UK HYDROGEN & FUEL CELL RESEARCH CAPABILITY DOCUMENT

January 2019
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BACKGROUND

This capability document is commissioned by the UK Hydrogen and Fuel Cell (H2FC) SUPERGEN Hub to create a database of researcher capability on hydrogen and fuel cells in the UK. Most of the submission in this document are from the Hub's Science Board and while this list is largely representative of the H2FC research community in the UK, it is by no means a comprehensive list of biographies or research activity in the UK. We invite researchers working on hydrogen and fuel cells to make submissions of their research profile if it is not listed in this document, these can be emailed to h2fc@imperial.ac.uk.

This document was last updated on 30th January 2018.

ACKNOWLEDGEMENTS

The H2FC Hub would like to thank all those who have made a submissions to this capability document. We welcome profile submission from new researchers and industrialists.
Introduction
Professor Nigel Brandon, Director H2FC SUPERGEN

As Director of the Hydrogen and Fuel Cell Research Hub, H2FC SUPERGEN, it is my pleasure to share with you the latest 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 to 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, the launch of commercial hydrogen fuel cell vehicles, and the increasing application of hydrogen to balance renewables in power to gas schemes.

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.
As Director of the Hydrogen and Fuel Cell Research Hub, H2FC SUPERGEN, it is my pleasure to share with you the latest 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 to be, then please contact us.

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HIGH TEMPERATURE FUEL CELLS
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 electrolyzers, carbon capture, and the pharmaceutical and agrochemical industries. She holds an EPSRC Leadership Fellowship and 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
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Biography
Bahman Horri is a Lecturer in Chemical Engineering at the University of Surrey. He received his PhD from Monash University in Australia and joined Surrey in 2016. He runs a research group focusing on solid oxide fuel cells and hydrogen production at Surrey. His research interest mainly lies in lowering the operational temperature of the solid oxide fuel cells through development of new ceramic nanocomposites for both anode and electrolyte layers. He has developed new approaches for green synthesis of low-cost ceramic nanocomposites for SOFCs. He has patented new processes for hydrogen production (metal/metal-oxide looping and electrolysis), nanomaterial synthesis, and nanocatalysis. With a multidisciplinary engineering and research background, he is also a chartered-engineer and scientist (CEng and CSci) by IChemE.

Research Interests
• Solid Oxide Fuel Cells and Electrolysers (SOFCs/ SOECs)
• Hydrogen production (water electrolysis and thermochemical looping)
• Green synthesis of nanocomposite ceramics and catalysts
• Microstructural improvement of SOFC electrodes
• Ammonia synthesis with solid oxide electrolysers
• Alkaline electrolysers and flow cells

Key Publications
• S. Pezeshkpour, A.Z. Abdullah, B. Salamatinia , B.A. Horri, Ionic–gelation synthesis of gadolinium doped ceria (Ce$_{0.8}$Gd$_{0.2}$O$_{1.90}$) nanocomposite powder using sodium-alginate, Ceramics International, 43 [09] (2017), pp. 7123-7135.

Equipment & Facilities
• Facilities for fabrication of SOFCs (screen printing, spin coater, hydraulic press, tube furnace, gas hubs)
• Impedance spectroscopy and single cells/ electrolysers performance analysers (potentiostat/galvanostat, DC load, DC power supply, digital multimeter, furnace...)
• Facilities for nanomaterial synthesis and characterisations (SEM/TEM, XRD, TGA, FTIR, Raman, DTA, DSC, ICP-MS, NMR...)
• Catalytic activity testing equipment and gas analysers (H$_2$, CO, CO$_2$, H$_2$O...
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 290 papers in scientific journals and books. He was a member of the General Engineering Panel for RAE2008 and a member of the Scientific Committee of the EU Fuel Cells and Hydrogen Joint Undertaking from 2009 to 2015.

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


Equipment & Facilities

- Focussed Ion Beam/ SEM 3D tomography
- Nano-/micro- indentation to 700°C
- Strength and toughness measurements at temperature
- Oxygen isotope surface exchange and diffusion by SIMS
- Surface analysis
Dr Richard Baker
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University of St Andrews
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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

Key Publications

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).
Professor Nigel Brandon

Dean of Engineering, Chair of the Sustainable Gas Institute

Imperial College London

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Biography

Nigel Brandon’s research is focused on electrochemical power sources for fuel cell and energy storage applications. He is Director of the UK Research Council funded Hydrogen and Fuel Cells SUPERGEN Hub (www.h2fcsupergen.com). He is a founder of Ceres Power (www.cerespower.com), an AIM listed fuel cell company spun out from Imperial College, and Chair of the Sustainable Gas Institute at Imperial College (www.sustainablegasinstitute.org). In 2017 he was appointed as Dean of Engineering at Imperial College London.

Research Interests

- Solid oxide fuel cells and electrolysis
- 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

Key Publications


Equipment & Facilities

- 3D imaging using FIB-SEM and xCT
- Extensive facilities for electrochemical characterisation in a hydrogen and CO safe laboratory
- Dedicated lab for fuel cell fabrication
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
- Microstructural and compositional grading of fuel cell 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
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, 916-923

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

Prof. Walter Johnstone leads the Photonic Systems research group in the department of Electronic and Electrical Engineering and is 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 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
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Biography
Jung-Sik Kim (Department of Aeronautical & Automotive Engineering, Loughborough University) has been working on ceramic powder processing over fifteen years and currently on SOFC thermal diagnostic tool development with generic interests: co-sintering of multi-layered functional bodies, thermal sensing & mapping of SOFC stacks (invented multi-thermo sensing array; Thermono©), and characterisation of SOFC for natural gas sensors or Lambda sensors developments. He recently published ‘single step fabrication of SOFCs’, ‘thermal sensing and predictive control of SOFC systems’, ‘air-fuel ratio sensing and gas composition sensing’ utilising SOFC technologies and ‘semiconductor-ion SOFC’ where an electrolyte layer is not physically separated and so a single component SOFC is fabricable. The cells’ distinguishable phenomena in physical & electrochemical ways require progressive understandings in a range of sub-atomic to millimetre scale to design an effective stack.

Research Interests
• Co-sintering of multi-layered components in a 3-D shape (wavy shaped SOFC)
• Thermal sensing for energy devices
• SOFC for gas sensor applications
• Semiconductor-ion SOFC/SOEC

Key Publications
• Kim, J.-S. et al, Advanced Fuel Cell based on Perovskite La-SrTiO3 Semiconductor as the Electrolyte with Super Oxide-ion Conduction, ACS Applied Materials and Interfaces, in printing, ISSN: 1944-8252.
• Kim, J.-S. et al, Charge separation and transport in La0.6Sr0.4Co0.2Fe0.8O3-δ and ion-doping ceria heterostructure material for new generation fuel cell, Nano Energy, 37, pp.195-202, ISSN: 2211-2855. DOI: 10.1016/j.nanoen.2017.05.003.

Equipment & Facilities
• Multi-array thermal sensors (Thermono©) fabrication facility (thin film and thin wire types)
• External wire connectors for multiple thermal sensors & data processor (hardware & software)
• Impedance spectroscopy and other electrochemical analysis methods
• Gas mix chambers (up to 8 gases) for providing a various mixture
• Sputter for thin solid sensor fabrications
• Reversible SOFC/SOEC cell holders
Biography

Professor R Vasant Kumar has conducted world-leading research in electrochemical redox reactions at the interface of electrodes and electrolytes and morphology of electrode materials within an ecological calculus at the cutting edge of new applications. He has published over 300 papers, 15 patents, 7 Chapters in Handbooks and 1 edited book (High energy density Li batteries, Wiley-VCH 2010). He has supervised over 35 PhD students, 20 post-doctoral researchers, over 25 visiting students and hosted 15 visiting professors. His research group consists of 20 researchers, working in harnessing electrochemical reactions in many applications ranging from sensors to batteries, fuel cells and photocatalytic reactions. His group has worked very closely with industry and research organizations and has been successful in transferring technology to industry.

Research Interests

- Solid Oxide Fuel Cells
- Batteries
- Sensors
- Photocatalytic processes
- Circular economy and sustainability

Key Publications

- Ch. Gao, Y. Liu, K. Xi, Sh. Jiao, R.I. Tomov, R. V. Kumar, Improve the catalytic property of La$_0.6$Sr$_{0.4}$Co$_{0.2}$Fe$_{0.8}$O$_{3}$/Ce$_{0.9}$Gd$_{0.1}$O$_2$ in solid oxide fuel cells application, Nano-Structures & Nano-Objects 12 (2017) 91–97
- C. Wang, R. I. Tomov, T. B. Mitchell-Williams, R. V. Kumar, B. A. Glowacki, Inkjet printing infiltration of Ni-Gd:CeO$_2$ anodes for low temperature solid oxide fuel cells, J Appl Electrochem (2017) 47:1227–1238

Equipment & Facilities

- Electrochemical work stations
- Impedance spectroscopy
- Hydrogen sensing systems
- InkJet Printing
- Characterisation of energy materials – ICP, Thermal Analysis, LECO, Gas Chromatography, ICP
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Biography
Dr Ming Li is an Assistant Professor in Materials at the Faculty of Engineering, University of Nottingham. Dr Li obtained his Ph.D. in 2008 from the University of Sheffield under the supervision of Professor Derek Sinclair. He worked as a PDRA with Professor Sinclair at Sheffield and Professor Matthew Rosseinsky at the University of Liverpool before starting his independent academic career at the University of Nottingham in 2014. Dr Li specialises in probing electrical conduction mechanisms and defect chemistry of functional metal oxides using various electrical characterisation techniques, particularly Impedance Spectroscopy. His current research focus is on designing new oxide ion conductors and mixed ionic-electronic conductors for energy applications including solid oxide fuel cells and oxygen separation membranes.

Research Interests
- Characterisation of electrical properties of functional materials
- Oxide ion conductors
- Mixed ionic-electronic conductors
- Solid oxide fuel cells
- Oxygen separation membranes

Key Publications

Equipment & Facilities
- Impedance test systems as a function of temperature and oxygen partial pressure (Solartron 1260, Solartron 1255, Solartron 1287, Solartron ModuLab MTS, coupled with furnaces, mass flow controller and oxygen sensors).
- Dc conductivity and Seebeck coefficient test system as a function of temperature and oxygen partial pressure.
- Electromotive force test system for oxygen transport number measurement.
- Oxygen permeation test system.
- Synthesis and device fabrication facilities including high temperature chamber and tube furnaces, high energy ball mill, cold isostatic press, screen printer, tape caster.
Dr Gregory Offer

Reader in Mechanical Engineering

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Biography
Dr Gregory Offer is a Reader 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 has also helped run 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 and motorbikes.

Research Interests
- Polymer electrolyte membrane (PEMFCs) and solid oxide (SOFC) fuel cells, modelling & testing, system design
- Lithium ion batteries, modelling & testing, extremes of operation, thermal management
- High energy density batteries, lithium sulfur, metallic lithium anodes, modelling experiments.
- Supercapacitors and lithium hybrid capacitors, modelling, experiments.

Key Publications

Equipment & Facilities
- Extensive facilities for electrochemical characterisation in a hydrogen and CO safe laboratory
- Material, cell, and stack testing (to 10 kWe)
- Prototype vehicle development garage, including battery, hybrid and fuel cell vehicle demonstrators
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
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 Kellog 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
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 electrolyzers 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
Biography

Robert Steinberger-Wilckens has been leading the Fuel Cell and Hydrogen Research group in Chemical Engineering at University of Birmingham since 2012. 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. Robert is the director of the Centre of Doctoral Training (CDT) in Fuel Cells and their Fuels, a project between the universities of Birmingham, Nottingham, and Loughborough, and Imperial College and University College of London lasting until 2022. In the EPSRC H2FC Hub he is co-director for education. He is one of the founders of the Joint European Summer School initiative that has been ongoing since 2004, he organises the annual Bruges Workshop on Fuel Cell Systems in May, and is the chair of the Scientific Committee of the European Fuel Cell & Hydrogen Joint Undertaking. 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 spun out the engineering consultancy PLANET GbR from university work and is one of its co-directors (planet-energie.de). His research interests centre around SOFC/SOFC technology and fuel cell system integration on vehicles, including fuel production.

