UK HYDROGEN & FUEL CELL RESEARCH CAPABILITY DOCUMENT

CAPTURING THE ENTIRE HYDROGEN AND FUEL CELL ACADEMIC RESEARCH LANDSCAPE

December 2014
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Introduction
Professor Nigel Brandon, Director H2FC SUPERGEN

As Director of the SUPERGEN Hydrogen and Fuel Cell Research Hub, H2FC SUPERGEN (http://www.h2fcsupergen.com), it is my pleasure to share with you the summary of the UK’s capability in Hydrogen and Fuel Cell Research. This has been produced through the Hub, and funded by the Research Councils Energy Programme. This document will be regularly updated and available via the Hub’s website. If your research is not yet included and you would like it be then please contact us.

These are exciting times in the fields of Hydrogen and Fuel Cells, for example the increasing uptake of fuel cell micro Combined Heat and Power units by customers, especially in Asia, and the launch of commercial hydrogen fuel cell vehicles.

The continued development and commercialisation of Hydrogen and Fuel Cell technology requires a collaborative approach between and within academia, industry and government. We hope that this document stimulates collaboration across the sector, and promotes new links with the outstanding UK research base in the field.
**Professor Claire Adjiman**
Professor of Chemical Engineering
Imperial College London
Email: c.adjiman@imperial.ac.uk
Phone: +44 (0)20 7594 6638
Website: www.imperial.ac.uk/people/c.adjiman

**Biography**
Claire Adjiman joined Imperial in 1998 following her PhD at Princeton University. Her group is focused on developing novel computer-aided design methods that bridge the gap between decisions at the scale of molecules and materials and decisions at the macroscale of the device or process. Her work includes the development of predictive models, design methods and optimisation methods. With her collaborators, she applies this work across several sectors including fuel cells and electrolysers, carbon capture, and the pharmaceutical and agrochemical industries. She holds an EPSRC Leadership Fellowship, is a recipient of the Philip Leverhulme Prize for Engineering (2009).

**Research Interests**
- Molecular Systems Engineering
- Optimisation and design methods
- Property prediction from structure, from electronic structure methods to bulk models
- Solid Oxide Fuel Cells and Electrolysers
- Molecular and process design

**Key Publications**

**Dr Ainara Aguadero**
Lecturer in Materials
Imperial College London
Email: a.aguadero@imperial.ac.uk
Phone: +44 (0)20 7594 5174
Website: www3.imperial.ac.uk/people/a.aguadero

**Biography**
Ainara is leading a research in the Department of Materials of Imperial College focused in the development of ceramic conductors for energy applications (solid oxide fuel cells, electrolysers and batteries). Specifically, she is focused on understanding the relation of the physical and chemical properties with the structural and microstructural features, and through this has developed new materials with substantially increased performance compared with the current state-of-the-art. Ainara has published 43 peer reviewed papers with combined citations of over 750 and she holds 1 patent.

**Research Interests**
- Ceramic oxides with topotactic reversible redox behaviour
- Pure ionic conductors (lithium, sodium and oxygen)
- Mixed ionic-electronic conductors
- Surface and interfacial phenomena

**Key Publications**
- A. Aguadero, J. A. Alonso, M. J. Escudero, L. Daza "Evaluation of the La2Ni1-xCuxO4+δ system as SOFC cathode material with 8YSZ and LSGM as electrolytes" Solid State Ionics, 179, 393, 2008

**Equipment & Facilities**
- Glove box for processing of moisture-sensitive ceramics and cell assembly with a high temperature furnace coupled (1600°C)
- Isotopic exchange laboratory: D2O, H218O, 18O, 6Li and 7Li labelling can be performed at different conditions of T, P(O2), P(H2O) and polarization.
- Extensive facilities for electrochemical characterisation
- Lab for the synthesis and processing of ceramic oxides
**Dr Paul Anderson**

**Reader in Inorganic and Materials Chemistry**  
University of Birmingham  
Email: p.a.anderson@bham.ac.uk  
Phone: +44 (0)121 414 4447  
Website: www.chem.bham.ac.uk/staff/anderson

**Biography**

Paul Anderson is Reader in Inorganic and Materials Chemistry, leader of the Materials Chemistry and Energy Research Theme, in the School of Chemistry at the University of Birmingham, and a Fellow of the Royal Society of Chemistry. Understanding the chemistry of solid state hydrogen storage has been a major theme of his research since 1999. He established and leads the Hydrogen Storage Chemistry Group in the School of Chemistry, which has an extensive ongoing programme dedicated to understanding how hydrogen interacts with solids and to discover, synthesis and primary characterization of new hydrogen storage materials.

**Research Interests**

- New amide/complex hydride materials for hydrogen and energy storage
- Ionic conductivity in amides and complex hydrides
- Mechanisms of hydrogen transport in solids
- Absorption and desorption pathways in amides and complex hydride materials
- Host–guest chemistry in zeolites and porous materials for energy applications

**Key Publications**

- Synthesis and structure of the new complex hydride Li2BH4NH2. PA Chater, WIF David and PA Anderson, Chemical Communications (2007), 4770–4772.

**Equipment & Facilities**

- Air-/moisture-free synthesis facilities
- Hydrogenator (600°C, 90 bar)
- Variable-temperature powder X-ray diffraction
- Impedance spectroscopy for hydrides
- X-ray fluorescence

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**Professor John Andrews**

**Professor of Infrastructure Asset Management**  
University of Nottingham  
Email: John.andrews@nottingham.ac.uk  
Phone: +44 (0) 115 846 8448  
Website: www.nottingham.ac.uk/engineering/departments/civeng/people/john.andrews

**Biography**

John Andrews is the Royal Academy of Engineering Professor of Infrastructure Asset Management at the University of Nottingham. He is also Director of The Lloyd’s Register Foundation Centre for Risk and Reliability Engineering. Prior to this he worked for 20 years at Loughborough University. The prime focus of his research has been on predicting system reliability in terms of the component failure probabilities, the system structure and the maintenance strategy employed. This work has concentrated on developing Petri Net, Fault Tree and Binary Decision Diagrams techniques.

**Research Interests**

- System Reliability Engineering
- System Maintenance Modelling
- Quantified Risk Assessment
- Fault Diagnostics
- Asset Management

**Key Publications**


**Supporting Technologies**

Professor Alan Atkinson
Professor of Materials Chemistry
Imperial College London
Email: alan.atkinson@imperial.ac.uk
Phone: +44 (0)20 7594 6780
Website: www.imperial.ac.uk/people/alan.atkinson

Biography
Alan Atkinson joined the Department of Materials in 1995 from AEA Technology (Harwell) where he was head of Materials Chemistry Department. There his research interests included: mass transport in ceramics (particularly at grain boundaries); high temperature corrosion; sol-gel processing of ceramics; cements and concrete for the disposal of radioactive waste; catalysts and adsorbents for environmental pollution abatement; and the mechanical properties of thin films. He is a co-founder of the fuel cell company Ceres Power Ltd, has published over 250 papers in scientific journals and books, and was a member of the General Engineering Panel for RAE2008. He is a member of the Scientific Committee of the EU Fuel Cells and Hydrogen Joint Undertaking and sub-editor of the journal 'Fuel Cells'.

Research Interests

- Mechanical properties and reliability of SOFC components and structures
- Relationships between mechanical properties and 3D microstructure of porous SOFC electrodes
- Durability and life time prediction of SOFC components
- Microstructure evolution and accelerated testing of SOFC electrodes
- Sintering of SOFC components

Key Publications


Dr Richard Baker
Senior Lecturer of Chemistry
University of St Andrews
Email: Rtb5@st-andrews.ac.uk
Phone: +44 (0)1334 463899
Website: www.st-andrews.ac.uk/chemistry/contact/academic/#rtb5

Biography
Richard Baker has worked in fuel cell research for over twenty years. He runs a research group working on the preparation and evaluation of materials for application in Solid Oxide Fuel Cells and also in heterogeneous catalysts. Particular interests are in low energy, high purity preparation routes, manufacture of nanostructured materials for SOFC and catalysis applications, evaluation of materials using electrochemical and catalytic activity techniques and the study of the relationship between fuel cell performance and the structure and composition of the materials down to the atomic scale, especially using high performance electron microscopy.

Research Interests

- Solid Oxide Fuel Cells (SOFCs)
- Preparation and evaluation of catalytic materials for SOFC anodes
- Improved electrolyte materials
- Hydrocarbon and alcohol utilisation in SOFCs
- Performance-nanostructure relationships in SOFCs

Equipment & Facilities

- Facilities for preparation of all SOFC electrolyte and electrode materials
- Impedance spectroscopy and other electrochemical analysis methods
- Catalytic activity testing equipment
- Electron Microscopy (TEM and SEM) for nano-analysis of fuel cell materials and components
- Wide range of characterisation methods available to the group (XRD, TGA, DTA, DSC, ICP-MS, NMR, MAS-NMR etc).

Key Publications

Professor David Book

University of Birmingham

Email: d.book@bham.ac.uk
Phone: +44 (0)121 414 5213
Website: http://tinyurl.com/DavidBookUoB

Biography

David Book leads the Hydrogen Materials Group (www.hydrogen.bham.ac.uk) in the School of Metallurgy and Materials. He was a member of EPSRC (SUPERGEN UK-SHEC, SUPERGEN H-Delivery, SCRATCH and Polymer-based H2 storage), and EC (FUCHSIA, NESSHY) H2 projects. He is now on the management board of the EPSRC Hydrogen & Fuel Cells SUPERGEN Hub, and is part of projects investigating hydrogen compression (EPSRC ESCHER), catalytic nanoparticles (EPSRC CL4W) and complex hydrides (EC ITN ECOSTORE). He has coordinated bilateral networks on hydrogen storage with Japan and Korea, and he is a UK expert on the IEA Task 32 on hydrogen storage.

Research Interests

• Hydrogen Storage Materials
• Gas Separation Membranes
• Hard magnetic materials
• Microstructural processing of materials using hydrogen
• Nanomaterials

Key Publications


Equipment & Facilities

• IGA (3) and Severts-PCT (2) systems to measure H2 storage properties (up to 20 & 200 bar)
• In situ Raman spectroscopy (77-873 K) and XRD (300-873 K) under 100 bar H2
• Measure H2 permeability and gas separation in membranes (foils & tubes)
• High pressure (700 bar) hydrogenation of samples; & TPD studies (TGA, Mass spec, RGA)
• Construction of metal hydride powder-beds for stores and compressors

Professor Nigel Brandon

Director of the Sustainable Gas Institute (SGI)

Imperial College London

Email: n brandon@imperial.ac.uk
Phone: +44 (0)20 7594 5704
Website: www3.imperial.ac.uk/people/n.brandon

Biography

Nigel Brandon’s research is focused on electrochemical power sources for fuel cell and energy storage applications. He is Director of the RC Energy programme funded Hydrogen and Fuel Cells SUPERGEN Hub (www.h2fcsupergen.com). He was the founding Director of the Energy Futures Lab at Imperial College (www.imperial.ac.uk/energyfutureslab), and a founder of Ceres Power (www.cerespower.com), an AIM listed fuel cell company spun out from Imperial College. In 2014 he was appointed to the BG Chair in Sustainable Gas and as Director of the Sustainable Gas Institute at Imperial College.

