



School of Computing, Engineering, and the Built Environment Edinburgh Napier University

PHD STUDENT PROJECT

Application instructions:

Detailed instructions are available at :

<https://www.napier.ac.uk/research-and-innovation/doctoral-college/how-to-apply>

Prospective candidates are encouraged to contact the Director of Studies (see details below) to discuss the project and their suitability for it.

Project details

Supervisory Team:

- DIRECTOR OF STUDY: Dr Neil Shearer (Email: n.shearer@napier.ac.uk)
- 2ND SUPERVISOR:

Subject Group: Engineering & Mathematics

Research Areas: Applied Chemistry, Inorganic Chemistry, Chemical Engineering, Energy Technologies, Ceramics, materials science - other

Project Title: Manufacture of Solid Oxide Fuel Cells Using Electroless Co Deposition

Project description:

Solid Oxide Fuel Cells (SOFCs) are promising energy technology devices for the highly efficient conversion of chemical to electrical energy. The higher operating temperature of SOFCs potentially give greater fuel flexibility so can act as a bridge between existing hydrocarbon fuels and future energy frameworks based on low carbon fuels such as hydrogen. However standard nickel based anode materials have issues if fuel supply is not well managed, such as carbon deposition, sulphur poisoning and dimensionally instability.

The manufacture of anodes and cathodes for solid oxide fuel cells (SOFCs) using electroless co-deposition of metal and ceramic powders. Conventional manufacture involves laying down the anode and cathode by methods that then require sintering to produce the desired composition of electrode.

By using electroless co-deposition the metallic component can be deposited with additions such as ceramic or pore formers inclusions; this method does not then

require sintering and the process is carried out at low manufacturing temperatures (<100°C).

Moving away from conventional Nickel based anodes and considering the lower temperature manufacturing methods Copper based anodes can be considered, potentially lowering the SOFC operating temperature.

The nature of the project is to develop an electroless deposition process for fuel cell applications and test / characterize the resultant cell.

This project aims for a candidate with a background knowledge in fuel cell technology and analysis techniques. Chemistry, materials science or engineering [ceramics/cermets] related areas due to the nature of the electroless process and materials in question.

Candidate characteristics

Education:

A second class honour degree or equivalent qualification in Materials science / engineering / technology or related area, Chemistry or related area

Subject knowledge:

- Chemistry
- Ceramics / cermets
- Fuel cells [SOFC]

Essential attributes:

- Fundamental Chemistry knowledge of metallic deposition processes such as electroless deposition.
- Good written and oral communication
- Strong motivation, with evidence of independent research skills.

Desirable attributes:

- Materials and impedance characterization techniques
- Experience of metallic coating techniques electro / electroless deposition