Research Interests

- **Solid Oxide Fuel Cells and Electrolysers (SOFC, SOE, rSOFC, SOC), especially using ScSZ electrolyte materials; catalysis for avoiding carbon deposition, dry reforming, aqueous tape casting, inkjet printing;**
- **Intermediate Temperature Polymer Electrolyte Fuel Cells (IT-PEFC) and lightweight IT-PEFC stack development;**
- **Degradation of fuel cells, fuel thermodynamics, reforming, carbon formation, biomass derived fuels; synthetic methane and diesel;**
- **Integration of fuel cells on vehicles, fuel cell systems; SOFC hybrid vehicles;**
- **market introduction of fuel cells and fuel cell vehicles.**

Key Publications


Equipment & Facilities

- Planar SOFC manufacturing using aqueous tape casting, screen and inkjet printing, and PVD; PEFC and IT-PEFC MEA and GDL manufacturing; sintering & drying furnaces, milling, paste and ink production
LOW TEMPERATURE FUEL CELLS
Biography

Dan Brett (DJLB) specialises in electrochemical materials science and technology development. He is co-founder of the UCL Electrochemical Innovation Lab that provides a sandpit environment where basic science meets industrial development, leading to exploitation of new technologies. He has published >250 peer reviewed journal papers (h-index 44) 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. DJLB 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
- >10 Electrochemical test stations incl. RRDE, FRA with up to 40A capability
- >10 Fuel cell test stations
- Raman microscope
- Thermal imaging camera
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Biography
Richard is currently SL in Chemical Engineering at Lancaster University. He has an MEng from Cambridge and a PhD from Imperial College London. Before joining Lancaster he worked for UK fuel cell companies; Ceres Power and AFC Energy. His industrial contributions to core IP can be seen in six published patents. Since joining Lancaster University he has been awarded two EPSRC grants as PI in the field of fuel cells, is Co-I on a major KETEP-EPSRC project EP/M02346X/1 concerned with ceramic fuel cell degradation and was lead academic on a 3-year KTP with Ceres Power. He is also Co-I on the recently started ‘Manufacturing immortality’ project EP/R020957/1.

Research Interests
- Solid oxide and alkaline fuel cells, materials, electrode and structural design, degradation and testing.
- Engineering simulations particularly structural and fluid flow.
- Manufacturing process simulation to inform process and in service failure.
- Novel materials for high performance durable electrodes and the accompanying electrode design. Particularly in the alkaline environment for fuel cell and electrolysis reactions.
- Electrochemical based separation processes applied to the fuel cell and electrolyser field such as the recovery of metal value from end-of-life devices and the separation of isotopes (tritium from protium) in water remediation.

Key Publications
- Engineering FEA Sintering Model Development for Metal Supported SOFC. / Chatzimichail, Rallou; Dawson, Richard James; Green, Sarah Margaret; Sullivan, Daniel; Mukerjee, Subhasish; Selby, Mark. ECS Transactions, Vol. 78, No. 1, 23.07.2017, p. 2773-2783.

Equipment & Facilities
- Alkaline FC and SOFC (optical access furnace)test stands, screen printer, chemisorption and more.
Biography
Stuart Holmes is a Professor of Chemical Engineering at the University of Manchester. He is a Fellow of the IChemE, Fellow of the RSC and a Chartered Engineer, Chemist and Scientist. His PhD was in porous materials in the Chemistry Department at UMIST and he has worked on materials for electrochemical systems for almost 20 years. He has worked on catalysts for Redox flow batteries, membranes for fuel cells and electrolyzers as well as electro-chemical wastewater treatment and the use of 2-D materials as barriers and supports in PEM fuel cells.

Research Interests
- Graphene based membranes
- PEM Fuel Cells
- Highly efficient gas diffusion layers
- Direct Methanol Fuel Cells

Key Publications
Biography

Prof. Ieropoulos is the director of Bristol BioEnergy Centre, in the Bristol Robotics Laboratory at UWE and has been an EPSRC Career Acceleration Fellow and the principal investigator of, MFC Commercialisation funded by EPSRC’s “Developing Leaders” Programme, as well as of “Decomposing Robots and MFCs” funded by the Leverhulme Trust. He is the principal investigator of the “Urine-tricity” project funded by the Bill & Melinda Gates Foundation. 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. Having 17 years’ experience in autonomous robots and MFC technology, the latest breakthroughs have been the charging of mobile phones and the powering of lights inside the Pee Power® urinals using urine as well as the powering of Row-bot. His grant income over the last 8 years has reached over £6M and his work has resulted in over 90 peer reviewed publications.

Research Interests

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

Key Publications

• Urine utilisation by microbial fuel cells; energy fuel for the future, I Ieropoulos, J Greenman, C Melhuish - Physical Chemistry Chemical Physics 14 (1), 94-98
• EcoBot-II: An artificial agent with a natural metabolism, I Ieropoulos, C Melhuish - 2005 - journals.sagepub.com
• Microbial fuel cells: from fundamentals to applications. A review, C Santoro, C Arbizzani, B Erable, I Ieropoulos - Journal of Power Sources, 2017 – Elsevier
• Enhanced MFC power production and struvite recovery by the addition of sea salts to urine, V Celorrio, DJ Fermin, J Greenman, I Ieropoulos - Water research, 2017 - Elsevier
• Here today, gone tomorrow: biodegradable soft robots, J Winfield, I Ieropoulos - Devices (EAPAD) 2016, 2016 - spiedigitallibrary.org
• Artificial gills for robots: MFC behaviour in water, I Ieropoulos, C Melhuish - Bioinspiration, 2007 - iopscience.iop.org

Equipment & Facilities

• Microbial Fuel Cells, MFC stacks and cascades
• Ultra low-power electronics
• 3D printing technology, laser cutting
• Electrochemical analysis e.g. computer-controlled resistorstat and potentiostats
• Equipment for the preparation of ceramics e.g. kiln, diamond saw, lathes
• Environmental Scanning Electron Microscope
• EDX, XRD, GC-MS, SIFT-MS, IC, HPLC
BIOGRAPHY: PROFESSOR JOHANNES KIEFER

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Biography
Johannes is a full professor and head of the division of engineering thermodynamics at the University of Bremen, and he is honorary professor of chemical engineering at the University of Aberdeen. Johannes is a chemical engineer by training. The University of Erlangen-Nuremberg awarded him a PhD in 2008. In his postgraduate career has worked at the Division of Combustion Physics at the University of Lund, Sweden, at the University of Erlangen-Nuremberg and the University of Aberdeen. In addition, he was a visiting researcher at the Sandia National Labs Livermore and Delft University. He received a number of prizes including the Royal Academy of Engineering/Exxonmobile Excellence in Teaching Award and the Hinshelwood Prize of the Combustion Institute.

Research Interests
- Development and application of optical/spectroscopic methods for advanced material and process analysis.
- Structure-property relationships of ionic fluids.
- Molecular interactions at electrode-electrolyte interfaces.
- Monitoring of direct alcohol fuel cells and redox flow batteries.
- Characterization of electrode materials and their precursors for flame spray pyrolysis.
- Hydrogen as combustion fuel and intermediate.

Key Publications
- F.M. Zehentbauer, E.J. Bain, J. Kiefer; Multiple parameter monitoring in a direct methanol fuel cell; Measurement Science and Technology 23, 045602, 6 pp (2012).

Equipment & Facilities
- State of the art facilities for FTIR, Raman, LIBS, and fluorescence spectroscopy
- Optical measurement cells for studying electrolytes under controlled conditions of extended temperature and pressure ranges
- Facilities for studying liquid-liquid, and vapour-liquid equilibria
Dr Denis Kramer

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Biography

Denis Kramer graduated with a Dipl.-Ing. (FH) from the University of Applied Sciences Zwickau (Germany) in 2002. He was awarded a PhD in mechanical engineering (summa cum laude) from the Technical University in Freiberg (Germany) in 2007 for his work on "Mass transport aspects of Polymer Electrolyte Fuel Cells under Two-Phase Flow Conditions" carried out at the Electrochemistry Laboratory of the Paul Scherrer Institut (Switzerland). Being awarded a Fellowship of the German Academic Exchange Service, he spend two years at the Massachusetts Institute of Technology (USA) studying Li-Ion batteries based on Density-Functional-Theory. He relocated to the UK in 2009 after taking up a position as Researcher Co-Investigator at Imperial College London to study the properties of Core-Shell nano-particles as catalysts for low temperature fuel cells in an collaborative effort seeking to combine Density-Functional-Theory with advanced experimental characterisation. He joined the School of Engineering Sciences in 2010 as a lecturer and is currently on sabbatical at Imperial College London.

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


Equipment & Facilities

- Largest UK university-based supercomputer (Iridis4)
- Access to Southampton’s NanoFab Centre (E-beam lithography, FIB, Epitaxy, …)
- Full range of electrochemical testing equipment in H2/CO safe lab space
- Full suite of physical characterisation instruments (XRD,SEM,AFM, …)
Biography
Dr Anthony Kucernak (ARK) B.Sc., Ph.D., CChem. MRSC, is Professor of Chemical Physics at the Department of Chemistry, Imperial College London. He has over 25 years in the development of electrochemical energy devices including batteries, fuel cells, photoelectrochemical devices, redox flow batteries, and new methods for studying such systems. He has published over one hundred and thirty refereed articles, and is inventor/co-inventor on ten patents. He is deputy director of the Energy Futures Lab – a cross faculty Institute at Imperial College promoting multidisciplinary research leading to a sustainable energy supply. He thus has good visibility of the research occurring across Imperial College in all faculties (Natural Sciences, Engineering, Business School etc). He is co-investigator of the Hydrogen and Fuel Cell Supergen where he leads the polymer electrolyte fuel cell work package. He has been PI on a number of International collaborative research programmes (UK-South Africa, UK-China, UK-India, UK-South Korea), each involving multiple UK universities and is on the international advisory board of a Canadian energy research programme (CARPE-FC). He has numerous international industrial collaborations associated with his work on electrochemical energy systems.

Research Interests
- New materials for components of fuel cells and electrolyser
- Development of new electrocatalysts for oxygen evolution and hydrogen evolution and oxidation, glucose and methanol oxidation
- Improved methods of determining catalytic activity and modelling of performance
- Poison tolerance of fuel cells and electrolyser – new catalysts and approaches

Key Publications

Equipment & Facilities
- Fuel Cell Test stations, potentiostats, small volume viscometer, BET SA analysis, SEM/EDX, ICMS, sputter and spay deposition, H₂ box furnace, FTIR with SS measurement, RF plasma treatment
Biography
Prof. Wen-Feng Lin is a Professor of Chemical Engineering at Loughborough University. Previously, he was a Reader in the School of Chemistry and Chemical Engineering at Queen’s University Belfast, a senior researcher at Newcastle University. He held prestigious Humboldt-Foundation and Max-Planck-Society research fellowships and worked with Nobel Laureate Prof. Ertl in the Fritz-Haber-Institute in Berlin, Germany. Prof. Lin also worked in Xiamen University (China), the University of Hong Kong and Case Western Reserve University (USA) before coming to the EU. He has expertise in electrochemistry, catalysis, electrochemical energy and environmental systems and engineering (fuel cells, batteries, ozone and advanced oxidation technologies for water treatment and disinfection), electro-synthesis, nanomaterials, nano-technologies, electro-catalysis, in-situ spectroscopy, surface science and surface engineering, and has been active in these areas for over 20 years with 170 publications.