Research Interests

• Solid Oxide Fuel Cells and Electrolysers
• Polymer Fuel Cells
• Fuel cell science and engineering at the electrode, cell, stack and system level
• 3D imaging and modelling of fuel cells and batteries
• Understanding fuel cell performance and degradation

Equipment & Facilities

• 3D imaging using FIB-SEM and xCT
• In-operando Raman spectroscopy
• Extensive facilities for electrochemical characterisation in a hydrogen and CO safe laboratory
• Material, cell, and stack testing (to 10 kWe)
• Dedicated lab for fuel cell processing

Key Publications

**BIOGRAPHY: DR DAN BRETT**

**Dr Dan Brett**

**Reader in Electrochemical Engineering**

**University College London**

**Email:** d.brett@ucl.ac.uk

**Phone:** +44(0)20 7679 3310

**Website:** www.ucl.ac.uk/eil

**Biography**

Dan Brett (DILB) [Reader in Electrochemical Engineering] specialises in electrochemical materials science and technology development. He is co-founder of the UCL Electrochemical Innovation Lab (www.ucl.ac.uk/eil) that provides a sandpit environment where basic science meets industrial development leading to exploitation of new technologies. He has published >100 peer reviewed journal papers (h-index 23) and was awarded the 2009 De Nora Prize in recognition of his 'outstanding contribution to fuel cell and battery research', along with the 2011 Baker Medal from the Institute of Civil Engineers for published work on fuel cells. DILB is commercialising two spin-out ventures, one to develop a new fuel cell device (with Prof Kucernak, Imperial) and the other an electrocatalyst material (Amalyst Ltd.).

**Research Interests**

- Fuel Cell and Electrolyser Diagnostics
- Electrolysers (materials and engineering)
- Electrocatalysis
- Fuel cell engineering
- Instrumentation

**Key Publications**


**Equipment & Facilities**

- www.ucl.ac.uk/electrochemical-innovation-lab/research/facilities
- >10 Electrochemical test stations incl. RRDE, FRA with up to 40A capability
- >10 Fuel cell test stations
- Raman microscope
- Thermal imaging camera

**Key Publications**


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**BIOGRAPHY: DR QIONG CAI**

**Dr Qiong Cai**

**Lecturer in Chemical Engineering**

**University College of Surrey**

**Email:** q.cai@surrey.ac.uk

**Phone:** +44(0) 1483686561

**Website:** www.surrey.ac.uk/cpe/people/dr_cai_qiong

**Biography**

Qiong Cai’s research interest lies in the design of materials and processes in electrochemical energy conversion devices including fuel cells, electrolysers and batteries. Her group at Surrey currently use models combining with experiment, for materials design, performance prediction and optimisation. She has delivered five national/EU funded projects as the main researcher, and had five years research experience on fuel cells and hydrogen research at Imperial College London before joining Surrey. Her PhD was on molecular simulation of porous materials and adsorption and transportation processes at University of Edinburgh, with an Overseas Research Scholarship from the Universities UK

**Research Interests**

- Solid oxide fuel cells and electrolysers
- Polymer fuel cells and electrolysers
- Porous materials
- Multi-scale modelling
- Linking materials design to device performance optimisation

**Key Publications**

- Cai Q, Brandon NP, Adjiman CS. (2011)

**Equipment & Facilities**

- Workstations and computer cluster for performing simulations
- Materials characterization facilities (including those for porosity, microstructure and surface characterization) well equipped at Surrey
- Facilities available for assembly and testing of fuel cells and electrolysers, via collaborations with Prof. John Varcoe and Prof. Bob Slade at Surrey

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**UK Hydrogen & Fuel Cell Research Capability Document**
Dr Mark Cassidy
Senior Research Fellow in Chemistry
University of St Andrews
Email: mc91@st-andrews.ac.uk
Phone: +44 (0)1334 463891
Website: http://chemistry.st-andrews.ac.uk/staff/jtsi/group/jtsi_group_html/mark_cassidy_profile.html

Biography
Mark Cassidy is a materials process specialist who has been involved in SOFC research since 1993. Awarded a Ph.D. in 1997 from Napier University, Edinburgh for the development and demonstration of screen printed electrolytes cofired on supporting anode tapes, he has held senior technical positions in a number of internationally leading industrial SOFC groups, UK (Rolls-Royce), Canada (Global Thermoelectric) and USA (Ion America – now Bloom Energy) and continues to actively collaborate with them. He joined the team at University of St-Andrews as a Senior Research Fellow in Jan 2006. Cassidy’s main focus is the process related aspects of the creation of controlled, engineered microstructures for both optimised performance and improved robustness in SOFC.

Research Interests
• Solid Oxide Fuel Cells and Electrolysers
• Ceramic Processing
• Aqueous Thick Film Technology Development
• Microstructural Development and Engineering
• Process-Microstructure-Performance Relationships

Key Publications

Equipment & Facilities
• Extensive High temperature Electrochemical Characterisation
• FIB-SEM (FEI Scios), HR-TEM (FEI Titan Themis 200) and FEG-SEM Microscopy and Analysis
• Ceramic Thick Film Process Development (aqueous and organic systems)
• Materials Characterisation, XRD, particle size, surface area, TGA, dillatometry, DSC etc.
• Cell testing facilities from button cell through to short stack
• Simulated reformate, Biogas, CO and sulphur capable rigs with gas analysis

Centre for Fuel Cell and Hydrogen Research
School of Chemical Engineering
University of Birmingham
Email: j.c.hooper@bham.ac.uk
Phone: +44 (0) 121 414 5275
Website: www.birmingham.ac.uk/research/activity/chemical-engineering/energy-chemical/fuel-cells/index.aspx

Biography
In 2008 funding was acquired for the Doctoral Training Centre on Hydrogen Fuel Cells and Their Applications (with Universities of Nottingham and Loughborough), allowing to engage reasonable numbers of PhD students. Today, Prof Robert Steinberger-Wilckens leads the group of 10 staff and PostDocs and 40 PhD students. The group has built up extensive laboratory capacities and covers a variety of topics from hydrogen production over PEFC and SOFC fuel cells and electrolysers, up to socio-economic research activities.

Currently, the renewed Centre of Doctoral Training (CDT) in Fuel Cells and their Fuels, now a project between the universities of Birmingham, Nottingham, and Loughborough, and Imperial College and University College of London lasting until 2022, has kicked off with the first ten-student cohort.

Research Interests
• Solid Oxide Fuel Cells and Electrolysers (SOFC / SOE)
• PEFC, IT-PEFC, DMFC: catalysis, Nanowires and Pt-Alloys for electrodes, GDLs, hydrogen from biomass, sunlight, and renewable electricity fuel cell systems and their integration into energy systems
• Integration of fuel cells on vehicles, fuel cell systems, market introduction of fuel cells and fuel cell vehicles, life cycle analysis, health implications of fuel cells, fuel cell policies and public acceptance

Key Publications

Equipment & Facilities
• Planar SOFC manufacturing using cold pressing and tape casting, screen printing and PVD (up to 5x5 sqcm); sintering & drying furnaces, milling, paste & ink production;
• Six SOFC test rigs for microtubes, button cells and planar cells (fuel cell and electrolysis mode), 4 test rigs for SOFC stacks 100 W to 5 kW; PEFC, DMFC and IT-PEFC test rigs; 4 materials characterisation (anode and cathode atmosphere exposure) test rigs
• Electrochemical characterisation of catalysts; in-laboratory SEM/EDX and optical microscopy, sample preparation
• Reforming and biomass gasification test rigs
• Fully functional hydrogen filling station (4kg/day)
**PROFESSOR RUI CHEN**

**Professor Rui Chen**

**Head of Thermofluids and Dynamics Research Theme**

Loughborough University

Email: r.chen@lboro.ac.uk

Phone: +44 (0)1509 227255

Website: www.lboro.ac.uk/departments/aae/about/staff/professor-rui-chen.html

**Biography**

Rui Chen has over 25 years’ experience of academic research and industrial development and was elected the fellow of IMechE in 2007. His research covers both modelling and experimental aspects of energy technologies in fuel cell technology, fuel catalytic processing, internal combustion engine and thermal environment analysis and control. He is Head of Thermofluids and Dynamics Research Theme at Loughborough University.

**Research Interests**

- Polymer Fuel Cells
- Electrochemistry impedance spectrum (EIS) analysis
- Lattice-Boltzmann numerical simulation
- Fuel catalytic fuel reforming and CO selective oxidation
- Combustion kinetics and IC engines

**Key Publications**


**Equipment & Facilities**

- Single and multi-channel electrochemical impedance spectrometers
- Fuel cell component analysers
- Gas chromatography – mass spectrometer
- Baltic fuel cell pressure/temperature controlled test unit
- Environmental chamber (1550L, -80ºC to +170ºC @ 3.5ºC/Min)

**PROFESSOR BILL DAVID**

**Professor Bill David**

**STFC Senior Research Fellow/ Professor of Chemistry**

ISIS Facility, Rutherford Appleton Laboratory/ University of Oxford

Email: bill.david@stfc.ac.uk  bill.david@chem.ox.ac.uk

Phone: +44 (0) 1235 445179/ +44 (0) 1865 272681

Website: www.billdavid.info

**Biography**

Bill David’s research is principally based on the discovery and characterisation of new materials for sustainable energy applications with a focus on energy-storage based around ammonia and hydrogen. He is also involved in the development of neutron and X-ray diffraction techniques in combination with computational modelling. Bill is STFC Senior Fellow at the ISIS Facility, Rutherford Appleton Laboratory and Professor of Chemistry in the Inorganic Chemistry Laboratory, University of Oxford.

**Research Interests**

- Ammonia as an energy vector and buffer
- Hydrogen storage
- Neutron and X-ray scattering
- Computational modelling of energy materials

**Equipment & Facilities**

- Intelligent Gravimetric Analysis (including apparatus for use in combination with neutron scattering experiments)
- Custom gas panel for ammonia decomposition reactions
- Raman microscope with in situ heating and reactive gas flow capability
- DSC-TGA with reactive gas flow capability
- X-ray and neutron scattering facilities

**Key Publications**

BIOGRAPHY : DR PAUL DODDS

Dr Paul Dodds
Senior Research Associate
UCL Institute for Sustainable Resources
Email: p.dodds@ucl.ac.uk
Phone: +44 (0)203 108 9071
Website: https://iris.ucl.ac.uk/iris/browse/profile?upi=PEDOD24

Biography
Paul Dodds specialises in energy system modelling and energy infrastructure research. He has led academic efforts to understand the opportunities for using hydrogen in the UK gas networks through two recent publications and by organising a 2-day conference with a range of public sector and industrial stakeholders in March 2013. He has led efforts to develop the UKTM energy system model. He was the lead editor on the first H2FC Hub White Paper on heat and is the project manager of the EPSRC Hydrogen's Value in the Energy System project.

Equipment & Facilities
- UKTM-UCL energy system model for the UK
- TIAM-UCL global energy system model

BIOGRAPHY : DR RICHARD DAWSON

Dr Richard Dawson
Lecturer
University of Lancaster
Email: r.dawson@lancaster.ac.uk
Phone: +44 (0)1524 593685
Website: www.engineering.lancs.ac.uk/people/richard-dawson

Biography
Having a background in both Mechanical and Chemical Engineering and a strong interest in energy, Richard was well placed to take up R&D positions in the fuel cell sector. At Ceres Power he was involved in a wide range of activities such as the development of a novel electrolyte deposition process and current collection concepts. More recently Richard has been Senior Scientist at AFC Energy developing alkaline fuel cells for stationary applications. At Lancaster he treads the line between the fundamental electrochemistry and fuel cell engineering, being involved in both stack and system development as well electrode architectures.

