the effects of varying functional groups on cell operation and surface reactions.

Biographical Statement of speaker:

After completing a B Sci (Chem)/B Eng (Chem) from the University of Newcastle, Matthew started a PhD under the supervision of Professors Stockenhuber, Kennedy and Dlugogorski. Research has focussed on the conversion of glycerol, both catalytically to value-added chemicals and via introduction to SOFCs for energy production.