Research Interests
• Electro-catalysis and catalytic reactions
• Fuel Cells: PEM Fuel Cells, Direct Alcohol Fuel Cells, Alkaline Fuel Cells
• Electrochemical In-situ FTIR spectroscopy and DFT modelling
• Nanomaterials: synthesis, characterization and applications in Energy technologies
• Electrocatalytic generation of ozone from water and for advanced oxidation reaction

Key Publications
• Xian-Yin Ma, Yafeng Chen, Han Wang, Qiao-Xia Lia, Wen-Feng Lin*, Wen-Bin Cai, Electrocatalytic Oxidation of Ethanol and Ethylene Glycol on Cubic, Octahedral and Rhombic Dodecahedral Palladium Nanocrystals, Chemical Communications, 2018,54, 2562-2565.
• Chen, Zhao-Yang; Duan, Long-Fa; Sheng, Tian; Lin, Xiao; Chen, Ya-Feng; Chu, You-Qun; Sun, Shi-Gang; Lin, Wen-Feng*, Dodecahedral W@WC Composite as Efficient Catalyst for Hydrogen Evolution and Nitrobenzene Reduction Reactions, ACS Appl. Mater. Interfaces 2017, 9, 20594−20602.

Equipment & Facilities
• Variable Temperature Electrochemical in-situ FTIR Spectroscopy for fuel cell and catalysis
• 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
Manchester Fuel Cell Innovation Centre

Academic Directors: Professors Peter Kelly and Craig Banks
Manchester Metropolitan University

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Description
The new £4m Manchester Fuel Cell Innovation Centre (MFCIC) which is part funded by European Regional Development Fund (ERDF) synergises state of the art facilities with world leading academics to deliver innovative, tailorable outputs for their partners including SMEs, Industry, Policy Makers and Researchers. Set to officially open in September 2018 MFCIC has already produced numerous high impact academic publications where its researchers have utilised and synergised 2D-nanomaterials, such as graphene and MoS2, with innovative additive manufacturing fabrication techniques (3D-printing and screen-printing).

As the centre is part funded by ERDF the MFCIC has a series of deliverables to achieve by working with SMEs and Industry to grow the Hydrogen & Fuel Cell sector. The centre itself is led by from an industry, SME, political level by Amer Gaffar who is Director of Partnerships for the Manchester Fuel Cell Innovation Centre with over 18 years’ experience within the low carbon sector arena for both public and private sector organisations leading an array of end user renewable installations. Amer launched the Greater Manchester Hydrogen Partnership (GMHP) project at Manchester Metropolitan University (MMU) in 2013 with Greater Manchester Combined Authority with aims of introducing Hydrogen Fuel Cell technology to the region via a series of demonstration, research and outreach projects. The centre works with SME’s, Industry and stakeholders to advance innovation, policy and development in Hydrogen & Fuel Cells. We aim to develop and test key commercial fuel cell designs, fuel conversion and processing, smart microgrid technologies, fuel-cell lifetime and reliability, advanced materials and rapid prototyping of next-generation FCs.

Biography: Professor Peter Kelly
Director of the Advanced Materials and Surface Engineering Research Centre (AMSE) which brings together a multidisciplinary group of researchers with world-leading experts in nanotechnology, electrochemistry, advanced manufacturing (2D/3D printing), polymer technology, surface engineering, biosensors, microbiology at interfaces, wearable technologies, advanced functional materials and catalysis. The goals of the Centre are to generate new understanding of materials and processes and use that knowledge to develop new applications, components and devices with novel or enhanced properties.

Biography: Professor Craig Banks
Professor of nano and electrochemical technology and has over 10 years’ experience of pushing the boundaries of screen-printing technology as well as developing an internationally leading research group focusing on the electrochemistry of 2D materials. Such highlights include: mass producible 2D-MoS2 and 2D MoSe2 screen-printed electrodes explored towards the oxygen reduction reaction and hydrogen evolution reaction as well as the fabrication and exploration of novel 2D electrocatalytic materials.

Equipment & Facilities
- Suite of fuel cell testing rigs (PEM and SOFC)
- Hydrogen electrolyser
- Surface analysis/characterisation suite, including XPS, AFM/Raman, Nanotester, acoustic emission spectroscopy, XRD, SEM/EDX
- Catalysis test rig
- Solar simulator for photocatalysis testing
- Suite of 3D printers and screen printers
- Suite of magnetron sputtering rigs for thin film deposition
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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

Equipment & Facilities
- Well equipped Bioprocess, Waste Water Treatment and Fermentative Hydrogen Production Laboratory
- Ultra Performance Liquid Chromatography, General Analytical and Molecular Biology Laboratories
- Virtual instrumentation, modeling environments, and electrochemical workstations with EIS
- Hydrogen R&D Laboratories at Baglan Bay, South Wales.
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
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Biography
Dr. Paramaconi Rodriguez is lecturer and leader of the Advanced Materials and Electrochemical Research Group at 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 60 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 electrolyzers
- 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
Professor Andrea E Russell
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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 electrolysers. 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 electrolysers**
- **In situ spectroscopic methods**

Key Publications

Equipment & Facilities
- Extensive electrochemical equipment
- SEM
- Raman
- Cells for in situ X-ray measurements (XRD and XAS)
BIOGRAPHY: PROFESSOR SHANWEN TAO

Professor Shanwen Tao
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Biography
Shanwen Tao leads a research group at University of Warwick focusing on materials for energy and sustainable synthesis. He is very interested in ionic and electronic conducting materials to be used as electrolyte or electrode materials for electrochemical devices such as fuel cells, electrolyzers, batteries and supercapacitors. 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 electrolyzers
- Membranes and catalysts for polymer membrane fuel cells
- Direct ammonia/urea/urine fuel cells
- Direct carbon fuel cells
- Electrochemical synthesis of ammonia and hydrocarbons
- New materials for batteries and supercapacitors

Key Publications
- Sivaprakash Sengodan; Rong Lan, John Humphreys, Dongwei Du, Wei Xu, Huanting Wang, Shanwen Tao, Advances in reforming and partial oxidation of hydrocarbons for hydrogen production and fuel cell applications, Renewable & Sustainable Energy Reviews, 82 (2018) 761-780.

Equipment & Facilities
- Electrochemical measurement systems such as Solartron 1470E/1455A with power booster, Solartron 1260A, Solartron 1287A/1250
- 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
- NETZCH 449 F1 STA for thermal analysis
- Agilent GC for gas analysis
- Shimazu UV-Vis spectrometer for both liquid and solid samples
- Ball-millers
Biography

Prof John Varcoe trained at the University of Exeter, receiving a BSc degree in 1995 and his PhD in 2000. He then held various positions at the University of Surrey. Since 2013, is currently Professor of Materials Chemistry in the Department of Chemistry at the University of Surrey. He was awarded an EPSRC Leadership Fellowship (2010-2015), as well as being a Chartered Chemist, a Fellow of the Royal Society of Chemistry (FRSC) and a member of the Electrochemical Society (USA). He specialises in the development of anion-exchange membranes and ionomers for electrochemical energy systems including solid state alkaline fuel cells and water electrolyser.

Research Interests

- Anion-exchange membranes (AEM) and ionomers (AEI);
- Radiation-based modification of polymers;
- Alkaline membrane fuel cells and water electrolysis;
- The application of non-Pt catalysts in fuel cells;
- Reverse electrodialysis (salinity gradient power);
- Raman spectro-microscopy.

Key Publications

- L. Wang, J. J. Brink, J. R. Varcoe, "The first anion-exchange membrane fuel cell to exceed 1 W cm-2 at 70 oC with a non-Pt-group (O2) cathode", Chem. Commun., 53, 11771 (2017);

Equipment & Facilities

- Polymer electrolyte synthesis and characterisation facility;
- 2 x Scribner hydrogen fuel cell test stations (with impedance spectroscopy);
- A suite of potentiostats, battery testers, and impedance analysers (including rotating ring-disk electrode);
- Renishaw Raman microscope system with five laser wavelengths.
HYDROGEN PRODUCTION
BIOGRAPHY : DR AINARA AGAUDERO

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Biography
Ainara is a Senior Lecturer in the Department of Materials of ICL specialised in solid state electrochemical devices (solid oxide fuel cells, electrolyzers and batteries). Specifically, she focuses on understanding the relationship of electrochemical and transport properties with chemical and structural features in oxides bulk, surfaces and interfaces. She has published 56 peer reviewed papers with over 1.6k citations (h=22), and she holds 1 patent. She successfully obtained research funding via fellowships and awards totalling over £3M, in addition to her contributions to a number of national and international projects.

Research Interests
- Ion dynamics in oxides bulk and interfaces
- Degradation processes
- Reversible redox processes
- In operando analysis
- Surface analysis

Key Publications
- R. Brugge, O. Helselman, A. Cavallaro, F. Pesci, R. Chater, J. Kilner, A. Aguadero* “Garnet electrolytes for solid state batteries: Visualisation of the moisture-induced chemical degradation and revealing its impact on the Li-ion dynamics” Chemistry of Materials, 30 (11), 3704, 2018
- L. Troncoso, J. A. Alonso, A. Aguadero* “Low activation energies for interstitial oxygen conduction in the layered perovskites La1+xSr1-xInO4+δ” Journal of Materials Chemistry A, 34, 17779, 2015

Equipment & Facilities
- Well-equipped laboratories dedicated to materials synthesis, processing and cell fabrication under controlled atmosphere
- Electrochemical characterization
- isotopic labelling
- Surface analysis techniques: LEIS, ToF-SIMS, FIB-SIMS and XPS, and a recently awarded unique dual beam FIBs for in operando characterisation of electrochemical systems
- X-ray diffraction
- High resolution electron microscopy
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
Dr Valerie Dupont
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Biography
Dupont’s most recent research activities fit under sustainable hydrogen production, having led investigations since 2002 in demonstrating the generation of high purity hydrogen with high energy efficiency from unconventional organic feedstocks derived from fossil and biomass sources and waste streams. In particular she has developed two approaches to the intensification of steam reforming and partial oxidation: chemical looping by oxygen transfer (also termed ‘unmixed combustion’ or unmixed reforming”), and sorption enhancement by CO2 capture under reactive high temperature as well as their coupling to attain maximum benefits in synergies of the two processes, thus achieving an overall autothermal H2 production (i.e. a process without external heat demand), whilst still producing high purity gas outputs with minimal environmental emissions.

Research Interests
- Diverse feedstocks for hydrogen, SNG and biofuels with a particular concern for sustainable sources.
- Chemical looping technologies for H2 production
- H2 production with Carbon capture at high temperatures
- Demonstrating CO2 savings by integration of energy intensive processes with low carbon measures i.e. H2/ biosources
- Experimental approaches to energy efficient measures featuring H2 production /utilisation, supported by numerical simulation
- Bioresource and sustainable development goal of affordable and clean energy for everyone

Key Publications
- Cheng F; Dupont V; Twigg MV, 2017. Direct reduction of nickel catalyst with model bio-compounds. Applied Catalysis B: Environmental

Equipment & Facilities
- Three bench scale fixed bed reformers
- Gas analysis by online micro-GCs (2 x 2 columns) and online ABB analysers (H2 by TCD, CO;CO2/CH4 by IR, paramagnetic O2, SO2 by UV abs)
- Mass flow controllers, syringe pumps
- Condensates analysis off line by TOC, EA, Ion Chromatography
- Solids characterisation by TOC, EA, TGA-FTIR, SEM and TEM, EDX mapping, N2 ads/des, powder XRD with patterns Rietveld refinement,
- Fuel properties: Bomb calorimetry, ash properties, ICP-MS
- Reactor (reformers) modelling using gproms, MATLAB
- Process flowsheeting, Process modelling, Economic evaluator using Aspen Tech
- Environmental Impact Assessments using SimaPro
Biography

Xiao Guo is a Professor of Chemistry with research focus on multi-scale syntheses and simulations of clusters, nanostructures to devices for clean energy, environment and information technologies, particularly in photo-/electro-/chemical catalysis, electro-/chemical energy storage, CO2 capture and fuel cells. He has contributed over 300 journal / 350 conference papers/presentations (cited >15,000; H-Index=54) with over 100 keynote/invited; received Beilby Medal 2000. He is UK representative of the Advanced Materials and Processes for Energy Applications consortium of the EU Energy Research Alliance. He was the “Focal-Point” for UK-China collaborations in Nano- & Materials (2009-12). He was Professor (2000-2007), Reader (1998-2000), and Lecturer (1995-1998) at QMUL; PDRA (1991-1994) at Univ. of Oxford; and PDRA (1988-1990) at Univ of Strathclyde; PhD (1984-1988) at Univ of Manchester.