Research Interests
- Fuel cells, (alkaline, solid oxide)
- Understanding degradation and failure in fuel cells and performance limits
- Stack design and manufacturing concepts
- Electrochemical based recovery and separation processes for end-of-life fuel cells
- Flow batteries

Key Publications

Equipment & Facilities
- Dedicated fuel cell preparation and testing laboratory (DSEAR compliant)
- Standard electrochemical and chemical techniques (RRDE, EIS, chemBET etc.)
- Fuel cell performance and durability measurement – long term automated testing
- Manufacturing techniques such as screen printing, laser process (additive and subtractive)
Dr Valerie Dupont

Reader in Low Carbon Energy
University of Leeds

Email: V. Dupont@leeds.ac.uk
Phone: +44 (0)113 343 2503
Website: www.engineering.leeds.ac.uk/people/staff/v.dupont

Biography
Dupont has been investigating novel reforming processes for producing hydrogen using varied feedstocks such as natural gases, model bio-compounds, bio and non-bio oils of waste origins at the University of Leeds since 2002. In particular, the process intensification methods of sorption enhanced steam reforming and chemical looping steam reforming have been the focus of her research, especially when implemented as combined measures due to their increased fuel flexibility and energy efficiency. Dupont’s expertise in these processes of H2 production has its origins in her background in combustion pollutants formation and catalytic oxidation/combustion systems (pre-2002). The drive behind Dupont’s research is to achieve energy intensive processes of global concern (e.g. production of fertilisers, clean transport fuels, wastes disposal) with minimal fuel expenditure and environmental impacts, and increase their sustainability credentials.

Research Interests

- Reforming processes with H2 production
- In situ high temperature CO2 sorption
- Feasibility of chemical looping processes
- Novel reactor bed materials (catalysts, sorbents)
- Feedstocks challenges (bio/fossil/wastes)

Key Publications

- Rollinson, Andrew N.; Rickett, Gavin L.; Lea-Langton, Amanda; et al. Hydrogen from urea-water and ammonia-water solutions. APPLIED CATALYSIS B-ENVIRONMENTAL Volume: 106 Issue: 3-4 Pages: 304-315 Published: AUG 11 2011
- Pimenidou, P.; Rickett, G.; Dupont, V.; et al. High purity H2 by sorption-enhanced chemical looping reforming of waste cooking oil in a packed bed reactor. BIORESOURCE TECHNOLOGY Volume: 101 Issue: 23 Pages: 9279-9286 Published: DEC 2010
- Dou, Binlin; Rickett, Gavin L.; Dupont, Valerie; et al. Steam reforming of crude glycerol with in situ CO2 sorption. BIORESOURCE TECHNOLOGY Volume: 101 Issue: 7 Pages: 2436-2442 Published: APR 2010

Equipment & Facilities

- 3 packed bed reformers (bench scale) full set ups (MKS gas mass flow controllers and syringe pumps for liquid feeds)
- Online syngas analysis (TCD/NDIR/NDUV/paramagnetic O2, 2s frequency) + two column micro-GC
- Catalysts and bed materials characterisation: Powder XRD (incl. phase composition/crystallite size and crystal strain by Rietveld refinement), FEGSEM, FEGTEM, EDS mapping
- Feedstocks characterisation: Elemental Analysis, ICP-MS, TGA-FTIR, ion chromatography, off line GCs, GC-MS, TGA-MS
- Chemical equilibrium modelling (unconventional systems), Gproms reactor kinetic modelling.

Professor Paul Ekins

Director of the UCL Institute for Sustainable Resources
University College London

Email: p.ekins@ucl.ac.uk
Phone: +44 (0)20 3108 5990
Website: https://iris.ucl.ac.uk/iris/browse/profile?upi=PEKIN72

Biography
Paul Ekins is Professor of Resources and Environmental Policy at UCL. He leads the Socio-economics and Policy WP of the Hydrogen and Fuel Cells (H2FC) Hub and the EPSRC Hydrogen’s Value in the Energy System project. He is also Deputy Director of the UK Energy Research Centre (www.uercc.ac.uk). His work on hydrogen has focused on its technological potential and the socio-economic challenges facing its large-scale deployment. He led the team producing the first H2FC Hub White Paper on heat and he edited the first academic book on the socio-economic challenges of hydrogen (see below). His group’s hydrogen research has focused on its technological potential and the socio-economic challenges facing its large-scale deployment. The group includes Dr Paul Dodds (energy systems), Will McDowall (socio-technical transitions and scenarios) and Dr Paolo Agnolucci (hydrogen infrastructure).

Research Interests

- Socio-economics and policy of hydrogen energy
- Integration of hydrogen systems with national energy systems
- Spatial development and deployment of hydrogen infrastructure
- Socio-technical transitions to hydrogen energy
- Technological learning for fuel cell systems

Key Publications


Equipment & Facilities

- Energy system models on UK (UKTM-UCL), European (ETM-UCL) and global (TIAM-UCL) scales
- SHIPMod spatial infrastructure planning model
BIOGRAPHY : PROFESSOR BARTEK GLOWACKI

Professor Bartek Glowacki
Professor of Energy and Materials Science
University of Cambridge
Email: bag10@cam.ac.uk
Phone: +44 (0)1223 331738
Website: www.msm.cam.ac.uk/ascg/contact.php

Biography
Bartek A. Glowacki heads Applied Superconductivity and Cryoscience Group (ASCG) at the Department of Materials Science and Metallurgy (University of Cambridge) focused on novel materials and methods for energy storage applications including cryo-storage and high temperature superconductivity. He is a founder of the Transnational Energy Materials Printing Research Initiative, TEMPRI, which is a European network developing inkjet printing and related technologies in the area of energy materials and functional electroceramics. The group has significant expertise in the application of ceramic and metallic materials inkjet printing for solid oxide fuel cells (SOFCs) and direct carbon fuel cells (DCFCs).

Research Interests
- Solid Oxide Fuel Cells and Electrolyzers
- Hydrogen purification and ortho-para conversion
- Cryogenic hydrogen storage
- Micro structural and compositional grading of fuel cells’ electrodes
- Modelling of fuel cells and fuel cell systems
- Degradation mechanisms of electrodes and interconnects

Key Publications

Equipment & Facilities
- Inkjet printing of suspension and sol inks
- High temperature vacuum sintering
- High pulsed field and current Jc(B,T) measurements
- Electrochemical testing of SOFC and materials
- Dedicated lab for cryogenic hydrogen experiments


BIOGRAPHY : PROFESSOR DAVID GRANT

Professor David Grant
Professor of Materials Science
University of Nottingham
Email: david.grant@nottingham.ac.uk
Phone: +44 (0)115 9513747
Website: www.nottingham.ac.uk/engineering/people/david.grant

Biography
David Grant heads the Advanced Materials Research Group at Nottingham, which comprises 14 academics who cover a wide range of advanced materials research. His own research focuses on solid state materials for hydrogen and thermal stores, coatings and biomaterials. The research covers both fundamental research into new materials and applied projects on scale up and models with strong links to industrial partners through direct research, TSB and EPSRC, EU funding. Through the Grand Challenge project on Engineering Safe Compact Hydrogen Energy Reserves (ESCHER) he is a member of the Hydrogen and Fuel Cells SUPERGEN Hub.

Research Interests
- Hydrogen storage
- Energy storage
- Coatings
- Biomaterials
- Smart Materials

Key Publications

Equipment & Facilities
- Hydrogen Laboratory - Synthesis, volumetric and gravimetric uptake - Wolfson Building
- Hydrogen Laboratory – prototype laboratory - Energy Technologies Building
- Thin Films Coatings both research and pilot scale
- Thermal analysis laboratory
- Physical and Chemical Materials Characterisation facilities
Biography

GMU are the lead organisation in the establishment of the Greater Manchester Hydrogen Partnership (GMHP). This strategically important group includes representatives from MMU (including the project manager), AGMA, TFGM, STEM Education North West, GM Low Carbon Hub, Viridor Laing GM, Manchester Airport Group, University of Manchester and the Central Manchester Hospital Trust. The Partnership is seen as a key vehicle in helping Greater Manchester achieve its 2020 carbon reduction targets over the next 6 years. The work to date has led the Department for Energy & Climate Change to invite MMU to join a working group to establish an industry-led green standard for the production of hydrogen that will be used as a basis for policy development.

Research Interests

- Building structural capacity in Greater Manchester
- Informing on national and local policy
- Furthering public understanding and acceptance of hydrogen fuel
- Developing a skilled workforce for hydrogen fuel applications

Equipment & Facilities

- Membership of the GMHP is opening up a range of new funding opportunities for MMU and will exploit these as they arise; these were recently highlighted in the new MIDAS report (Manchester’s Investment and Development Agency) which has a remit to attract new investment and employment to the city region. MIDAS forms part of the newly created Greater Manchester Centre of Excellence for Business Growth Trade and Inward Investment and works to a single overarching business plan for the Manchester Family which delivers against five of the 11 strategic priorities set out in the Greater Manchester Strategy. MMU is currently recruiting a Chair in Hydrogen and Fuel Cell Technology.

Key Publications

- “Ammonia uptake and release in the MnX2 – NH3 (X=Cl, Br) systems and structure of the Mn(NH3)nX2 (n = 6, 2) ammines.” H. Reardon, J. M. Hanlon, M. Grant, J. Fullbrook, D. H. Gregory, Crystals, 2012, 2, 193-212.

Biography

Duncan Gregory is the WestCHEM chair of Inorganic Materials and Head of Inorganic Chemistry, University of Glasgow. He has published over 120 scientific papers, 1 international patent and 1 book chapter. He is Vice President of the RSC Materials Chemistry Division and Fellow of both the Royal Society of Chemistry and of the Institute of Materials, Minerals and Mining. He serves as Editor in Chief of Inorganics and is an Associate Editor of Materials for Renewable and Sustainable Energy. He sits on the Editorial Board of Nanomaterials and Energy and the Editorial Advisory board of Dalton Transactions. Duncan Gregory was the winner of the RSC Sustainable Energy Award in 2009.

