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Professor of Electrochemical Engineering, Research Institute for Industry

Professor Frank C Walsh is Professor of Electrochemical Engineering, Research Institute for Industry within Engineering and the Environment at the University of Southampton.

Frank Walsh holds the degrees of BSC (Applied Chemistry), MSc (Materials Protection and PhD (Electrochemical Engineering) following periods of study at from the Universities of Portsmouth, UMIST and Loughborough. He has held the academic positions of Research Fellow (Southampton), Lecturer in Chemical Technology (Strathclyde) Senior Lecturer/Reader/Professor and Head of the Department of Pharmacy & Biomedical Sciences (Portsmouth). His last position was Head of the Chemical Engineering Department at the University of Bath. Frank has over 20 years industrial experience of electrochemical reactor design gained via consultancy assignments and direct industrial projects. He has published and presented over 200 papers and three text books in aspects of electrochemical engineering and surface finishing of metals. Frank Walsh was awarded the Westinghouse Prize (Institute of Metal Finishing, 1998) for studies on electrochemical deposition and characterization of metallic coatings and the Breyer Medal (Royal Australian Chemical Institute, 2000) for international contributions to electrochemical science and engineering. Grant income of over £1.5M since 1999 has involved sponsorship from EPSRC, EU, Dti and industrial organizations in the areas of electrochemical reactor design, corrosion and surface finishing of metals

Research

Publications

Teaching

Contact

Research interests

- electrochemical engineering (fuel cells and environmental treatment)
- corrosion engineering and synthesis of materials
- electroplating and plasma anodizing as engineering coatings
- nanostructured materials via electrochemistry

Research group(s)

Engineering Materials

Affiliate research group(s)

Energy Technology

Research project(s)

Development of an antifouling system using environmentally acceptable and naturally occuring products - Dormant

Lightweight ceramic nanotubes reinforced polymer composite coatings and nanofibres with improved impact resistance and responsive functions

Zinc cerium redox flow battery

NECOBAUT: iron-air redox flow battery

Normally iron corrodes when exposed to air and humidity and has to be protected by painting it, using corrosion inhibitors or by passing a cathodic current through it (cathodic protection). These methods avoid the oxidation of iron into a rusty iron oxide. However, in this project, a novel investigation of the oxidation of iron, combined with the reduction of oxygen is used to generate energy.

Aluminium-air battery: study of three dimensional aluminium anode and air cathode for the development of high energy density battery for micro-UAVs

The project focusses on the electrochemical properties and energy capability of the aluminium – air battery system. This comprises the separate half-cells, including the aluminium anode and its alloys as well as the cathode materials for oxygen reduction and the electrolytes with and without additives. The project propose the construction of a structural three dimensional battery and it is based on a PhD project currently in the final stages.

Development of borohydride fuel cells

The direct borohydride fuel cell is a promising alternative for electrical power generation in large-scale and for portable equipment, such as laptop computers or mobile phones. Its predicted maximum energy density compared with other cells or batteries is higher but several drawbacks need to be overcome to reach that energy.

Redox flow cells batteries: zinc - cerium

The project focusses on the electrochemical properties and energy capability of the zinc–cerium system, initially developed by Plurion Inc., which has a theoretical energy density of 463 kJ mol-1. This is larger than other redox flow systems such as the vanadium and iron-chromium systems and has one of the highest thermodynamic open-circuit cell voltages.

Article(s)

The electrochemical reduction of Cr(VI) ions in acid solution at titanium and graphite electrodes - Velasco, G., Gutiérrez-Granados, S., Ponce De Leon Albarran, Carlos, Alatorre-Ordaz, Alejandro, Walsh, Frank and Rodríguez-Torres, I.
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