Research Interests

- **Hydrogen generation:** water splitting; CH4 conversion; chemical looping reforming;
- **Hydrogen Storage:** (complex) hydrides and hybrids; micro-porous structures;
- **Hydrogen Purification:** sorbents and membranes;
- **Catalysts for Fuel Cells:** HER, ORR, OER...;
- **Proton Conduction Membranes for low humidity**;
- **Simulations:** electronic structures and (de)hydrogenation mechanisms and pathways.

Key Publications

- Jijia Xie, Stephen A. Shevlin, Qiushi Ruan, Savio J. A. Moniz, Yangrong Liu, Xu Liu, Yaomin Li, Chi Ching Lau, Zheng Xiao Guo, and Junwang Tang, Efficient Visible Light-Driven Water Oxidation and Proton Reduction by an Ordered Covalent Triazine-Based Framework, Energy & Env. Sci 11 (6), 1617-1624;

Equipment & Facilities

- BET; TG/DSC/MS; PCT
- GC for sorbents and membranes;
- Quadruple MS for purification tests;
Professor Alan Guwy
Director of Energy and Environment Research Institute (EERI)
University of South Wales
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Phone: +44 (0)144 348 2239
Website: staff.southwales.ac.uk/users/216-ajguwy

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.

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

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
Biography
Xiaohong Li’s research is focused on energy conversion and storage, with an emphasis on redox flow battery (RFB) and anion exchange membrane (AEM) water electrolyser for hydrogen production. Since 2003 she has made major contribution to 7 projects including 3 EPSRC, 2 Innovate UK, and 2 EU projects, and is currently the principal investigator of an EPSRC project of Zinc-Nickel Redox Flow Battery for Energy Storage and the principal investigator at the University of Exeter side for an EU Interreg 2 Seas project of E2C Electrons to high value Chemical products. Xiaohong is members of Science Board of the EPSRC Energy Storage Supergen Hub, British Standards Institution, International Society of Electrochemistry, and Energy Institute.

Research Interests
- Energy storage and conversion
- Redox flow batteries
- Water electrolyser for hydrogen production
- Fuel cells
- Supercapacitors
- Nanomaterials for electrocatalysis

Key Publications

Equipment & Facilities
- Extensive facilities for electrochemical characterisation (potentiostats, EIS, RDE, and RRDE etc.)
- Material characterisation facilities (including SEM/EDS, FIB, TEM, XRD, X-Tek CT, BET etc.)
- Lab for the synthesis and processing of catalysts and membrane-electrode-assembly for water electrolyser
BIOGRAPHY : PROFESSOR IAN METCALFE

Biography
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 text book on kinetics and reaction engineering which has sold 10 000 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

Equipment & Facilities
- Hiden Catlab microreactor system
- Rubotherm high pressure magnetic suspension balance
- Pulsed oxygen isotopic exchange
- Solid electrolyte potentiometry
- Membrane permeation test rigs
Dr Alison Parkin
Senior Lecturer
University of York
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Phone: +44 (0)190 432 2561
Website: www.york.ac.uk/chemistry/staff/academic/o-s/aparkin/

Biography
Alison was appointed to the University of York in 2012 as an Anniversary Research Lecturer, and promoted to Senior Lecturer in 2018. Prior to this (2008-2012) she was a Junior Research Fellow at Merton College, University of Oxford. She also obtained her DPhil (PhD, 2004-2008) and MChem (2000-2004) degrees from the University of Oxford.

Research Interests
• Bio-hydrogen
• Bacterial hydrogen respiration
• Redox metalloenzymes
• Biological electron transfer
• Bio-electrochemistry

Key Publications
• Retuning the catalytic bias and overpotential of a [NiFe]-hydrogenase via a single amino acid exchange at the electron entry/exit site. Hope Adamson, Martin Robinson, John J. Wright, Lindsey A. Flanagan, Julia Walton, Darrell Elton, David J. Gavaghan, Alan M. Bond, Maxie M. Roessler, Alison Parkin, Journal of the American Chemical Society, 2017, 139 (31), 10677-10686
• Re-engineering a NiFe hydrogenase to increase the H2 production bias while maintaining native levels of O2 tolerance. LA Flanagan, JI Wright, MM Roessler, JW Moir, A Parkin, Chemical Communications, 2016, 52 (58), 9133-9136
• Probing biological redox chemistry with large amplitude Fourier transformed ac voltammetry. H Adamson, AM Bond, A Parkin, Chemical Communications, 2017, 53 (69), 9519-9533

Equipment & Facilities
• Molecular biology, bacterial growth and enzyme extraction
• Gas-controlled enzyme electrochemistry
Biography

Keith Scott’s research group in fuel cells, batteries and hydrogen technologies is part of a larger group in electrochemical engineering science focused on electrolysis, power generation, materials recycling, water treatment and electrosynthesis. He is science director of a spin out company, Newcell Technologies Ltd., and VN partners Ltd., with programmes in new hydrogen electrolysis technologies, fuel cells and electrocatalyst and electrode fabrication.

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
- Imaging and modelling of fuel cells and batteries
- Understanding fuel cell and electrolyser performance and degradation
- Microbial electrochemical cells
- Photo-electrochemical cells

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 electrolyzers and low and intermediate temperature fuel cells
- Fuel cell and electrolyser test stations
- Polymer electrolyte electrolyser pilot plane
- Electrocatalyst and membrane electrode assembly fabrication facilities
- Electrodialysis and electrohydrolysis stack test rig for water treatment and recycling
- Temperature programmed Li and metal/air battery test facility
- Analytical facilities include: FTIR, NMR, TEM, SEM, XPS, EDX, XRD, Raman, XPS, EIS
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Website: www.liverpool.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 science and chemical engineering directed towards energy and environmental applications. His research has been largely focused on the development, characterisation, modelling and optimisation of novel plasma processes for gas cleaning, gas reforming/conversion, waste-to-energy and nuclear decommissioning. Significant efforts have been devoted to plasma-catalysis where the combination of non-thermal plasma and heterogeneous catalysis has been developed for the removal of gas pollutants and for the conversion of carbon emissions (e.g. CH4, CO2, tars, and hydrocarbons) into value-added fuels and chemicals such as hydrogen, olefins, liquid fuels and carbon nanomaterials at low temperatures.

Research Interests
- Low temperature plasmas: generation, diagnostics, optimisation and modelling
- Plasma-catalysis for gas clean-up, CH4 activation, CO2 conversion, tar reforming and ammonia synthesis
- Plasma synthesis and treatment of coke resistant catalysts
- Plasma synthesis of carbon nanomaterials
- Thermal plasma gasification/vitrification of waste

Key Publications

Equipment & Facilities
- Low temperature plasma systems (gliding arc, DBD, liquid plasma, etc)
- Integrated gasification and plasma-catalytic system
- Gas/liquid analytic equipment: GC, GCMS, FTIR, Ozone monitor
- Plasma diagnostics facilities: optical emission spectrometer, ICCD, different probes, MBMS
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 electrolysers and 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 Associate Professor in Physical Chemistry.

Research Interests

- **Electrocatalysis in polymer electrolyte fuel cells and electrolysers**
- **Ionic liquid-based electrolyte membranes for intermediate temperature fuel cells and electrolysers**
- **High-throughput screening of fuel cell electrocatalysts**
- **Electrocatalysis in regenerative fuel cells**

Key Publications


Equipment & Facilities

- Electrochemical facilities for characterisation of low- and intermediate-temperature fuel cell electrocatalysts
- Electro catalyst synthesis facilities
- Scanning electro chemical microscopy of fuel cell electrocatalysts
- High-resolution electron microscopy of nanostructured fuel cell electrocatalysts
Biography
Huizhi Wang is a lecturer in the Department of Mechanical Engineering at Imperial College London. She received her PhD in Mechanical Engineering from the University of Hong Kong in 2012. She then worked at the University of Hong Kong as a postdoctoral fellow until 2014. Prior to joining Imperial College, she was an assistant professor at Heriot-Watt University. Her research interest lies in electrochemical engineering with a particular focus on the thermofluid aspects of electrochemical energy devices and systems including fuel cells, batteries and electrolysers. She is also interested in advanced manufacturing (e.g., microfluidic-based fabrication, additive manufacturing) and diagnostic techniques for electrochemical energy applications.

Research Interests
• Design and manufacturing of electrochemical materials and devices
• Modelling electrochemical devices
• Electrochemical characterisation and diagnostics
• PEM fuel cells and electrolysers
• Batteries including metal-air, lithium ion and multivalent ion batteries

Key Publications


Equipment & Facilities
• Fluorescence microscope
• Glovebox
• Facilities for pouch cell fabrication and assembly
• Potentiostats and cyclers
Biography
Upul Wijayantha has worked in hydrogen technologies and product development both in industry (Hydrogen Solar Ltd, 2003-2006) and in academia (Loughborough University, 2007 – to date). In industry, he led a team to develop 30x30 cm² solar hydrogen generation cells and integrated gas collection systems. He has extensively worked on electrocatalysts, on-board generation, on-demand generation, active materials and device encapsulation materials. He is keenly working on production of hydrogen at scale by methane cracking technology. He runs the Energy Research Laboratory in Loughborough Chemistry. He is a UK expert on water electrolysis and represented in the IEA task 20, Hydrogen from Water Photolysis. He is the present honorary Chair of the RSC Electrochemistry Group.

Research Interests
- Electrolysis
- On-board and on-demand Hydrogen generation.
- Energy storage
- Methane cracking
- Materials for hydrogen technologies
- Photoelectrolysis
- Ammonia as an alternative energy vector

Key Publications

Equipment & Facilities
- High temperature, microwave and wet chemical synthesis capability for materials and film growth.
- Synchronised tools to real-time monitor materials/film growth (GC-MS for in-situ reaction monitoring etc.).
- Materials characterisation, XRD, Raman, AFM, particle size, surface area, TGA, DSC etc.
- FIB-SEM, HR-TEM and FEG-SEM Microscopy
- Electrode and Electrochemical cell testing facilities
- Manufacturing techniques such as screen printing, aerosol deposition, electrodeposition, spin coating...
Dr Chunfei Wu

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Phone: +44 (0)289 097 5573
Website: pure.qub.ac.uk/portal/en/persons/chunfei-wu(6dff231-a80c-4762-94b2-75749cc9adfa).html

Biography
Dr. Chunfei Wu is a Senior Lecturer at the School of Chemistry and Chemical Engineering at Queen’s University Belfast. He obtained his PhD degree in Chemical and Energy Engineering at the University of Leeds in 2010. He was a Lecturer at the University of Hull from 2014 to 2018. He has worked in the areas of converting renewable and waste resources to energy, fuel, and chemicals through catalytic thermo-chemical routes for more than 10 years. He is a PI of a EU RISE international exchange programme and has been involved in several EPSRC and EU projects (e.g. Co-I in EP/R000670/1 using microwave for bio-oil upgrading, EU H2020-MSCA-RISE-2014 (643322) for co-processing biomass and plastic wastes). He has published more than 110 peer reviewed journal papers with >3000 citations and an ‘h factor’ of 33 (Google Scholar) in the areas of catalytic thermo-chemical conversion of wastes, and he is a Charted Scientist and a Member of Royal Society of Chemistry. Dr Wu is on Editorial board of Process Safety and Environmental Protection (Subject Editor), and Advances in Polymer Technology.