Research Interests

- Metal, complex and chemical hydrides for hydrogen storage
- Ammonia storage and direct ammonia fuel cell materials
- Lithium ion batteries
- Thermoelectric materials
- Materials synthesis and characterisation

Equipment & Facilities

- High temperature, microwave, mechanochemical and wet chemical synthesis capability
- Variable temperature powder X-ray diffraction and Micro Raman spectroscopy
- Thermal analysis (TG-DTA-MS, DSC) and gravimetric and volumetric gas measurement equipment
- Electron microscopy

UK Hydrogen & Fuel Cell Research Capability Document
Dr. Alan Guwy
Director of Energy and Environment Research Institute (EERI)
University of South Wales
Email: alan.guwy@southwales.ac.uk
Phone: +44 (0)1443 482 239
Website: http://serc.research.southwales.ac.uk

BIOGRAPHY: PROFESSOR ALAN GUWY

Dr. Adam Hawkes
Deputy Director, Sustainable Gas Institute
Imperial College
Email: a.hawkes@imperial.ac.uk
Phone: +44(0)2075949300
Website: www.imperial.ac.uk/people/a.hawkes

BIOGRAPHY: DR ADAM HAWKES

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**Research Interests**
- Biohydrogen, microbial electrolysis and biological fuel cells
- Integrated anaerobic conversion of wastes and biomasses to energy and chemical products
- Optimisation of production and purification of sustainable gases
- "Power-to-Gas" energy storage systems to maximise the balancing potential
- Energy from wastewater systems

**Key Publications**

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**Research Interests**
- Techno-economic and thermo-economic multi-scale modelling of fuel cell systems
- National/regional/global energy systems modelling examining the role of specific technologies (e.g. H2FC options) in sustainable energy system transitions
- Bottom-up H2FC market share modelling
- "Smart" energy systems; more integrated and coordinated energy system design and control
- Heat decarbonisation technology and strategy

**Key Publications**

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**Equipment & Facilities**
- Significant hardware resources (HPC, energy modelling cluster)
- GAMS optimisation software installed on 200-core cluster
- UKTM “gold” standard UK energy systems optimisation model
- VEDA-TIMES energy systems modelling software

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**Biography**
Dr Adam Hawkes CEng MEI is a mechanical engineer by training, with a PhD on modelling fuel cell-based micro combined heat and power. He has industry experience in software development and in energy/environment consultancy, and has also worked in energy policy for government. Adam’s research team focuses on development and application of multi-scale modelling approaches that bridge the gap between technology design detail and system-level energy, economic and environmental performance. Adam has 15 years of experience in modelling energy systems, much of which has focused on fuel cell techno-economics and the role of H2FC technologies in energy system transitions.

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**Biography**
Alan Guwy is the head of the Sustainable Environment Research Centre and Director of the Energy and Environment Research Institute at the University of South Wales. He is an Operating Agent for the International Energy Association’s Biohydrogen Task. He was a founder of the HEFCW funded Low Carbon Research Institute in Wales in which he leads the “Hydrogen Energy Systems” theme. He is currently the lead for the CymruH2Wales ERDF project and the PI for H2&FC project “Biohydrogen Production by Fermentation and Bioelectrolysis” and worked on many national and international energy projects including the EPSRC SUPERGEN UKSHEC and BIOFC projects.

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**Research Interests**
- Electrochemical energy storage systems to provide energy and power
- Heat decarbonisation technology and strategy
- Development and application of multi-scale modelling and optimisation of energy systems

**Key Publications**
Dr Mamdud Hossain

Reader and Theme Leader of Institute for Innovation, Design and Sustainability

Robert Gordon University, Aberdeen

Email: M.Hossain@rgu.ac.uk

Phone: +44 (0)1224 262351

Website: www.rgu.ac.uk/dmstaff/hossain-mamdud

Biography

Mamdud Hossain is a Reader in Thermofluids at School of Engineering of Robert Gordon University. He also acts as a Theme Leader in Energy, Environment, and Sustainability at the IDEAS Research Institute. He has widely published in fuel cell and hydrogen technologies and presented his work in a number of international conferences. He has secured funding for fuel cell research from Scottish Funding Council through the Northern Research Partnership (NRP) and the Carnegie Trust.

Research Interests

• CFD modelling of Polymer Electrolyte Fuel Cell
• Water dynamics in cathode channel
• Structure-property relationship of PEM catalyst layers

Key Publications


Equipment & Facilities

• In-house CFD code for PEM fuel cell modelling
• Open flanges SOFC set-up (Fiaxell) for electro-chemical testing with OrigaFlex OGF05A
• Peristaltic multi-channel pumps

Professor Ioannis Ieropoulos

Director of the Bristol BioEnergy Centre

Bristol Robotics Laboratory

Email: Ioannis.Ieropoulos@brl.ac.uk

Phone: +44(0) 1173286318

Website: www.brl.ac.uk/researchthemes/bioenergyselfsustainable.aspx

Biography

Prof. Ieropoulos is the director of the newly formed UWE Bristol BioEnergy, located within the Bristol Robotics Laboratory, and an EPSRC Career Acceleration Fellow. He is the principal investigator of the projects “Urine-tricity” and “Urinettractivity+”, funded by the Bill & Melinda Gates Foundation, MFC Commercialisation funded by EPSRC’s “Developing Leaders” Programme, as well as of “Decomposing Robots and MFCs” funded by the Leverhulme Trust. He has produced EcoBots I and II for his PhD (2002-2005) and EcoBot-III as the Lead Researcher on the EU-FP-6 ICEA Project. He has 12 years’ experience in autonomous robots and MFC technology, the latest breakthrough from which has been the charging of a mobile phone with urine. His grant income over the last 4 years has come to over £2M and his work has resulted in over 40 peer reviewed publications.

Research Interests

• Microbial Fuel Cells
• Energy, BioEnergy and the environment
• Self-sustainable systems
• Robotics

Key Publications


Equipment & Facilities

• Microbial Fuel Cells, MFC stacks and cascades
• Ultra low-power electronics
• 3D printing technology, laser cutting
• Electrochemical analysis e.g. computer-controlled resistosstat and potentiostats

• Equipment for the preparation of ceramics e.g. kiln, diamond saw, lathes
• Peristaltic multi-channel pumps
• Environmental Scanning Electron Microscope
• EDX, XRD, GC-MS, SIFT-MS, ICP, HPLC

BIOGRAPHY: PROFESSOR JOHN TS IRVINE

Professor John TS Irvine
Professor of Chemistry
University of St Andrews
Email: jts@st-andrews.ac.uk
Phone: +44 (0)1334 463817
Website: http://ch-www.st-andrews.ac.uk/staff/jtsi/group/group/index

Biography
John Irvine is Professor of Chemistry at the University of St Andrews and currently holds a Royal Society Wolfson Merit Award. In 2005, he was elected as a Fellow of the Royal Society of Edinburgh. He has around 370 publications in refereed scientific journals and leads a group of over 50 researchers. Irvine has led three previous European Programmes on Fuel Cells and currently leads a European project on Direct Coal Fuel Cells. Irvine has been chairman of the Scottish Hydrogen and Fuel Cells Association that seeks to promote these technologies to industry and the public in Scotland. He is a Co-director of the Energy Technology Partnership, and leads Energy Conversion and Storage aspects of ETP.

Research Interests
- Finding new electronic conductors for fuel cells
- Developing fuel flexible SOFC anodes
- High performance fuel cell electrolytes
- Direct carbon fuel cells
- Durability and resistance in high temperature fuel cells

Key Publications
- “In Situ growth of nanoparticles through control of non-stoichiometry” Neagu, D. Tsekouras, G. Miller, D. N. Menard, H. Irvine, J. T. S. Nat. Chem. 2013, 5, DOI: 10.1109/JLT.2013.2247378

Equipment & Facilities
- Transmission Electron Microscopy
- Scanning Electron Microscopy
- X-ray Diffraction
- Electrochemical Impedance Spectroscopy
- Potentiostats

BIOGRAPHY: PROFESSOR WALTER JOHNSTONE

Professor Walter Johnstone
Vice Dean, Faculty of Engineering
University of Strathclyde
Email: w.johnstone@strath.ac.uk
Phone: +44 (0)141 548 2641
Website: www.strath.ac.uk/eee/research/cmp/people/profwalterjohnstone/

Biography
Prof. Walter Johnstone leads the Photonic Systems research group in the department of Electronic and Electrical Engineering and is Vice Dean of the Faculty of Engineering at Strathclyde University. As well as carrying out basic research, his group is involved in the engineering of photonic systems for in-situ industrial deployment and commercial exploitation. The team currently focus on the application of laser spectroscopy to accurate measurement of gas concentration, pressure and temperature in complex gas processing systems and harsh environments such as fuel cells at temperatures up to 1000°C and pressures of 5-8 bar or in gas turbine (aero) engines.

Research Interests
- Laser spectroscopy for gas measurements (concentration, pressure and temperature)
- Fuel cell condition monitoring and process control through in-situ gas measurement
- Measurements of methane, water vapour, carbon dioxide and carbon monoxide plus
- Gas measurements in gas turbine (aero) engines
- Tunable diode laser spectroscopy

Key Publications

Equipment & Facilities
- A wide range of laser spectroscopy systems capable of measurements on many gases
- High temperature spectrometers capable of simulating conditions within fuel cells etc.
- Spectrometers with variable gas concentration, pressure and temperature up to 1000°C and 10 atmospheres
- Near and Mid infra red laser spectrometers
Dr Denis Kramer

Lecturer, New Energy Technologies
University of Southampton
Email: d.kramer@soton.ac.uk
Phone: +44 (0) 2380 59 8410
Website: www.southampton.ac.uk/engineering/about/staff/dk2u09.page

Biography
Denis Kramer joined the University of Southampton after PostDocs at MIT and Imperial College. His research interests focus on electrochemical energy technologies such as fuel cells and batteries, mainly working at the interface between theory and experiment to combine computational materials design (based on DFT) with advanced electrochemical techniques to discover technology-enabling materials. He worked at the Paul Scherrer Institut (Switzerland) applying neutron imaging to fuel cells, spent two years at MIT studying Li-ion batteries based on DFT, and relocated to the UK in 2009 to study electrocatalysts for low temperature fuel cells at Imperial. Since 2011, he pursues his research interests at the University of Southampton.

Research Interests
- Polymer Electrolyte Fuel Cells and Flow Batteries
- Rational design of materials by combining Density-Functional Theory with advanced synthesis/characterisation
- Stability and performance of advanced functional materials in Fuel Cell environments
- Modelling at the atomic scale and beyond
- Mitigating degradation

Key Publications

Professor Anthony Kucernak

Professor of Chemical Physics
Imperial College London
Email: Anthony@imperial.ac.uk
Phone: +44 (0)20 75945831
Website: www.ch.imperial.ac.uk/kucernak

Biography
Anthony Kucernak heads a research group at Imperial College London focused on electrochemical power sources such as fuel cells and energy storage applications such as supercapacitors. He is deputy director of the Energy Future Lab (www.imperial.ac.uk/energyfutureslab), and leader of the PEFC work package in the H2FC SUPERGEN (www.h2fcsupergen.com).

Research Interests
- Novel designs for polymer electrolyte fuel cells and electrolysers for superior performance
- Designing catalysts and electrodes utilising low – to none platinum group metals
- Development of diagnostics to probe fuel cell fundamentals
- Development of approaches to limit and mitigate against fuel cell degradation
- Development of novel refuelling strategies for fuel cells

Key Publications

Equipment & Facilities
- Automated electrode fabrication facility
- Flow field/electrode imaging of reactant transport
- High performance electrocatalyst activity measurements
- Fuel Cell/RFB test standards and high current/high voltage potentiotstat systems
- Complete suite of catalyst and diffusion layer production facilities
**Biography**

Dr R Vasant Kumar is a Reader in Materials Chemistry at the University of Cambridge. His research focuses on understanding the relationship between dopant and ionic transport in yttria-doped ceria-zirconia, and he has published over 200 papers, 9 patents, and 4 Chapters in Handbooks. His research group consists of 20 researchers, working in harnessing electrochemical reactions in many applications ranging from sensors to batteries, fuel cells, and photocatalytic systems.

**Research Interests**

- Solid Oxide Fuel Cells
- Electrochemical Systems
- Harnessing Energy from Renewable Sources
- Sustainability in Materials
- Environmental Issues

**Equipment & Facilities**

- Electrochemical work stations
- Impedance spectroscopy
- Hydrogen sensing systems
- Inkjet Printing
- Characterisation of energy materials – ICP, Thermal analysis, zeta sizer

**Key Publications**

- Inkjet printing of Gd doped ceria on NiO-YSZ substrate for SOFC applications; C Wang, RI Tomov, RV Kumar and BA Glowacki, J Mater. Sc; 46(21), 6889-96, 2011.

