COLÁISTE NA TRÍONÓIDE, BAILE ÁTHA CLIATH | TRINITY COLLEGE DUBLIN
Ollscoil Átha Cliath | The University of Dublin

4 year PhD Studentships : Electrochemical Energy Conversion.

Applications are invited for a four-year PhD Research position in the Physical and Materials Electrochemistry Group based within the School of Chemistry at Trinity College Dublin, led by Dr Mike Lyons. The successful applicant will be expected to undertake research in an SFI funded project entitled: 'Redox and catalytic properties of hydrated metal oxide electrodes for use in energy conversion and storage devices'.

Electrochemical science forms the scientific basis for a feasible solution to the major issue of cheap sustainable energy production underpinning the future sustainability of 21st century life. It provides the basis for the hydrogen economy involving the production of molecular hydrogen from non fossil sources, its distribution and storage, and its cold combustion in a fuel cell to generate electricity. There has been a considerable renewal in interest in the optimization of oxygen evolution reaction (OER) and oxygen reduction reaction (ORR) electrode materials, since these reactions decrease the performance of water splitting reactors and fuel cells. This project will use a range of state of art electrochemical techniques to optimize, and fully understand, the use of metal oxide coated electrodes as catalysts for these demanding electron transfer reactions in these energy applications and to use such materials as new types of pH sensors.

The anodic evolution and cathodic reduction of oxygen at electrode surfaces represents a major limiting factor in the efficient operation of water electrolysis systems and medium temperature fuel cells, and the optimization of the latter reactions at electrode surfaces represents one of the remaining grand challenges to be surmounted in the area of electrochemical energy conversion and storage. In this project a wide range of micro-dispersed metal oxyhydroxide films will be prepared electrochemically using a simple and scalable potential cycling methodology on noble (Pt, Ir, Rh,) and non-noble (Fe, Co, Ni, Mn) metal electrode surfaces and on the latter electrodes coated with randomly oriented meshes of carbon nanotubes, in aqueous solution and characterized using a number of modern electrochemical (steady state and transient), gravimetric, spectroscopic, hydrodynamic and scanning probe techniques. The redox, charge storage, acid/base, and electrocatalytic properties of the hydrated layers will be quantitatively elucidated, and a detailed comparative understanding of the mechanism of water oxidation and oxygen reduction at a series of well defined and characterized oxide coated surfaces obtained for the first time under similar experimental conditions.

Candidates should have a very strong background (2.1/1st or equivalent) in chemistry /physics/materials, be independent, organized and have the ability to work effectively within a multidisciplinary team. These PhD studentships are funded for 4 years according to current SFI research student scales and consist of a very competitive stipend allied with a significant fixed contribution towards postgraduate fees. Students will automatically be enrolled in the Dublin Chemistry Graduate Programme and will be required to act as demonstrators in undergraduate

laboratories within the School of Chemistry as part of their duties. To apply please email a PDF copy of a brief cover letter and CV, names and contact information of 2-3 referees to melyons@tcd.ie Informal inquiries may also be directed to the same address.