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
- Chunfei Wu, Lisha Dong, Jude Onwudili, Paul T. Williams, Jun Huang. Effect of Ni Particle Location within the Mesoporous MCM-41 Support for Hydrogen Production from the Catalytic Gasification of Biomass. ACS Sustainable Chemistry & Engineering 1 (2013): 1083-1091

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
HYDROGEN STORAGE AND SAFETY
**Dr Paul Anderson**

**Reader in Inorganic and Materials Chemistry**
University of Birmingham

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**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 the discovery, synthesis and primary characterisation 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  
- Recycling of automotive lithium ion batteries  
- Host–guest chemistry in zeolites and porous materials for energy applications

**Key Publications**

- New B,N-hydrides: characterization and chemistry.
Biography

Elena Besley obtained her PhD in Physics and Mathematics (2000) from St. Petersburg State University, Russia. There followed postdoctoral research appointments in Computational Chemistry at the Universities of Nottingham, Sussex and Cambridge, UK. She was appointed to a Lecturer in Theoretical and Computational Chemistry at Nottingham (2011), followed by promotion to Associate Professor (2014), and Professor of Theoretical and Computational Chemistry (2015). Elena’s research involves the development of theoretical and computational approaches to prediction of materials properties with a focus on multiscale modelling; electrostatic interactions at the nanoscale; gas storage and interactions in porous solids. Elena was awarded an EPSRC Career Acceleration Fellowship (2008-2013), New Directions for Research Leaders Award (2012), and a €1.4M ERC Consolidator Grant (2013-2018). In the past decade, her research portfolio has been supported by grants with a total value of over £2M as sole or principal investigator, and a further £5.6M as co-investigator. She has published over 120 publications. She is a member of the expert database of Outstanding Female Scientists and Scholars, AcademiaNet, launched by the German Chancellor Dr. Angela Merkel.

Research Interests

• **Gas storage and interactions in porous solids;**
• **Development of theoretical and computational approaches to prediction of materials properties;**
• **Computational modelling of the behaviour, properties and manipulation of nanomaterials;**
• **Electrostatic interactions at the nanoscale.**

Key Publications

• **Nature Chemistry 9, 1191-1197 (2017)**
• **Journal of the American Chemical Society 138, 14828-14831 (2016)**
• **Nature Materials 11, 710-716 (2012)**
• **Nature Materials 10, 687-692 (2011)**
• **Nature Chemistry 3, 732-737 (2011)**
• **Nature Chemistry 2, 450-453 (2010)**

Equipment & Facilities

• Custom configured Computer Server comprising 88 processors
Dr Nuno Bimbo
Lecturer in Chemical Engineering
Lancaster University
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Phone: +44 (0)1524 595 5063
Website: www.lancaster.ac.uk/energy-lancaster/about-us/people/nuno-marques-dos-santos-bimbo

Biography
Dr Nuno Bimbo completed an MEng in Chemical Engineering from the University of Coimbra (Portugal) in 2009, followed by a PhD in the University of Bath (2013) on hydrogen storage. He then spent 2 years as a research assistant researching safety strategies for onboard hydrogen storage. Highlights of his PhD and postdoctoral research include the first experimental evidence for solid H2 in a porous carbon at 77 K using neutron spectroscopy, and the development of an analytical model for supercritical adsorption of H2 in microporous materials. In October 2015, Nuno was appointed to a Lectureship in Chemical Engineering in Lancaster University, where he currently leads a research group working on synthesis and applications of porous materials.

Research Interests
- Adsorption and high-surface area porous materials;
- Hydrogen storage in porous materials;
- Modelling adsorption equilibria and kinetics processes;
- Novel two-dimensional porous materials for gas storage and separation;
- Thermodynamic modelling of adsorption processes.

Key Publications
- High-pressure adsorptive storage in hydrogen in MIL-101 (Cr) and AX-21 for mobile applications: cryocharging and cryokinetics. Bimbo, N., Xu, W., Sharpe, J.E., Ting, V.P., Mays, T.J. 5/01/2016 In: Materials and Design. 89, p. 1086-1094. 9 p.
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 Sieverts-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
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

Key Publications

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
Biography
After ten years at the University of Edinburgh, Tina Düren joined the Department of Chemical Engineering, University of Bath in 2014. In her research, Tina uses molecular modelling techniques to design innovative porous materials with properties tailored for specific adsorption applications including hydrogen purification and storage. In her work Tina studies predicts the performance of porous materials in adsorption and membrane applications and studies how properties on the molecular level influence their macroscopic performance. She is also developing methods to integrate modelling across different length scales including process modelling as well as screening methods.

Research Interests
- Molecular simulation
- Adsorption
- Membranes
- Nanoporous materials including metal-organic frameworks and zeolites

Key Publications

Equipment & Facilities
- Computational facilities and software to run DFT, Monte Carlo and molecular dynamics simulations
Biography
David Grant heads the Advanced Materials Research Group at Nottingham, which comprises 14 academics covering 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
Duncan H. Gregory is currently a Visiting Professor at Kyushu University and was Vice President of the RSC Materials Chemistry Division Council from 2009-2014. His research interests focus on the synthesis and characterization of new solids including sustainable energy. He has published over 160 scientific papers, 3 international patents and 1 book chapter. He is Editor in Chief of “Inorganics” and is an Associate Editor of both “Materials for Renewable and Sustainable Energy” and “Materials”. He was the winner of the Royal Society of Chemistry (RSC) Sustainable Energy Award in 2009 and is a Fellow of both the RSC and the Institute of Materials, Minerals and Mining.

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

Key Publications

Equipment & Facilities
- High temperature, microwave, mechanochemical and wet chemical synthesis capability
- Variable temperature powder X-ray diffraction, IR, Micro Raman and diffuse reflectance UV-Vis spectroscopy
- Thermal analysis (TG-DTA-MS, DSC) and gravimetric and volumetric gas measurement equipment (for hydrogen and ammonia)
- Electron microscopy
- Electrochemical and battery testing equipment
Biography
Sanliang Ling is an independent Nottingham Research Fellow in the Advanced Materials Research Group at the University of Nottingham. He is a full member of the UK’s High End Computing Materials Chemistry Consortium. His research interests focus on first-principles computational materials design, with an emphasis on fundamental understanding of materials properties for energy applications at atomic and molecular level. He has worked on a range of materials in the past, including metal oxides, metal/oxide and semiconductor/oxide interfaces, and porous materials (e.g. zeolites and metal-organic frameworks), for applications including thermoelectrics, multiferroics, heterogeneous catalysis, and gas storage and separation. He is currently working on designing new metal hydrides and complex hydrides for solid-state hydrogen storage.

Research Interests
- Computational materials design
- Hydrogen production and storage
- Carbon capture and utilisation
- Microporous materials
- Machine learning

Key Publications

Equipment & Facilities
- High Performance Computing
- Software for materials modeling and simulation
Dr Dmitriy Makarov
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Biography
Dmitriy Makarov is a member of Hydrogen Safety Engineering and Research Centre (HySAFER) at Ulster University. He has more than 15 years hydrogen safety research experience. His research focus is on the development of contemporary models and tools for hydrogen safety engineering. Together with Prof Vladimir Molkov he pioneered application of Large Eddy Simulation (LES) for modelling and simulation of large-scale premixed combustion and detonations. He is a key investigator in 7 ongoing and 11 completed EC and UK funded projects. He made a significant contribution to the Regulation in the field, i.e. Commission Regulation (EU) No.406/2010 on type-approval of hydrogen-powered vehicles. He is a member of European Hydrogen and Fuel Cell Association (Transport Innovation pillar), contributor to work of Int. Association for Hydrogen Safety (IA HySafe) and Int. Energy Agency Hydrogen Implementing Agreement Task 37 “Hydrogen Safety”, actively involved in teaching activities in the field.

Research Interests
- Computational fluid dynamics (CFD) for assessment of hazards relevant to hydrogen accidents
- Large eddy simulation (LES) of hydrogen releases, dispersion, deflagrations and detonations
- Engineering models and solutions for hydrogen safety engineering
- Safety strategies and mitigation techniques for hydrogen indoors and outdoors applications
- Fire resistance and safety of onboard hydrogen storage

Key Publications

Equipment & Facilities
- Dedicated computer lab with contemporary hardware
- Software for hydrogen safety research, including but not limited to ANSYS FLUENT, Open FOAM.
Biography
Tim Mays is Professor of Chemical and Materials Engineering at the University of Bath, UK. He has over 25 years’ experience as an academic at the University, and before then — also at Bath — as a PhD student and postdoctoral researcher. He has over 140 published outputs in research journals and conference proceedings, has been an investigator on 30 research grants worth UK£25M and has lead supervised 22 PhD students to graduation. Most of Prof Mays work has been in the area of advanced materials for energy applications, including (especially since 2003) hydrogen storage materials. He is a Chartered Engineer and a Fellow of the Institution of Chemical Engineers.

Research Interests
• Hydrogen storage in porous materials
• Design of hydrogen storage systems
• Safety of hydrogen storage systems
• Effects of hydrogen purity on storage and use in fuel cells
• Storage/separation of other gases including methane and carbon dioxide

Key Publications

Equipment & Facilities
• Full range of adsorption measurement equipment to 20 MPa.
• Full range of materials characterisation equipment (chemical & physical).
• Full range of chemical and materials synthesis facilities.
• High-performance computing.
Biography

Neil B. 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
The Institute for Energy Systems is a multidisciplinary research institute within the School of Engineering at the University of Edinburgh. Its Energy Storage and Carbon Capture group aims at developing cost-competitive technologies ranging from the development of storage technologies to their integration into the wider energy system. This includes hydrogen storage and conversion to chemicals (especially process simulation for CO2 utilization), as well as energy grids that incorporate hydrogen, from small scale and island to large scale geological storage.

Its members work in collaboration with the School of Geosciences, the School of Chemistry, and also with members of the Institute for Materials and Processes.

Research Interests
- *Simulation of chemical processes that utilize CO2 and are powered by variable renewable energies*
- *Energy efficient electrolysis with hydrogen energy storage at high temperatures*
- *Geological storage of hydrogen*
- *Small scale energy systems that integrate hydrogen*
- *CO2 electrolysis*

Key Publications
Biography

Vladimir Molkov heads a research team at Ulster University focused on safety engineering of hydrogen systems and infrastructure. He has coordinated and contributed to main hydrogen safety related projects in Europe and UK. Ulster champions hydrogen safety research and education in the UK. In 2008 he established and directs the HySAFER Centre, one of key providers of hydrogen safety research and education globally. He is a UK expert in ISO TC/197 “Hydrogen technologies”, CEN/CENELEC/TC6 “Hydrogen in energy systems”, IWG Sub-Group Safety of UN Global Technical Regulation on Hydrogen and Fuel Cell Vehicles #13, European Hydrogen Safety Panel, Regulations Codes and Standards Strategy Coordination Group of Fuel Cell and Hydrogen Joint Undertaking, etc.

Research Interests

- Under-expanded hydrogen jet releases, dispersion and ventilation
- Spontaneous ignition of hydrogen release, free hydrogen jet fires and under-ventilated fires
- LES and mitigation of deflagrations, deflagration-to-detonation transition, and detonations
- Blast waves and fireballs after high-pressure storage tank rupture in a fire, including tunnels
- Safety strategies and engineering solutions for hydrogen outdoors and indoors applications
- Breakthrough safety technology for explosion-free in a fire tank (leak-no-burst technology)

Key Publications


Equipment & Facilities

- Dedicated computer laboratory with contemporary hardware.
- Software for hydrogen safety research, including but not limited to ANSYS FLUENT, Open FOAM, etc
Biography
Dr Valeska Ting has a background in materials synthesis, characterisation and physical properties testing. Her research into functional nanoporous materials for hydrogen storage has been recognised both nationally and internationally by award of the Sir Frederick Warner Medal from the Institution of Chemical Engineers, the UK Parliamentary and Scientific Committee’s SET for Britain Gold Medal for Engineering and the Westminster Medal (all in 2013).

Valeska currently holds a prestigious EPSRC Research Fellowship to develop new nanocomposite materials to enable safer, more economical storage of hydrogen. She employs a large range of experimental materials characterisation techniques including X-ray and neutron diffraction, electron microscopy, thermogravimetric and spectroscopic analysis, gas sorption testing and physical properties testing for design and development of new materials-based solutions.