**Biography**

Dr. Wen-Feng Lin is a Reader in Physical Chemistry at Queen’s University Belfast. He has been active in these areas for 20 years with 150 publications. His research focuses on electro-catalysis and catalytic reactions, electrochemical half cell tests at various temperatures and in various media, and hydrogen synthesis of nanomaterials.

**Research Interests**

- Electro-catalysis and catalytic reactions
- Fuel Cells: PEM Fuel Cells, Direct Alcohol Fuel Cells, Alkaline Fuel Cells
- In-situ FTIR spectroscopy
- Nanomaterials
- Electrocatalytic generation of ozone from water and for advanced oxidation reaction

**Equipment & Facilities**

- Variable Temperature Electrochemical in-situ FTIR Spectroscopy for fuel cell and catalysts
- Electrochemical half cell tests at various temperatures and in various media
- Electrochemical synthesis of nanomaterials
- Fuel cell assembly and testing
- DFT atomistic modelling and computational chemistry

**Key Publications**

**Professor Weeratunge Malalasekera**  
Professor of Computational Fluid Flow and Heat Transfer  
University of Loughborough  
Email:  w.malalasekera@lboro.ac.uk  
Phone:  +44 (0)1509 227556  
Website:  www.lboro.ac.uk/departments/mechman/staff/weeratunge-malalasekera.html

**Biography**  
Weeratunge Malalasekera heads the Computational Combustion and Heat Transfer modelling research at Loughborough University. Combustion modelling, i.e. engine combustion, energy related technologies such as Hydrogen technologies are core research areas. Application of Computational Fluid Dynamics (CFD) to safety related problems particularly development of advanced modelling techniques for the prediction of combustion explosions and deflagration problems have been part of his research work. In this context development of combustion models for the assessment of safety of hydrogen applications, flow and heat transfer in fuel cells, combustion of Hydrogen with other fuels and gas turbine applications with syngas for carbon capture and storage are main research areas.

**Research Interests**  
- Hydrogen applications and safety studies  
- Modelling Flow and heat transfer in Fuel Cells  
- Modelling of combustion, explosions and deflagration problems  
- Application of CFD techniques including the Large Eddy Simulation (LES) technique  
- CFD in i.c. engine modelling  
- Energy technologies in general

**Key Publications**  

**Equipment & Facilities**  
- CFD & Combustion modelling  
- Radiative heat transfer  
- I.C. engine modelling (s.i and c.i.)  
- Experience with leading CFD commercial software and OpenFoam  
- High Performance Computing (HPC)  
- Hydrogen related combustion experimentation (with Sydney University, Australia)

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**Professor Weeratunge Malalasekera**  
Professor of Computational Fluid Flow and Heat Transfer  
University of Loughborough  
Email:  w.malalasekera@lboro.ac.uk  
Phone:  +44 (0)1509 227556  
Website:  www.lboro.ac.uk/departments/mechman/staff/weeratunge-malalasekera.html

**Biography**  
Weeratunge Malalasekera heads the Computational Combustion and Heat Transfer modelling research at Loughborough University. Combustion modelling, i.e. engine combustion, energy related technologies such as Hydrogen technologies are core research areas. Application of Computational Fluid Dynamics (CFD) to safety related problems particularly development of advanced modelling techniques for the prediction of combustion explosions and deflagration problems have been part of his research work. In this context development of combustion models for the assessment of safety of hydrogen applications, flow and heat transfer in fuel cells, combustion of Hydrogen with other fuels and gas turbine applications with syngas for carbon capture and storage are main research areas.

**Research Interests**  
- Hydrogen applications and safety studies  
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- CFD in i.c. engine modelling  
- Energy technologies in general

**Key Publications**  

**Equipment & Facilities**  
- CFD & Combustion modelling  
- Radiative heat transfer  
- I.C. engine modelling (s.i and c.i.)  
- Experience with leading CFD commercial software and OpenFoam  
- High Performance Computing (HPC)  
- Hydrogen related combustion experimentation (with Sydney University, Australia)
**Biography**

Will McDowall is an interdisciplinary researcher with experience in academia, government, NGOs and the private sector. His research focuses on climate and energy policies, particularly focused on energy innovation policy, and on the sustainability appraisal of energy technologies and pathways. He has particular expertise in, and expertise in, hydrogen energy technologies. He has expertise in a wide range of qualitative and quantitative research methods, including energy systems modelling, deliberative multi-criteria mapping, systematic literature review, qualitative interviews and participatory scenario building. Will is regularly invited to act as a peer reviewer by over a dozen journals including the International Journal of Hydrogen Energy, Energy Policy, Sustainable Development, Science Technology and Human Values, Transport Policy, Ecological Economics, and Research Policy.

**Research Interests**

- Technological transitions
- Sustainability appraisal
- Energy innovation policy
- Hydrogen energy
- Energy system scenarios

**Key Publications**


**Equipment & Facilities**

- UK TIMES model
- Spatial Hydrogen Infrastructure Planning Model (SHIPMod)

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**Biography**

Professor Neil McKeown (NBM) was recently appointed as the Crawford Tercentenary Chair of Chemistry at the University of Edinburgh. His research group is engaged in the rapidly developing field of organic microporous materials with active projects in both polymeric and crystalline materials. Of particular interest are the Polymers of Intrinsic Microporosity (PIMs), which combine microporosity with solution processability and show great promise as materials for gas separation membranes and gas storage.

**Research Interests**

- Gas separation membranes
- Microporous materials
- Hydrogen separations
- Polymers as hydrogen storage media
- Polymer synthesis

**Key Publications**


**Equipment & Facilities**

- Gel permeation chromatography
- Surface area analysis using nitrogen adsorption
- Facilities for the synthesis of polymers
Biography

Professor Ian Metcalfe
Professor of Chemical Engineering
University of Newcastle
Email: i.metcalfe@ncl.ac.uk
Phone: +44 (0)191 222 5279
Website: http://research.ncl.ac.uk/appcat

Ian Metcalfe is a Chartered Engineer, a Fellow of the Institution of Chemical Engineers, a Chartered Chemist and a Fellow of the Royal Society of Chemistry. Ian was elected a Fellow of the Royal Academy of Engineering in 2012. His work is primarily in the area of high temperature membrane and chemical looping systems applied to energy. He holds an ERC Advanced Grant. He was awarded the Imperial College Award for Excellence in Teaching in 1997 and has authored a textbook on kinetics and reaction engineering which has sold more than 7500 copies worldwide.

Research Interests
- Ceramic and ceramic composite membranes
- New materials for chemical looping processes
- Kinetics of dynamic and membrane systems
- Solid state transport processes
- Shift and reforming catalysis

Key Publications
- R.V. Franca, A. Thursfield and I. S. Metcalfe, ‘La0.6Sr0.4Co0.2Fe0.8O3 microtubular membranes for hydrogen production from water splitting’ J. Membrane Sci. 389 (2012) 173–181.

Professor Vladimir Molkov
Director of the Hydrogen Safety Engineering and Research Centre (HySAFER)
University of Ulster
Email: v.molkov@ulster.ac.uk
Phone: +44 (0)20 7594 5704
Website: http://hysafer.ulster.ac.uk

Vladimir Molkov heads a research team at the University of Ulster focused on hydrogen safety of hydrogen systems and infrastructure. He has coordinated and contributed to main hydrogen safety related projects in Europe and UK. In particular, he has led e-Academy of Hydrogen Safety within European Network of Excellence “Safety of hydrogen as an energy carrier” project (www.hysafe.org), is currently heading the networking activities within European H2FC Infrastructure project (www.h2fc.eu), and champions safety in the UK EPSRC SUPERGEN HFC Hub project (www.h2fcsupergen.com). In 2008 he established and directs the Hydrogen Safety Engineering and Research Centre (HySAFER) at the University of Ulster, one of key providers of hydrogen safety research and education globally. In 2007 he initiated the establishment of the World’s first MSc course in Hydrogen Safety Engineering, Part I, ISBN 978-87-403-0226-4. Part II, ISBN 978-87-403-0279-0, free download eBook, www.bookboon.com.

Key Publications

Equipment & Facilities
- Dedicated computer lab with contemporary hardware
- Software for hydrogen safety research, including but not limited to ANSYS FLUENT, Open FOAM, etc.
Dr Gregory Offer
Lecturer in Mechanical Engineering
Imperial College
Email: Gregory.offer@imperial.ac.uk
Phone: +44 (0)20 7594 7072
Website: www3.imperial.ac.uk/people/gregory.offer

Biography
Dr Gregory Offer is a Lecturer in the Department of Mechanical Engineering researching energy storage systems from fundamental science to integration and systems engineering. His work covers battery, fuel cell, and supercapacitor technologies, and their applications, mostly in transport. As an electrochemist, he has experience of using fundamental science to solve real-world challenges. Greg holds an EPSRC fellowship, and was a co-founder and has been project manager of Imperial Racing Green since 2007, an undergraduate teaching project involving over 100 undergraduate students a year designing, building, testing and racing, hydrogen fuel cell, battery electric and hybrid race cars & motorbikes.

Research Interests
- Polymer electrolyte membrane (PEM) fuel cells, modelling & testing, system design
- Solid Oxide Fuel Cells and Electrolysers (SOFC/SOEC), carbon deposition, Raman spectroscopy
- Systems integration, fundamental understanding based system design optimisation
- Lithium ion batteries, modelling & testing, extremes of operation, thermal management
- Lithium sulfur batteries, modelling & testing

Key Publications

Equipment & Facilities
- In-operando Raman spectroscopy
- Extensive facilities for electrochemical characterisation in a hydrogen and CO safe laboratory
- Material, cell, and stack testing (to 10 kWe)
- Dedicated lab for fuel cell processing
- Prototype vehicle development garage, including fuel cell vehicle demonstrators

Professor Mark Ormerod
Pro Vice-Chancellor (Research and Enterprise) and Professor of Clean Technology and Inorganic Materials Chemistry
Keele University
Email: r.m.ormerod@keele.ac.uk
Phone: +44 (0)1782 734443
Website: www.keele.ac.uk/chemistry/staff/mormerod

Biography
Mark Ormerod is Pro Vice-Chancellor (Research and Enterprise) at Keele University, having previously been Head of the School of Physical and Geographical Sciences. In 1997 he was awarded an EPSRC Advanced Research Fellowship and promoted to Professor of Clean Technology. He leads the Catalysis and Sustainable Materials research group at Keele. His research interests centre on sustainable processes, in particular solid oxide fuel cells, heterogeneous catalysis, sustainable materials chemistry and biogas conversion. He has published over 140 papers. His interests extend to interdisciplinary research in sustainability and energy, focusing on factors affecting pro-environmental behaviour in individuals and communities. He has been involved in promoting public engagement and increasing awareness of sustainability and sustainable energy approaches for many years. He co-leads the Science for Sustainability group, which has a nationally leading reputation for its work in engaging schoolchildren and disadvantaged communities in sustainability issues.

Research Interests
- Solid Oxide Fuel Cells
- Fuel reforming catalysis
- Development of new anode and reforming catalyst materials for SOFCs
- Understanding fuel cell performance and degradation
- Utilisation of biogas and sustainable materials chemistry

Key Publications
- IP Silverwood, NG Hamilton, CJ Laycock, JZ Staniforth, RM Ormerod, CD Frost, SF Parker, D Lennon, 2010, Quantification of surface species present on a nickel/alumina methane reforming catalyst, Physical Chemistry Chemical Physics, Vol. 12, Pages: 3102-3107

Equipment & Facilities
- Catalyst testing laboratory
- Fuel cell testing facilities
- Well-equipped materials chemistry laboratory
- In situ XRD, solid state NMR, Electron microscopy, EDX
- Full range of analytical and spectroscopic facilities
**Dr Alison Parkin**  
**Chemistry Anniversary Research Lecturer**  
University of York  
Email: alison.parkin@york.ac.uk  
Phone: +44 (0)19 0432 2561  
Website: www.york.ac.uk/chemistry/staff/academic/o-s/aparkin

**Research Interests**  
- Hydrogen enzymes  
- Fourier transform voltammetry  
- Methanogens  
- Carbon electrodes

**Key Publications**  

**Equipment & Facilities**  
- Anaerobic electrochemistry under H2 and CO environments  
- Microbial cell culturing  
- Enzyme extraction and purification  
- Spectroelectrochemical UV-vis and EPR  
- Fourier transform voltammetry potentiostat

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**Professor Christopher Pickett**  
**Professor of Chemistry**  
University of East Anglia  
Email: c.pickett@uea.ac.uk  
Phone: +44 (0) 1603 592486  
Website: www.uea.ac.uk/chemistry/people/profile/c-pickett

**Research Interests**  
- Chemistry related to the active sites of the hydrogenases  
- Photoelectrochemistry at semi-conductors  
- Solar fuels  
- Electrocatalysis for transformation of small molecules: H2, N2, CO, CO2, alkanes

**Key Publications**  
- [FeFe] Hydrogenase: Protonation of {2Fe3S} anion.201406210  
- Structural and Functional Analogues of the Active Sites of the [Fe]-, [NiFe]-, and [FeFe]-Hydrogenases. Tard C, Pickett CJ. Chemical Reviews, 2009, 109, (6), pp 2245-2274 DOI:10.1021/cr800542q

**Equipment & Facilities**  
- Electrochemical instrumentation  
- FTIR ATR spectroelectrochemistry  
- UV-visible spectroelectrochemistry  
- Stopped-flow FTIR and UV-visible facilities  
- High pressure electrochemistry  
- Synthetic facilities for air sensitive materials
Prof Giuliano Premier
Chair – Low carbon Systems Engineering
University of South Wales, Treforest
Email: iano.premier@southwales.ac.uk
Website: http://serc.research.southwales.ac.uk

Biography
Giuliano Premier is a senior member of the Sustainable Environment Research Center (SERC) and its sub-units. His research activities cover renewable energy systems, biological wastewater treatment, biohydrogen production and the ‘hydrogen economy’, bioelectrochemical systems (BES), in particular microbial fuel cells, CACSD, modelling and automatic control of anaerobic processes. He has been co-investigator in several collaborative funded projects e.g. by EU FP and ERDF, EPSRC SUPERGEN, NERC, leading the Microbial Theme of the UKERC SUPERGEN Biological Fuel Cell.

Research Interests
- Renewable energy systems
- Energy and resource recovery from waste, crop and co-product biomass
- Microbial fuel cells and bioelectrochemical systems
- System modelling and control
- System design and scale-up

Key Publications

Dr Neil Rees
Lecturer, Fuel Cell Research
University of Birmingham
Email: n.rees@bham.ac.uk
Phone: +44 (0) 121 4154532
Website: www.birmingham.ac.uk/research/activity/chemical-engineering/energy-chemical/fuel-cells/index.aspx

Biography
Neil Rees has been lecturer in fuel cell research in the School of Chemical Engineering at the University of Birmingham since 2012. He leads the PEFC Group in, and is a deputy director of, the Centre for Doctoral Training in Fuel Cells and their Fuels (CDT): a project between the universities of Birmingham, Nottingham, Loughborough, Imperial College and University College of London lasting until 2022. The PEFC Group is housed within the CDT laboratories, which are well equipped for a wide variety of applied research work on fuel cells, and overall facilities in terms of workshop support, libraries, IT, and technical support is of a high standard. The Group has wide-ranging interests in fuel-cell related work: from fundamental electrochemistry to catalyst and membrane development, all with application to low temperature proton exchange and alkaline fuel cells up to single cell level.

Neil has more than 10 years’ experience in research electrochemistry, having been a postdoctoral researcher at both Cardiff and Oxford Universities, where his research spanned a wide range of analytical, physical, and nanoelectrochemistry. NVR has published 97 papers in peer-reviewed journals (h=24) and 4 patents as at October 2014.

Research Interests
- Low temperature fuel cells: PEFC & AFC
- Redox mediators
- Novel catalysts & fabrication methods
- Kinetics and Mechanism of nanoscale processes
- Designer catalysts & supports

Key Publications

Equipment & Facilities
- 6 electrochemical workstations, equipped with Autolab and Ivium potentiostats
- Hydrodynamic electrochemistry (3 rotating disks/ring disk controllers, channel flow unit)
- 2 low temperature fuel test stations (Paxitech & Scribner)
- Zeiss binocular optical microscope
- Glove box for air-sensitive handling

UK Hydrogen & Fuel Cell Research Capability Document
BIOGRAPHY: PROFESSOR ANDREA RUSSELL

Professor Andrea E. Russell
Professor of Physical Electrochemistry
University of Southampton
Email: a.e.russell@soton.ac.uk
Phone: +44 (0)23 8059 3306
Website: www.southampton.ac.uk/chemistry/about/staff/aer1.page

Biography
Andrea’s research interests are in the application of spectroscopic methods (from infrared to X-rays) to characterise the electrode/electrolyte interface and to study structure/property relationships in electrocatalysis, with particular emphasis on the electrocatalysts for PEM fuel cells, air batteries, and water electrolyser. Her work often involves the use of national and international facilities such as the Diamond Light Source, ISIS, and other synchrotron radiation sources in Europe and the USA.

Research Interests
- Electrocatalysts
- Polymer Electrolyte Fuel Cells
- Air electrodes for batteries
- Water electrolyser
- In situ spectroscopic methods

Key Publications

BIOGRAPHY: DR PARAMACONI RODRIGUEZ

Dr Paramaconi Rodriguez
Lecturer of Chemistry
University of Birmingham
Email: p.b.rodriguez@bham.ac.uk
Phone: +44(0)121 414 4365
Website: www.birmingham.ac.uk/staff/profiles/chemistry/rodriguez-para.png

Biography
Dr. Paramaconi Rodriguez is lecturer and leader of the Advanced Materials and Electrochemical Research group (www.ampere.technology) in the University of Birmingham. The group focuses on the formulation and testing of new electrocatalyst materials for Fuel cell and electrolyser applications. He has published over 45 peer-reviewed papers, including review papers on PEM Fuel Cells and book chapters related to fuel cell technology. He also has filed 2 patents related to the preparation and use of catalysts for fuel cell applications.

Research Interests
- Polymer electrolyte Fuel cell and electrolyser
- Direct Alcohol Fuel Cell
- Alkaline Fuel Cell
- Electrocatalysis, electrochemical interface and reaction mechanisms
- Synthesis of advanced energy materials

Key Publications

Equipment & Facilities
- Synthesis of nanomaterials by Cathodic Corrosion and wet chemistry
- On-Line electrochemical mass spectrometry (OLEMS)
- Extensive facilities for the characterization of the electrochemical interface
Dr Jhuma Sadhukhan
Senior Lecturer of Sustainable Resources
University of Surrey
Email: j.sadhukhan@surrey.ac.uk
Phone: +44 (0)1483 686642
Website: www.surrey.ac.uk/ces/people/jhuma_sadhukhan

Biography
Jhuma Sadhukhan heads a research group at University of Surrey focused on electrochemical, bioelectrochemical, biochemical and thermochemical processes for converting wastes into biofuel, chemical and combined heat and power and resource recovery from wastewaters in integrated biorefineries. She has extensive industrial experience with MW Kellogg Ltd. and Technip. In 1999, her work on gasification received the first prize in IChemE international conference on Gasification for the Future. In 2006, she was awarded IChemE Hanson Medal for contribution to an article on biorefinery engineering education. In 2011, she was awarded IChemE Junior Moulton Medal for the best publication (on carbon capture).

Research Interests
- Fuel cells science and engineering
- Solid oxide fuel cells and bioelectrochemical systems
- Fuel cell integration with renewable energy sources and biorefineries
- Waste biorefineries: Design, process integration and optimisation
- Life cycle sustainability assessment

Key Publications

Equipment & Facilities
- Aspen Plus simulation package
- Cradle to grave life cycle assessment software, GaBi, Ecoinvent
- Simulation, optimisation and modelling tools and computational facilities for fuel cells

Professor Keith Scott
Professor of Electrical Engineering
University of Newcastle
Email: k.scott@ncl.ac.uk
Phone: +44 (0) 191 208 8771
Website: www.ncl.ac.uk/ceam/staff/profile/keith.scott

Biography
Keith Scott’s research group in fuel cells and hydrogen technologies is part of a larger group in electrochemical engineering focused on electrocatalysis, power generation, materials recycling, water treatment and electrolysis. He is director of a spin out company, Newcell Technologies, with programmes in new hydrogen electrolysis technologies, fuel cells and electrocatalyst and electrode fabrication. He is the coordinator of a Marie Curie Training site in Sustainable Hydrogen Generation (SUSHGEN)

Research Interests
- Polymer membrane Fuel Cells and Electrolysers
- Metal air and lithium batteries
- Fuel cell science and engineering at the electrode, cell, stack and system level
- 3D Imaging and modelling of fuel cells and batteries
- Understanding fuel cell and electrolyser performance and degradation

Key Publications

Equipment & Facilities
- Extensive facilities for electrochemical characterisation in a hydrogen and CO safe laboratory
- Material, cell, and stack testing for fuel cells and electrolysers and low and intermediate temperature fuel cells
- Electrocatalyst and membrane electrode assembly fabrication facilities
- Electrodialysis and electrohydrolysis stack test rig for water treatment and recycling
- Temperature programmed Li battery test facility
Biography
Nilay Shah is the Director of the Centre for Process Systems Engineering (CPSE) and co-director of the Urban Energy Systems project at Imperial. His research interests include the application of process modelling and mathematical/systems engineering techniques to analyse and optimise complex, spatially-and temporally-explicit low-carbon energy systems, including hydrogen infrastructures, carbon capture and storage systems, urban energy systems and bioenergy systems. He is also interested in devising process systems engineering methods for complex systems such as large scale supply chains and biorenewable processes, and in the application of model-based methods for plant safety assessment and risk analysis. He has published widely in these areas and is particularly interested in the transfer of technology from academia to industry. He has provided consultancy services on systems optimisation to a large number of people from academia to industry. He has been an IChemE Young Chemical Engineer of the Year. He has published more than 50 papers in the past 5 years (h=16) and is a pioneer of ‘4-D Tomography’ as recognised by the award of his RAEng Fellowship entitled ‘4-dimensional Tomography of Electrochemical Devices’. He leads the STFC Global Challenge Network in Batteries and Electrochemical Energy Devices and is a recent recipient of a SRL Science Highlight Award. In 2006 he graduated from Birmingham with the top first class degree in Chemical Engineering, and in 2009 he took a PhD in Batteries and Electrochemical Energy Devices. He leads the STFC Global Challenge Network entitled ‘4-dimensional Tomography of Electrochemical Devices’. He is an elected member of the Royal Academy of Engineering.