Research Interests
- Nanoporous materials for gas storage and separation
- Development of methods for in-situ characterization of nanomaterials
- Smart nanomaterials for responsive containment of gases/materials

Key Publications
- Ting, V. P. (2013) Hydrogen storage materials: driving developments in transport and smoothing routes to renewable generation (Policy Brief)

Equipment & Facilities
- Porous materials characterisation (surface area and pore size analysis)
- High pressure, variable temperature gas sorption analyser
Biography

Professor Walker joined the University of Nottingham in 1997, where he has established a leading research group in hydrogen storage which has expanded into hydrogen systems. In recognition of his research, he was awarded a Low Carbon Leadership award from Carbon Trust and EPSRC in 2007 and in 2010 was appointed as the Sir Harry and Lady Djanogly Chair in Sustainable Energy. In addition to over 100 publications, he is also Editor of the text “Solid State Hydrogen Storage Materials”. In 2014 Gavin Walker became Director of the University of Nottingham’s Energy Technologies Research Institute (ETRI), with an energy related research portfolio of over £100 million, including efficient fossil, energy storage, renewables, smart grids and efficient energy buildings.

Research Interests

- Hydrogen storage materials (metal hydrides, complex hydrides, chemical hydrides and porous materials)
- Engineering of metal hydride based energy stores (for storage of hydrogen or heat)
- Engineering of solid state hydrogen compressors and hydride-based air conditioner.
- Integration of hydrogen systems for microgrid applications.
- Systems analysis and energy management
- New materials for hydrogen applications (including electrolysers, water splitting, purification and SOFC)

Key Publications


Doi: 10.1016/j.ijhydene.2016.01.098


Equipment & Facilities

- Suite of materials characterisation facilities for in situ and ex situ characterisation.
- Hydrogen storage cycling rigs
- Prototyping facilities
- 60 kWe hydrogen energy system for a community energy microgrid
- Hydrogen systems test bed (serviced by a 200 kW PEM electrolyser)
- Hydrogen refuelling station
- Fuel cell and electrolyser test facilities
Biography
Jennifer Wen established and currently leads Warwick FIRE, a multidisciplinary research laboratory for research into fire and explosion hazards as well as accidental releases of hazardous materials. Her research is focused on the development and application of computational fluid dynamics (CFD) to cross cutting safety issues, for which she has co-authored over 300 papers. Jennifer’s career funding totals over £8M. She is currently the Warwick PI for a dozen research projects, five of them are related to hydrogen safety. Jennifer sits on a range of professional and international conference organization/scientific committees. She is a member of the first European Hydrogen Safety Panel appointed by the Fuel Cells and Hydrogen 2 Joint Undertaking and leads one of the four tasks.

Research Interests
- Spontaneous ignition
- Hydrogen jet fires
- Heat fluxes to hydrogen cylinder surface subject to fire impingement
- Hydrogen deflagration, DDT and detonation
- Modelling liquid hydrogen release covering pool spread and flashing jets

Key Publications

Equipment & Facilities
- In-house modified CFD code FireFOAM for simulating hydrogen releases including small leaks;
- In-house modified CFD code KIVA for simulating spontaneous ignition in pressurised hydrogen release;
- In-house modified CFD code OpenFOAM for simulating:
  - hydrogen explosions in the open or confined spaces, with and without obstacles;
  - Vented hydrogen explosions to assist vent design;
  - flame acceleration, transition from deflagration to detonation and detonation
- In-house engineering model for vented hydrogen explosion to assist vent design
SYSTEM DESIGN, MODELLING AND SOCIOECONOMIC ANALYSIS
Dr Qiong Cai
Senior Lecturer
University of Surrey
Email: q.cai@surrey.ac.uk
Phone: +44 (0)1483 68 6561
Website: www.surrey.ac.uk/people/qiong-cai

Biography
Dr 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 successfully delivered three EPSRC funded projects as the PI, on Na-ion batteries, polymer membrane fuel cells and capacitive deionization respectively. She is currently the Co-I of a newly funded £1.2 million project from EPSRC on Na-ion batteries, and the Co-I of a Surrey-NPL project on lithium air batteries. She is on the Scientific Board of the H2FC SUPERGEN Hub, the Scientific Board of the Energy Storage SUPERGEN Hub, and a member of the EPRSC peer review college.

Research Interests
- Advanced electrode materials
- Multi-scale modelling
- Solid oxide fuel cells and electrolysers
- Polymer fuel cells and electrolysers
- Batteries including sodium ion batteries, redox flow batteries and metal-air batteries

Key Publications

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
**Biography**

Sam Cooper is a lecturer in the Dyson School of Design Engineering at Imperial College London. His work focuses on the application of simulation to investigate transport and exchange processes in materials, as well as the performance of electrochemical devices. Sam developed a technique for applying isotopic exchange methods to multicomponent atmospheres and is currently extending this approach for the characterisation of solid-solid interfaces. He has developed a software platform, TauFactor, for the analysis of transport processes in 3D microstructural data, including the calculation of diffusion impedance spectra. More recently he has been exploring the applications of machine learning approaches for modelling electrochemical devices and their degradation processes. Over the past four years, Sam has also worked closely with the UK SOFC company Ceres Power Ltd.

**Research Interests**

- Modelling of electrochemical devices
- Characterisation of materials and microstructures
- Data analysis and machine learning
- Isotopic methods and 3D imaging
- Open-source software
- SOFCs and batteries (including lithium-ion and solid-state)

**Key Publications**

- Niania, M. et al. In situ study of strontium segregation in La0.6Sr0.4Co0.2Fe0.8O3−δ in ambient atmospheres using high-temperature environmental scanning electron microscopy. J. Mater. Chem. A (2018).

**Equipment & Facilities**

- GE Phoenix Nanotom-s X-ray CT (c. 1 µm resolution).
- Zeiss Auriga FIB-SEM 3D imaging system (c. 10 nm resolution).
- Potentiostats and cyclers.
- Isotopic exchange laboratory for oxygen and lithium systems.
- SIMS.
Biography

Paul Dodds specialises in energy system modelling and energy infrastructure research, spanning engineering and economics. He has led academic efforts to understand the opportunities for using hydrogen in the UK energy system through contributing to four H2FC Hub White Papers. He pioneered the recent interest in converting the UK gas networks to deliver hydrogen through a journal paper in 2013. He is interested in policy issues surrounding hydrogen and recently led projects on green hydrogen and on hydrogen’s value to the energy system. Paul is the UK Government’s alternative delegate at IEA Hydrogen. He also leads projects on energy storage and interconnection, and is a member of the UK Energy Research Centre and the UK CCS Research Centre.

Research Interests

- Socioeconomics and policy of hydrogen energy
- Energy infrastructure, particularly gas systems
- Integration of hydrogen systems with national energy systems, including through power-to-gas
- Low-carbon road transport
- Energy system modelling

Key Publications


Equipment & Facilities

- UK TIMES energy system model for the UK
- TIAM-UCL global energy system model
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.ukerc.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 socioeconomic 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

- Socioeconomics 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

Rupert Gammon’s research focuses on responsive energy demand, particularly at the nexus of power and transport sectors. Having set up the UK’s first integrated hydrogen and renewable energy mini-grid as part of his PhD study at Loughborough University, Dr Gammon co-founded the British Midlands Hydrogen Forum, the UK Hydrogen and Fuel Cell Association and a consultancy, called Bryte Energy Ltd, that worked in the field of sustainable energy systems, primarily those involving hydrogen. He has also participated in a number of Hydrogen Implementing Agreement tasks for the International Energy Agency. In 2011 Rupert joined De Montfort University as a Senior Research Fellow where he is developing novel energy storage, smart grid and emission-free transport technologies and systems.

Research Interests

- Integration of hydrogen into energy systems using electrolysis and/or fuel cells
- Zero-emission transport (electric and hydrogen powered)
- Low-carbon mini-grids, especially in Developing World applications
- Responsive demand and energy storage for smart grids

Key Publications


Equipment & Facilities

- Hydrogen system integration, prototyping and test laboratory
- PEM Fuel Cell test rig
- Electrolyser test rig
- Smart grid laboratory
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 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.

Research Interests

- Technoeconomic and thermoeconomic 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 for more integrated and coordinated energy system design and control
- Heat decarbonisation technology and strategy

Key Publications


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
Biography
Klaus Hellgardt (KH) is a Professor of Chemical Engineering in the Department of Chemical Engineering at Imperial College London. He is the current Director of Undergraduate Studies. KH’s research focuses on advanced reaction engineering and applied catalysis, with specific emphasis on solar (bio)fuels, smart petrofuels engineering, kinetics, (electro-) chemical and bioreactor modeling, design and application. He is the head of the REaCT group (Reaction Engineering and Catalytic Technology). To date, his cumulative grant support exceeds £20M. He has published over 100 papers (H-Index 28), a similar number of conference proceedings, six book chapters and eight patents.

Research Interests
• Solar Fuels
• Clean Fossil Fuels
• Unconventional Fuel Cells
• Flow Chemistry

Key Publications

Equipment & Facilities
• Photocurrent spectroscopy; solar simulators
• Batch and continuous flow high temperature/pressure reactors
• Photo-Reactors (biological, semiconductor)
• Mass Spectrometers
• Batch and Semi-Continuous Mini-Plants
BIOGRAPHY : DR MAMDUD HOSSAIN

Dr Mamdud Hossain

Reader in Thermofluids

Robert Gordon University Aberdeen
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Phone: +44(0)1224 744 1201
Website: www3.rgu.ac.uk/dmstaff/hossain-mamdud/

Biography

Mamdud Hossain is a Reader in Thermofluids at School of Engineering of Robert Gordon University. 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 electrochemical
- Testing with OrigaFlex OGF05A
- Potentiostat/voltammetry/EIS
- SEM (scanning electron microscope); XPS (X-ray photoelectron spectroscopy); X-ray fluorescence spectroscopy; AFM (atomic force microscope)
- 2 kW PEM fuel cell stack
Professor Weeratunge Malalasekera
Professor of Computational Fluid Flow and Heat Transfer
Loughborough University
Email: w.malalasekera@lboro.ac.uk
Phone: +44 (0)150 922 7556
Website: www.lboro.ac.uk/departments/meme/staff/weeratunge-malalasekera/

Biography
Weeratunge Malalsekera heads the Computational Combustion and Heat Transfer modelling research at Loughborough University. Combustion modelling, i.c. 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)
Biography
Will McDowall’s research activities cover three related areas of interest. First, his work on energy innovation applies ‘innovation systems’ approaches to understanding the development and deployment of new technologies, and has examined the role of expectations, visions and foresight processes in guiding and shaping technological change. Second, he has an interest in developing scenarios -- using both qualitative, participatory approaches and formal quantitative models -- to explore possible futures of the energy system, and provide insights for policymakers. Finally, he has an interest in the application of innovative technology appraisal methods that open up space for deliberation and debate (such as Multi-Criteria Mapping). Much of his work has explored these interests in the context of hydrogen energy, and renewable energy technologies.

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)
Dr Julius Partridge
Research Associate
University College London
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Phone: +44 (0)207 679 5119
Website: mecheng.ucl.ac.uk/people/profile/dr-julius-partridge/

Biography
Julius Partridge is a research engineer in the Mechanical Engineering Department at University College London. He received a BSc in Physics from Warwick University before moving to UCL to complete an MSc in Power Systems Engineering and then an EngD in Urban Sustainability and Resilience, where his research focussed on the conversion of mechanical work from humans into electrical energy. Currently his research interests are focussed on hybrid power systems for transportation applications, most recently on fuel cell/supercapacitor hybrid propulsion systems and their application in urban transport.

Research Interests
- Hybrid power trains and control systems.
- Sustainable transport.
- Hydrogen energy.
- Regenerative braking.
- Wireless power transfer.

Key Publications
Biography

Professor Christopher Pickett
Professor of Chemistry
University of East Anglia
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Phone: +44 (0)160 359 2486
Website: people.uea.ac.uk/en/persons/c-pickett

Biography

After completing his PhD in 1975 (Southampton) he joined the Nitrogen Fixation Laboratory (Sussex). The laboratory moved to the John Innes Centre (1995, Norwich) where he became Associate Head of the Department of Biological Chemistry (2001) and held an Honorary Professorship at the University of East Anglia (UEA, 2000). He was appointed to a Chair in Chemistry at UEA in 2005 where he set up the Energy Materials Laboratory. He was awarded by the Royal Society of Chemistry the INCO medal for Chemistry of the Transition Metals in 1993 and subsequently the Ludwig Mond medal in 2009.

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

- 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
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 process industry and energy companies. A team (including Prof Shah) from CPSE and its spin-off company, PSE Ltd won the prestigious 2007 MacRobert award from 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 SSRL Science Highlight Award. In 2006 he graduated from Birmingham with the top first in Chemical Engineering, and in 2009 he took a PhD from 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 xe1540 FIB-SEM
- Materials processing for fuel cells (PEMFC and SOFC)
Dr Spyros Skarvelis-Kazakos
Senior Lecturer in Power Electronics
University of Sussex
Email:  s.skarvelis-kazakos@sussex.ac.uk>
Phone:  +44 (0)127 387 7352
Website:  www.sussex.ac.uk/profiles/372786

Biography
Dr Skarvelis-Kazakos joined Sussex in July 2015 and is now a Senior Lecturer in Power Electronics. He is a member of the Dynamics, Control and Vehicle (DCV) Research Group. The main focus of his research is smart grids and integrated energy systems. He has successfully attracted over £300k of research funding for 6 research projects from the UK’s innovation agency (TSB / Innovate UK), H2020 MSCA and the industry (Arup) to work on distributed agent-based controllers, integrated energy systems, energy storage and microgrids. He is also developing the Energy and Transport laboratory at Sussex, which includes microgrid equipment, controller hardware and real-time network simulation / HiL equipment.

Research Interests
• Intelligent control / aggregation of Distributed Energy Resources,
• Integrated energy systems and multiple energy carriers,
• Energy network reliability and controllability,
• Complex network dynamics,
• Micro-grids and Virtual Power Plants,
• Energy storage.

Key Publications

Equipment & Facilities
• OPAL-RT OP5600 real-time simulator, with eMEGASIM, capable of simulating Simulink-based models
• Microgrid setup connecting power equipment in a local network
• Grid-forming battery inverter with 19.2 kWh lead-acid battery pack
• Moixa Smart Battery
• Sunamp UniQ Heat Battery
• Programmable power source
• Solar inverter
• Electric Vehicle charging point (Type 2, up to 32A)
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.

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

Key Publications

Equipment & Facilities
- Chassis Dynamometer 1
- Chassis Dynamometer 2
Dr Anthony Velazquez Abad

Research Associate
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Phone: +44 (0)203 108 7387
Website: iris.ucl.ac.uk/iris/browse/profile?upi=AVELA20

Biography
Anthony is working on energy systems policy, energy modelling, decarbonisation strategies and blockchain. He is very interested in reducing the negative externalities of energy systems, especially in transportation and logistics. Currently, he is working on the characterisation of Green Hydrogen Standards, Mapping the hydrogen supply chain and its carbon emissions and identifying the role of innovation in hydrogen, fuel cells and electrolisers in the context of the UK Industrial Strategy. He is also a Technical ‘Assessor for the Energy Entrepreneurs Fund Phase 7 (EEF) and Future BEIS Innovation Projects’ for ‘Hydrogen, Fuel Cell Technologies & Synthetic Fuels’. He also works on energy storage modelling; interconnection business models and European decarbonisation strategies.

During his EPSRC funded EngD, Anthony developed a model for the optimisation of heavy goods vehicles’ configurations minimizing GHG emissions cost-efficiently according to multiple objectives. He has a broad expertise in areas such as metaheuristics and business models, multi-criteria decision analyses, 3D vehicles simulations, management of automotive low carbon technology trials, carbon accounting and patent analysis.

Research Interests
- Assessment of research and innovation capabilities of hydrogen supply chains
- Green hydrogen standards and guarantees of origin
- Business models
- Hydrogen policy
- Techno-economic analysis of transportation modes powered by hydrogen and fuel cells

Key Publications

Equipment & Facilities
- EU and UK TIMES energy system models
- TIAM-UCL global energy system model
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 is now Professor of Energy Systems at The University of Sheffield. He was trained as 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
Biography
Billy Wu is a senior lecturer in the Dyson School of Design Engineering at Imperial College London. His work focuses at the interface between fundamental science and engineering application of electrochemical devices with research activities in the manufacturing, diagnostics and modelling of fuel cells, batteries and supercapacitors. Prior to Billy’s academic appointment (2015) he completed a post-doc (2014), PhD (2014) and masters in Mechanical Engineering (2010) at Imperial College London.

Research Interests
- Manufacturing of electrochemical devices
- Modelling and testing electrochemical devices
- Electrochemical characterisation and diagnostics
- Proton exchange membrane fuel cells
- Lithium-ion batteries/supercapacitors
- Storage state hydrogen storage reactors

Key Publications

Equipment & Facilities
- Direct metal laser sintering (DMLS) facility for metal 3D printing – Renishaw AM250, Concept Laser mLab Cusing
- In-house developed electrospinning rig
- Various potentiostats, thermal chambers and cyclers
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
The Fuel Cell and Hydrogen Research group within the energy department in Chemical Engineering at University of Birmingham started in the year 2000. Today it is the largest UK research group focusing on fuel cell and hydrogen technologies. Prof Robert Steinberger-Wilckens leads a group of 10 staff and PostDocs, and 40 PhD students and academic visitors. The group has built 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. It prides itself of not only working in the fields of catalysis and materials for fuel cells and electrolysers, but also being able to fabricate sample cells for electrochemical characterisation and long-term testing.

Research Interests
- Solid Oxide Fuel Cells and Electrolysers, reversible fuel cells (SOFC, SOE, rSOFC, and SOC): reversible operation, carbon deposition, catalysis, dry reforming, tape casting, inkjet printing, tubular SOFC stack development,
- PEFC, IT-PEFC, DMFC: catalysis, nanowires and low-Pt-Alloys for electrodes, GDLs,
- Hydrogen from biomass, sunlight, and renewable electricity; hydrocarbon reforming catalysts,
- Fuel cell systems and their integration into energy systems, power-to-gas, hydrogen for storage of electricity; synthetic methane and diesel production from renewable energy, hydrogen, and CO2,
- Integration of fuel cells on vehicles, absorption chillers driven by fuel cells, SOFC hybrid heavy duty vehicles; fuel cells in rail, aircraft, maritime applications.
- Market introduction of fuel cells and fuel cell vehicles, life cycle analysis, fuel cell policies and public acceptance, educational programmes for undergraduates, graduates, and professionals.

Key Publications
- S.A.Archer, R.J.Murphy, R.Steinberger-Wilckens: A Methodological Analysis of Palm Oil Biodiesel Life Cycle Studies. Accepted by Renewable & Sustainable Energy Reviews, May 2018; doi 10.1016/j.rser.2018.05.066.

Equipment & Facilities
- Planar SOFC manufacturing using aqueous tape casting, screen and inkjet 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;
- 8 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; on-campus SEM/TEM/FIB-SEM, XRD, XRF etc. analysis;
- Reforming and biomass gasification test rigs;
- Fully functional hydrogen filling station (4kg/day).
RESEARCH INTEREST MATRIX

Some of the researchers above have identified their research interests and the scope of their work through the matrix below. 1 indicating primary interest and 5 indicating lower active interest.

<table>
<thead>
<tr>
<th>Forename</th>
<th>Surname</th>
<th>High Temperature Fuel Cells</th>
<th>Low Temperature Fuel Cells</th>
<th>Hydrogen Production</th>
<th>Hydrogen Storage and Safety</th>
<th>System Design, Modelling and Socioeconomic Analysis</th>
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UK ORGANISATIONS WITH EXPERTISE IN HYDROGEN AND FUEL CELLS
Ames Goldsmith Ceimig

Suppliers of high quality precious metals and powders

James Woodward
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Website: www.ceimig.co.uk

Background
Ames Goldsmith Ceimig is a team of highly experienced catalytic chemists, chemical engineers and scientists based in the UK. The company was founded in 2005 to commercialise precious metal products and research concepts, today they manufacture market leading precious metal catalysts at commercial scale for use in Hydrogen Fuel Cells and Electrolysers.

Ames Goldsmith Ceimig materials typically outperform conventionally available materials in terms of quality, consistency, and performance characteristics. Their customers value access to their scientific and technical expertise and their ability to optimise standard materials or to develop new materials to specific customer requirements.

Commercial Technology and Economic Development Focus Areas
- Platinum & Iridium Catalysts
- Low PGM Catalysts
- Core Shell Technology
- Engineered Carbons
- MEA Waste Recycling
Arcola Energy
A leading specialist in hydrogen and fuel cell technologies
Richard Kemp-Harper or Ben Todd
Email: richard@arcolaenergy.com or ben@arcolaenergy.com
Phone: +44 (0)202 503 1386
Website: www.arcolaenergy.com

Background
Arcola Energy is a system engineering business specialising in fuel cell and hydrogen technologies. Arcola works with clients to develop and integrate complete systems in all areas of the emerging hydrogen and fuel cell markets. Arcola is an independent integrator and works with fuel cells and systems from all the leading suppliers. We are working with PEM and solid oxide fuel cells. Arcola is also expert at integrating fuel cells into optimised hybrid systems, for example selecting appropriate battery chemistry and pack design. Arcola has sophisticated in-house modelling capability, based on collaboration with Imperial College, to enable design of powertrains or fuel cell systems to meet specific duty cycle requirements and optimise efficiency, system cost, performance and lifetime.

Commercial Technology and Economic Development Focus Areas
- Fuel cell and hydrogen system engineering and integration
- FCEV powertrains for buses and commercial vehicles
- Vehicle and system sales, deployment, service and support
- Stationary and portable power and CHP
- HFC education

Research Interests
- Modelling of electrochemical devices (fuel cells batteries especially) and integrated systems
- System and component lifetime
- Asset management
- Hydrogen storage and storage device integration
Background
Founded in 2016 at University College London (UCL) and Imperial College London, Bramble Energy Ltd., through revolutionary fuel cell design and manufacturing techniques have developed the unique, patent protected, printed circuit board (PCB) fuel cell – the PCBFC™.

The PCBFC™ utilises cost-effective production methods and materials from the PCB industry to reduce the cost and complexity of manufacturing of hydrogen fuel cells.

Bramble Energy’s ability to leverage the global high-volume PCB industry means that they are the first fuel cell company with the manufacturing capacity to supply gigawatts of fuel cell hardware, something the battery industry has spent many years and £B’s to achieve.

Bramble Energy’s fuel cells have been extensively designed, tested and iterated; they have been successfully integrated into industrial manufacturing with our PCB supply chain. This is a key differentiator for Bramble Energy compared to our competitors as we don’t require the typical manufacturing costs including staff or capital expenditure.