Research Interests
- Hydrogen infrastructures
- Multiscale modelling
- Process design and optimisation

Key Publications

Equipment & Facilities
- Software tools for hydrogen infrastructure optimisation
- Large scale computational cluster

Biography
Paul’s research explores the relationship between performance and microstructure for functional materials, with a primary focus on energy materials. He has published more than 50 papers in the past 5 years (h=16) and is a pioneer of ‘4-D Tomography’ as recognised by the award of his RAEng Fellowship entitled ‘4-dimensional Tomography of Electrochemical Devices’. He leads the STFC Global Challenge Network in Batteries and Electrochemical Energy Devices and is a recent recipient of a SRL Science Highlight Award. In 2006 he graduated from Birmingham with the top first class degree in Chemical Engineering, and in 2009 he took a PhD in Imperial College. He is the recipient of the Salter’s Graduate Prize and the Janet Watson memorial prize for research excellence, and in 2014 was short listed for the IChemE Young Chemical Engineering of the Year.

Research Interests
- 3D Imaging of Electrochemical Devices
- Synchrotron techniques
- Image based modelling
- Electrochemical Diagnostics
- Transport phenomena applied to fuel cells and electrochemical devices

Key Publications

Equipment & Facilities
- Xradia Versa 520 High resolution X-ray CT
- Xradia Ultra 810 Super High Resolution X-ray CT
- >10 Electrochemical test stations incl. FRA with up to 40A capability
- Zeiss EVO Scanning Electron Microscope, and access to Zeiss xb1540 FIB-SEM
- Materials processing for fuel cells (PEMFC and SOFC)
Dr Spyros Skarvelis-Kazakos
Lecturer in Sustainable Electrical Power Engineering
University of Greenwich
Email: s.skarvelis-kazakos@gre.ac.uk
Phone: +44 (0) 1634 883125
Website: www2.gre.ac.uk/about/faculty/engsci/study/elcomp/staff/spyros-skarvelis-kazakos

Key Publications

Research Interests
- Intelligent control of distributed energy resources
- Multiple energy carriers and multi-energy systems
- Energy storage in power systems
- Microgrids and Virtual Power Plants
- Grid integration of renewable energy

Biography
Dr Skarvelis-Kazakos has been involved in a range of FP6, FP7 and TSB projects, mostly relating to intelligent control of distributed energy resources, including fuel cell micro-generators, electric vehicles and distributed energy storage. Most recently, he has been involved in three TSB-funded projects and a high-profile commercially-funded project. His research is mostly targeted towards intelligent control of distributed energy resources, including fuel cells. Recently, he has been investigating the control of multiple energy carriers, including hydrogen.

Professor Peter Slater
Professor of Materials Chemistry
University of Birmingham
Email: p.r.slater@bham.ac.uk
Phone: +44 (0) 121 4148906
Website: www.birmingham.ac.uk/staff/profiles/chemistry/slater-peter

Key Publications
- Investigation into the effect of Si doping on the cell symmetry and performance of Sr1-yCayFeO3-∂ SOFC cathode materials; J.M. Porras-Vázquez and P.R. Slater; J. Power Sources 209, 180-183, 2012.
- Enhanced CO2 stability of oxygen doped Ba2In2O5 systems co-doped with La, Zr; J.F. Shin, P.R. Slater; J. Power Sources 196, 8539-8543, 2011.

Research Interests
- Solid Oxide Fuel Cells and Electrolysers
- Oxide ion and Proton conducting ceramics
- Structural studies with X-ray and neutron diffraction
- Development of new electrolyte and electrode materials
- Alkaline Fuel Cells

Equipment & Facilities
- BOC HYMERA™ fuel cell generator
- 7.5kWp photovoltaic installation
- Battery setup with DC output
- Electric Vehicle charging point (Type 2, up to 32A)
- Intelligent controller setup, based on Raspberry Pi controllers

Biography
Peter Slater is Professor of Materials Chemistry in the School of Chemistry, University of Birmingham. His research interests include a range of topics, including fuel cells, high temperature superconductivity, battery materials, magnetic materials and structural studies of inorganic solids. His fuel cell research is focusing on understanding the effect of structure on the performance of materials, and the development of new materials for use in alkaline and solid oxide fuel cells.

Equipment & Facilities
- X-ray diffraction suite with high temperature facility
- Solid State Synthesis Suite
- Conductivity measurement suite
- Raman spectroscopy facility
- Thermal analysis facility
Professor Stephen Skinner
Professor of Materials Chemistry
Imperial College
Email: s.skinner@imperial.ac.uk
Phone: +44 (0)20 7594 6782
Website: www3.imperial.ac.uk/people/s.skinner

Biography
Stephen Skinner leads a research group with interests in materials for new energy technologies and is primarily concerned with the chemical and physical properties of solid oxide fuel cell electrolytes and electrodes. His group has extensive experience of the use of neutron and synchrotron facilities to undertake in-situ high temperature characterisation of new materials and in relating structural characteristics of materials to their electrochemical properties. A particular field of interest is the development of interstitial oxide ion conductors for fuel cell applications. Further areas of interest include the development of high temperature electrolysers based on oxide ion and proton conducting oxides, permeation membranes and solid-state electrochemical sensors for the detection of gases.

Research Interests
- In-situ structural characterisation of electrodes & electrolytes
- Proton conducting oxides
- Surface chemistry and structure of electrodes
- Solid Oxide Fuel Cells: materials development
- High temperature steam electrolysis

Key Publications

Equipment & Facilities
- TOF-SIMS – Low energy ion scattering
- Isotopic labelling and exchange of materials (D2O, H218O, 18O2)
- Electrochemical impedance spectroscopy and DC conductivity
- In-situ X-ray powder diffraction
- FIB-SIMS & microscopy (SEM, TEM), including atomic scale imaging

Professor Robert Steinberger-Wilckens
Chair, Hydrogen and Fuel Cell Research
University of Birmingham
Email: r.steinbergerwilckens@bham.ac.uk
Phone: +44 (0) 121 415 8169
Website: www.birmingham.ac.uk/research/activity/chemistry-engineer-

Biography
Robert Steinberger-Wilckens has been leading the Fuel Cell and Hydrogen Research group of 10 staff and PostDocs and 40 PhD students within the energy department in Chemical Engineering at University of Birmingham since 2012. Robert is also director of the Centre of Doctoral Training (CDT) in Fuel Cells and their Fuels. In the EPSRC H2FC Hub he is co-director of education and is member of the EPRSC SAC. He is one of the founders of the Joint European Summer School initiative that has been ongoing since 2004. In the past, Robert led the SOFC development group at Research Centre Juelich in Germany for ten years, one of the largest and most successful groups worldwide. He has spun out two companies out of university activities, an engineering consultancy (planet-energie.de) and an electric vehicle manufacturer (elano-mobile.de).

Research Interests
- Solid Oxide Fuel Cells and Electrolysers (SOFC), especially using ScSZ
- Intermediate Temperature Polymer Electrolyte Fuel Cells (IT-PEFC)
- Catalysis for Polymer Electrolyte Fuel Cells (PEFC), Nanowires and Pt-Alloys
- Degradation of fuel cells, fuel thermodynamics, reforming, carbon formation, biomass derived fuels
- Integration of fuel cells on vehicles, fuel cell systems, market introduction of fuel cells and fuel cell vehicles

Key Publications

Equipment & Facilities
- Planar SOFC manufacturing using cold pressing and tape casting, screen printing and PVD (up to 5x5 sqcm); PEFC and IT-PEFC MEA and GDL manufacturing (up to 5x5 sqcm); sintering & drying furnaces, milling, paste & ink production;
- 6 SOFC test rigs for microtubes, button cells and planar cells (fuel cell and electrolysis mode), 4 test rigs for SOFC stacks 100 W to 5 kW; PEFC, DMFC and IT-PEFC test rigs; 4 materials characterisation (anode and cathode atmosphere exposure) test rigs
- Electrochemical characterisation of catalysts; in-laboratory SEM/EDX and optical microscopy, sample preparation
- Reforming and biomass gasification test rigs
- Fully functional hydrogen filling station (4kg/day)
BIOGRAPHY: PROFESSOR SHANWEN TAO

Professor Shanwen Tao
Professor Chemical & Process Engineering
University of Strathclyde
Email: shanwen.tao@strath.ac.uk
Phone: +44 (0) 141 548 2361
Website: www.strath.ac.uk/chemeng/research/groupdetails/profshan-wentao-professor

Biography
Shanwen Tao leads a research group at University of Strathclyde focusing on materials for energy and sustainable synthesis. He is very interested in ionic and electronic conducting materials to be used as electrocatalysts for fuel cells and electrolysers, based on both solid oxide and polymer electrolytes. He is interested in direct ammonia/urea/urine fuel cells and direct carbon fuel cells. He is also interested in electrochemical synthesis technologies using hydrogen or water as the precursors.

Research Interests
- Materials for solid oxide fuel cells and electrolysers
- Membranes and catalysts for polymer membrane fuel cells
- Direct ammonia/urea/urine fuel cells
- Direct carbon fuel cells
- Electrochemical synthesis of ammonia and hydrocarbons

Key Publications
- Rong Lan and Shanwen Tao, Novel proton conductors in layered oxide material Li_xAl_0.5Co_0.5O_2, Advanced Energy Materials, 4 (2014) 1301683.

Equipment & Facilities
- Electrochemical measurement systems such as Solartron 1470A/1455A with power booster
- FCT-150 PEMFC Testing System up to 500 W
- Various fuel cell test rigs for both PEMFCs and SOFCs
- NETZCH 402 PC Dilatometer for TEC measurements
- Agilent GC for gas analysis

Biography
Prof. Rob Thring has 30 years experience in the automotive field, with Ricardo Consulting Engineers, Southwest Research Institute (USA) and Loughborough University. He has constructed and directed major consortium research programmes, including one that generated technology needed for car makers to meet the California ULEV (Ultra Low Emission Vehicle) regulations. He also started an Engine Technology consulting service and built it to 30 client companies in the USA, Japan, Korea and Europe, with a total value of 3 million US dollars. The first to coin the term HCCI (Homogeneous Charge Compression Ignition), he conducted seminal research in that field. He was also the first to publish results in the field of engine/transmission matching, with its associated benefits in fuel economy, a technique that has been widely adopted by the auto makers. He was Head of the Department of Aeronautical and Automotive Engineering at Loughborough University from 2003 until 2008. In 2009 he was responsible for the installation and commissioning of the second hydrogen vehicle refueller in the UK, at Loughborough University, value £400,000, and worked with Intelligent Energy and Suzuki on fuel cell electric scooter research. Rob Thring is a Fellow of the Institution of Mechanical Engineers, a Chartered Engineer and has 44 published papers and 6 patents.

Key Publications

Research Interests
- The application of fuel cells to vehicles
- Building research consortia
- Bringing together of industry and academia
- Fuel Cell Hybrid Vehicles
- Electric Vehicles

Equipment & Facilities
- Chassis Dynamometer 1
- Chassis Dynamometer 2

UK Hydrogen & Fuel Cell Research Capability Document
Dr Valeska Ting
Lecturer and Prize Fellow in Smart Nanomaterials
University of Bath
Email: v.ting@bath.ac.uk
Phone: +44 (0)1225 383369
Website: http://people.bath.ac.uk/vt233

**Biography**
Valeska’s expertise is in the synthesis, characterisation and application of porous materials. She currently heads a research group at Bath concerned with the understanding of structure-property relationships of functional nanoporous materials and their application to problems in sustainable energies. Some of her recent research into new characterisation methods for porous hydrogen storage materials was awarded the UK’s Parliamentary and Scientific Committee’s 2013 SET for Britain Gold Medal for Engineering and the Westminster Medal. In addition, her work in sustainable chemical technologies and engineering outreach was recognised by the award of the Institution of Chemical Engineers’ 2013 Sir Frederick Warner medal.

**Research Interests**
- Nanoporous materials for gas storage
- Development of methods for in-situ characterisation of nanomaterials
- Smart nanomaterials for responsive containment of gases/materials

**Key Publications**

**Equipment & Facilities**
- Porous materials characterisation lab at Bath (including TGA, He pycnometry, surface area and pore size analysis)
- High pressure, variable temperature gas sorption analyser

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Dr Xin Tu
Lecturer in Technological Plasmas
University of Liverpool
Email: xin.tu@liverpool.ac.uk
Phone: +44 (0)151 794 4513
Website: www.liv.ac.uk/electrical-engineering-and-electronics/staff/xin-tu

**Biography**
Xin Tu leads a research group working on the interdisciplinary research at the interface of plasma physics and plasma chemistry directed towards energy and environmental applications. His research has been largely focused on the development, characterisation and optimisation of novel plasma processes for gas cleaning/purification, gas reforming/conversion and solid waste treatment. Significant efforts have been devoted to plasma-catalysis where the combination of plasma and catalysis has been used for the removal of gas pollutants and for the conversion of carbon emissions (e.g. CH4, CO2, hydrocarbons) into value-added fuels and chemicals such as hydrogen, C2 and carbon nanomaterials at low temperatures.

**Research Interests**
- Low temperature plasmas: generation and diagnostics
- Plasma-catalysis for gas cleaning, hydrogen production and CO2 conversion/utilisation
- Plasma synthesis/treatment of catalysts and carbon nanomaterials
- Thermal plasma gasification/vitrification of waste
- Understanding synergy and interactions of plasma and catalyst

**Key Publications**

**Equipment & Facilities**
- Low temperature plasma systems (gliding arc, dielectric barrier discharge)
- Gas analytic equipment: GC, GC-MS, FTIR, Ozone monitor
- Catalyst preparation/processing platform
- Plasma diagnostics equipment: ICCD, optical emission spectrometer, probes and MS (shared)
- Fibre optical thermometer and infrared thermometer

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Professor John Varcoe
Professor of Materials Chemistry
University of Surrey
Email: j.varcoe@surrey.ac.uk
Phone: +44 (0)1483 686838
Website: www.surrey.ac.uk/chemistry/people/john_varcoe/

Biography
John Varcoe (Professor of Materials Chemistry) was awarded a 5 year EPSRC Leadership Fellowship in 2010. He has expertise in electrocatalyst and polymer electrolyte synthesis and characterisation, and electrochemical device testing. He has published > 50 papers since 2000 (h-index 28, > 3250 citations) and is PI of > £2M of research grants (Co-I/co-author of ca. £5M). He is on the scientific board of the EPSRC Supergen H2 & Fuel Cell Hub and an academic lead of the EPSRC CO2Chem Grand Challenge Network’s Electrochemistry Cluster [co2chem.co.uk].

Research Interests
- Anion-exchange Polymer Electrolytes
- Low temperature Alkaline Polymer Electrolyte Fuel Cells (APEFCs) containing non-Pt catalysts
- Alkaline water electrolyser containing polymer electrolytes for the generation of pure H2
- Electrolysers for electro-reduction of CO2 into high value chemicals
- Other polymer electrolyte-containing energy technologies such as Microbial Fuel Cells, Reverse Electrodialysis, and Redox Flow Batteries

Key Publications

Dr Darren Walsh
Assistant Professor in Physical Chemistry
University of Nottingham
Email: darren.walsh@nottingham.ac.uk
Phone: +44 (0)115 846 7495
Website: www.nottingham.ac.uk/~pczdw1/electrochemistry

Biography
Darren Walsh is an electrochemist and heads a research group at The University of Nottingham, which focuses primarily on the development of novel electrocatalysts and electrolytes for fuel cells. He obtained his PhD in 2002 from Dublin City University before moving to the University of Texas at Austin, where he carried out postdoctoral research on high-throughput screening of fuel cell electrocatalysts. He then accepted a Lectureship in Physical Chemistry at Newcastle University before moving in 2007 to Nottingham, where he is currently Assistant Professor in Physical Chemistry.

Research Interests
- Electrocatalysis in polymer electrolyte fuel cells
- Ionic liquid-based electrolyte membranes for intermediate temperature fuel cells
- High-throughput screening of fuel cell electrocatalysts
- Electrocatalysts in regenerative fuel cells

Key Publications

Equipment & Facilities
- Electrochemical facilities for characterisation of low- and intermediate-temperature fuel cell electrocatalysts
- Electrocatalyst synthesis facilities
- Scanning electrochemical microscopy of fuel cell electrocatalysts
- High-resolution electron microscopy of nanostructured fuel cell catalysts
BIography: Professor Jennifer X Wen

Professor Jennifer X Wen
Head of Warwick FIRE
University of Warwick
Email: jennifer.wen@warwick.ac.uk
Phone: +44 (0)24 765 73365
Website: www2.warwick.ac.uk/fac/sci/eng/people/profile/?tag=jxw

Biography
Professor Jennifer Wen established and currently leads Warwick FIRE, an internationally recognised multidisciplinary research laboratory for both fundamental and applied research into fire and explosion hazards as well as accidental release of hazardous materials. She is a member/steering committee members of several professional committees and professional organisations. As Lead Guest Editor, she published three special issues on Hydrogen Safety for the International Journal of Hydrogen Energy between 2012 and 2013; and currently continues to serve as a Guest Editor for the special issues of the series of International Conferences on Hydrogen Safety in the journal. She was a member of the Expert Advisory Council for European Network of Excellence on Hydrogen Safety (HYSAFE) and currently sits on the Science Board of the UK Hydrogen and Fuel Cell Hub.

Research Interests
• Hydrogen jets and jet fires
• Hydrogen behaviour in enclosure
• Spontaneous ignition of hydrogen in pressurised release
• Hydrogen explosion – flame acceleration, vented deflagrations, deflagration to detonation transition (DDT) and detonation
• Release, spread and ignition of liquid hydrogen

Key Publications

Equipment & Facilities
• In-house computational fluid dynamics (CFD) code for hydrogen spontaneous ignition.
• In-house modified version of OpenFOAM® for hydrogen jet fires and explosions.
• In-house high performance computing facility

BIography: Prof Meihong Wang

Prof Meihong Wang
Professor in Process and Energy Systems Engineering
University of Hull
Email: Meihong.Wang@hull.ac.uk
Phone: +44 (0) 1482 46 66 88
Website: www2.hull.ac.uk/science/engineering/our%20staff/academic/meihong%20wang.aspx

Biography
Meihong Wang joined the University of Hull in Oct. 2012 as Reader in Process and Energy Systems Engineering & CCS. He was then promoted to professorship from Aug. 2014. From Sept. 2006 to Sept. 2012, he worked at Cranfield University as Lecturer and MSc Course Director. He was trained as a Process Engineer in China, then moved to the UK in Jan. 1999 to join Imperial College London and University College London.

Professor Wang is a Chartered Engineer. He has published over 90 technical (journal and conference) papers, and industrial reports. He has been involved in different research projects worth around £8.67 million from UK Research Councils. European Union and Industry as investigators.

Research Interests
• Process Modelling, Simulation, Control and Optimisation
• Power Plant, Carbon Capture and Transport (CCT), and Energy Storage
• Bio-fuel Production
• Refinery Planning and Scheduling
• Process Condition Monitoring and System Identification

Key Publications

Equipment & Facilities
• High Performance Computer
• Process Modelling and Simulation Software: gPROMS, Aspen Custom Modeller, COMSOL
• Process Control Soft DCS – Emerson DeltaV Simulate
• Process Control Soft DCS – Emerson DeltaV Simulate

UK Hydrogen & Fuel Cell Research Capability Document
Dr Chunfei Wu
Lecturer in Chemical Engineering
University of Hull
Email: C.Wu@hull.ac.uk
Phone: +44 (0) 1482 46 6464
Website: www2.hull.ac.uk/science/engineering/our_staff/academic/chunfeiwu.aspx

Biography
Dr. Chunfei Wu is a Lecturer in the Chemical Engineering at the University of Hull. He is also a Visiting Lecturer at the University of Leeds. He has worked in the areas of converting renewable and waste resources to energy, fuel and chemicals through catalytic thermo-chemical routes for 10 years. One of his key research areas is to produce carbon nanotubes as a by-product of hydrogen from catalytic reforming of renewable resources. He has 59 peer reviewed journal publications with around 620 citations with an ‘h factor’ of 16. He is a member of the Royal Society Chemistry and a Charted Chemist.

Research Interests
• Producing carbon nanotubes and hydrogen from renewable resources
• Multi-functional catalyst/material development for enhanced hydrogen production with in-situ CO2 adsorption
• Hydrogen production from wastes e.g. plastics

Key Publications

Equipment & Facilities
• Fixed bed reaction system for co-production of carbon nanotubes and hydrogen
• Catalyst/sorbent development and characterisations including SEM, TEM, TPO, TPR, Raman etc.
• CO2 adsorption/desorption using TGA

Dr Billy Wu
Lecturer, School of Design Engineering
Imperial College London
Email: billy.wu06@imperial.ac.uk
Phone: +44 (0)20 7594 6385
Website: www.imperial.ac.uk/people/billy.wu06

Biography
Dr Billy Wu is a lecturer in the School of Design Engineering working on applications of 3D selective laser sintering for electrochemical devices, working at the interface between fundamental science and the engineering application. Prior to this, he was a research associate at Imperial working on modelling and testing of electrochemical devices for grid storage applications having completed his PhD on modelling and testing of fuel cell hybrid vehicles also at Imperial. He currently co-leads Imperial’s efforts on the TSB funded project for materials and process development for a low cost 1-10 kW FC stack with Arcola Energy.

Research Interests
• Proton Exchange Membrane Fuel Cells – Cell design and systems
• Lithium-ion batteries – Diagnosis techniques, modelling and packs
• Redox flow cells – Novel chemistries and cell design
• Metal-air batteries – Zinc-air anode microstructural characterisation
• Additive manufacturing – Scaffold and flow field designs

Key Publications

Equipment & Facilities
• Direct metal laser sintering equipment – 3D printing
• Medium scale (10kWe) fuel cell demonstrators
• Fuel cell/electric vehicle development
• Electrochemical characterisation facility for fuel cells/flow cells
• Non-destructive x-ray CT material characterisation

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For enquiries, please contact:

**Prof Nigel Brandon OBE FREng**  
H2FC Supergen Hub Director  
Director BG Institute for Sustainable Gas  
Imperial College London  
SW7 2AZ  
n.brandon@imperial.ac.uk  
+44 (0)20 7594 5704

**Dr Chloe Stockford**  
Hydrogen and Fuel Cells Supergen Hub Coordinator  
Energy Futures Lab  
Imperial College London  
SW7 2AZ  
c.stockford@imperial.ac.uk  
+44 (0)20 7594 5850