Commercial Technology and Economic Development Focus Areas
• Portable and stationary power PEM solutions for applications ranging from 20 W – several kW.
• Flexible manufacturing to provide bespoke fuel cell design and integration for OEMs including the development of both open and closed cathode fuel cell systems for high power density systems.
• Automotive range extender development program for modular systems up to 50 kW.
**Bright Green Hydrogen**

**Building a sustainable future**

David Hogg  
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Phone: +44 (0)133 343 9321  
Website: www.brightgreenhydrogen.org.uk

**Background**

Bright Green Hydrogen offers a range of services to businesses throughout Scotland, primarily through demonstration of renewable energy and hydrogen energy storage technologies. We have a demonstration site in Methil, Fife, where visitors can get up close and personal with the renewable energy technologies. Our 3 main services are:

- Renewable Energy Education with nurseries, schools, colleges and universities
- Tours of our Renewable Energy Demonstration Site in Methil, Fife
- Project Consultancy for Renewable Energy Projects

**Commercial Technology and Economic Development Focus Areas**

- Development of hydrogen energy storage sites in Scotland
- Educational workshops for primary and secondary school age children
- Hosting demonstration visits for people who are interested in entering the hydrogen industry

**Research Interests**

- Techno-economic modelling of hydrogen energy storage systems – Maja Persson joint PhD student with Dr Dimitri Mignard at University of Edinburgh
- Detailed electrical modelling of hydrogen energy storage systems and their interaction with both distribution grid systems and local microgrid systems

**Infrastructure, Equipment and Facilities**

- Levenmouth Community Energy Project consisting of:  
  - 910kW of renewable generation (750kW wind, 160kW PV)
  - Eight building parallel microgrid on the business park
  - Hydrogen energy storage system (250kW PEM electrolyser, 50kg 30bar hydrogen storage, 100kW PEM fuel cell)
  - Two all-in-one hydrogen refuelling stations (60kW electrolyser, compressor to 450bar, 35kg 450bar hydrogen storage, vehicle dispensing at 350bar)
  - 17 vehicle hydrogen fleet (10 fuel cell range extender Renault Kangoo from Symbio FC, 5 dual fuel hydrogen/diesel ICE Ford Transits converted by ULEMCo, 2 dual fuel hydrogen/diesel ICE Mercedes RCVs converted by ULEMCo)
Cenex
Independent, not-for-profit, low carbon technology experts
Robert Evans
Email: robert.evans@cenex.co.uk
Phone: +44 (0)150 642 500
Website: www.cenex.co.uk

Background
Cenex is a not-for-profit consultancy and research organisation focused on transport and energy challenges related to the transition to a low carbon economy. Cenex aims to assist technology developers to transition low carbon technologies from research to market applications and help first adopters to trial these new technologies.

For hydrogen and fuel cells, Cenex has an established track record as a research partner in a series of large-scale demonstration projects for vehicle and infrastructure deployment. Current projects include H2ME (Hydrogen Mobility Europe, 2015-2022), the largest Fuel Cell and Hydrogen Joint Undertaking (FCH JU)-supported hydrogen vehicle and refuelling infrastructure demonstration project in Europe, which aims to deploy over 1,400 vehicles and 49 stations in key strategic locations throughout Europe.

Roles undertaken by Cenex in these projects include data collection and analysis for hydrogen and hydrogen fuel cell vehicles as well as hydrogen fuelling stations. Cenex also supports dissemination activities for these large multi-stakeholder projects.

Cenex also undertakes consultancy projects on behalf of public (cities and regions) and private sector clients where consultancy is the clients’ preferred mode of planning for and progressing the implementation and evaluation of low carbon transport and energy investments.

Commercial Technology and Economic Development Focus Areas
- Business case for commercial and private use of hydrogen fuel cell vehicles and supporting refuelling infrastructure.
- The strategic investment case for hydrogen and fuel cell technologies for local/regional economic advantage.

Research Interests

Publications
Ceres Power

Power for a Changing World

Mark Selby
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Website: www.cerespower.com

Background
Ceres Power is fuel cell technology and engineering company bringing cleaner and cheaper energy to every home and business. Ceres Power have developed the SteelCell technology to a point of maturity for commercialisation in Stationary power applications including CHP and mono-generation and currently developing for mobility applications including range extenders or auxiliary power units. This wide applicability results from the demonstration of high efficiency, world leading robustness and low cost potential.
The SteelCell combines the simple manufacturing, construction, flexibility and robustness of the PEMFC technology with the fuel flexibility and high primary energy efficiency of HT-SOFC or large central generation plants.

Commercial Technology and Economic Development Focus Areas

- Core stack, cell and materials R&D
- Small scale domestic CHP applications
- Commercial scale domestic CHP applications
- Prime Power, High Efficiency Mono-Generation
- Range Extender applications for light and medium duty vehicle applications
E4tech
Strategy | Energy | Sustainability
Dr David Hart, Director
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Phone: +44 (0)20 3008 6140
Website: www.e4tech.com

Background
E4tech is a global strategic consultancy focused on sustainable energy, internationally recognised for over 20 years for its advisory work on Hydrogen and Fuel Cells. E4tech’s deep understanding of the fuel cell and hydrogen sectors includes all relevant technologies, the global landscape of actors, and business and policy implications. E4tech provides advice to large and small corporations, investors, policy-makers and technology developers on if, where and how fuel cells and hydrogen will enter markets. E4tech’s annual Fuel Cell Industry Review is an essential reference in the sector, providing an objective overview of fuel cell shipments and of industry developments.

Publications
European Marine Energy Centre

A globally successful marine energy industry

Jon Clipsham, Hydrogen Manager
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Phone: +44 (0)185 685 2043
Website: www.emec.org.uk

Background
Established in 2003, EMEC is the first and only centre of its kind in the world to provide developers of both wave and tidal energy converters with purpose-built, accredited open-sea testing facilities. In September 2017, EMEC produced green hydrogen gas using electricity generated from tidal energy for the first time in the world on its tidal energy test site in Orkney. EMEC are partnered on the Surf ‘n’ Turf and BIG HIT projects which have been strong driving forces creating an emerging hydrogen economy in Orkney, demonstrating R&D projects in remote locations. EMEC are also leading an €11m Interreg North-West Europe project, ITEG, which looks at integrating tidal power and hydrogen to tackle grid export limitations.

Commercial Technology and Economic Development Focus Areas
- Test and demonstration centre for hydrogen technologies across the value chain
- Efficiency of hydrogen production from renewables
- Linking hydrogen in with the wider energy system in remote and rural communities
- Optimising generation, utilising storage and local applications

Research Interests
- Hydrogen storage and transport
- Hydrogen for ferries and marine applications
- Emerging techniques for hydrogen generation
- High value products produced using green hydrogen

Infrastructure, Equipment and Facilities
- ITM Power Electrolyser (500kw)
- AREVA H2Gen Electrolyser (in development)
- Hydrogen trailers
- Test and laydown area
Frazer-Nash Consultancy is one of the UK’s biggest providers of systems and engineering technology and gives impartial advice to the energy, defence, transport and industrial sectors. They work closely with both the government and academia to develop and optimise new technologies.

They have extensive experience in gas transportation and power generation and have leading expertise in developing safety cases for engineering assets including the identification, assessment and management of risk.

They have also investigated the logistical challenges of undertaking a nationwide 100% hydrogen conversion, considering both the modifications at an individual property level, and how a large-scale conversion could be facilitated. The study looked at the lessons that can be learnt from the 1970s town gas conversion.

Frazer-Nash is independent of any gas appliance product or hydrogen conversion technology.

**Research Interests**
- Analysis of industrial machinery – modifications to gas plants for different fuels including hydrogen.
- Gas flow modelling - combustion and gas dispersion.
- Material and structural assessment – re-purposing of piping systems and pressure vessels.
- Development of safety cases including ATEX and DSEAR.
- Technology appraisal and assessment

**Publications**
Health and Safety Laboratory

Prevention of death, injury and ill-health to those at work

Stuart Hawksworth
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Phone: +44 (0)203 028 2000
Website: www.hsl.gov.uk

Background

HSEs laboratory, originally founded 1911, has been focusing on the safety of hydrogen as energy vector since early 2000s. Specialisms include leading large technical projects and delivery teams in the area of major hazards innovation, including leading the 70 member HSL Major Hazards Unit until 2014, a range of major projects for industry and government, and leading major incident investigations. Successful in leading of large technical teams with a good understanding of challenges associated with safety related research and development programmes. Experienced in striking balance between team consensus and moving forward technical progress.

Major hydrogen related activities include: Leading member of international team that successfully proposed and delivered the 25 organisation EU €13m HySafe Network of Excellence (2003-2009); Technical Coordinator of €2.5m FP6 HyPer Project developing knowledge and guidance for installation of small stationary fuel cells/ hydrogen systems (2006-2009); Lead £2.5m programme for UK nuclear industry to address control of hydrogen hazards in long term nuclear storage; Currently leading £4.0m project for UK Energy Technologies Institute addressing safety of Combined Cycle Gas Turbine & Engine (CCGT&E) systems operating on high hydrogen fuels.

• Represent UK on International Energy Agency Hydrogen Safety Working Group
• Member of International Association of Hydrogen Safety
• Member of IGEM Hydrogen Working Group

Publications

Hiden Isochema Ltd

World leader in hydrogen sorption instrumentation

Dr Darren Broom

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Phone: +44 (0)192 524 4678
Website: www.hidenisochema.com

Background
Hiden Isochema is a world leader in the design and manufacture of gas and vapour sorption instrumentation for research, development and production applications in surface chemistry and materials science. The Intelligent Gravimetric Analyser (IGA), our first product, was originally designed to measure hydrogen absorption by metal hydrides, which are used in various hydrogen-based applications, for example, for hydrogen storage, H₂ compression, and for H₂ separation and purification. The IGA is now used more widely to measure the adsorption of gases, such as H₂, by porous adsorbents, with hundreds of these instruments installed in industrial and academic laboratories worldwide. Hiden Isochema continues to develop new instrumentation, including the introduction, in 2013, of a new type of high pressure sorption microbalance, the XEMIS.

Commercial Technology and Economic Development Focus Areas
- Gravimetric and manometric instruments for measuring hydrogen uptake by materials
- Bespoke instrument engineering for specialist applications, such as in-situ neutron scattering studies
- Contract analysis of materials using our purpose built laboratory, equipped with a suite of sorption instruments

Research Interests
- Developing new methods for analysing gas and vapour sorption by materials
- Improving the accuracy of hydrogen sorption measurements by developing new analytical instrumentation
- Validating sorption measurements by continuous improvement of in-house conformance testing and participation in interlaboratory exercises

Infrastructure, Equipment and Facilities
- Intelligent Gravimetric Analyser (IGA) for hydrogen sorption measurements up to 20 bar
- XEMIS high pressure sorption microbalance for measurements up to 170 bar
- Intelligent Manometric Analyser (IMI) for hydrogen sorption measurements up to 200 bar
- Close couple mass spectrometry (Hiden Analytical) for the analysis of gas composition
Intelligent Energy Ltd
Fuel cell company focused on growing PEM FC technologies
Debbi Hughes, Head of Marketing and Communications
Email: debbie.hughes@intelligent-energy.com
Phone: +44 (0)150 927 1921
Website: www.intelligent-energy.com

Background
Intelligent Energy is a fuel cell engineering company focused on the development and commercialisation of its PEM fuel cell technologies for a range of markets including automotive, stationary power and UAVs. We are headquartered in the UK, with additional offices and representation in the US, Japan, India and China.

Commercial Technology and Economic Development Focus Areas
- **Automotive fuel cells for primary, range extender and off-road power**
- **Fuel Cell Modules for stationary and portable power for applications in the range 1-20kW**
- **Lightweight fuel cell power modules to extend commercial UAV flight times**
iPower Energy Ltd

Focused on reducing energy bills and carbon emissions

Jon Cape, Managing Director
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Phone: +44 (0)757 756 4092
Website: www.ipoweruk.com

Background
iPower develops and manages low carbon projects using a mix of established (e.g. solar) and new technologies such as fuel cells and batteries. iPower has developed or facilitated projects including solar rooftop, solar farm, hydrogen fuel cell and heat pump projects. It has pioneered deployment of multiple fuel cell installation and deployed fuel cells in a wide range of building types. It has developed a social esco model for fuel cell/heat pump projects e.g. with social landlords. It is a distributor for several fuel cell products. It has facilitated 10MW solar farm development. Since 2017 iPower has been working with a nanotechnology partner and is progressing hydrogen-from-methane projects with graphene as co-product.

Commercial Technology and Economic Development Focus Areas

- **Hydrogen use:** deployment in micro, mid and large scale hydrogen fuel cell CHP systems, using a range of hydrogen sources including piped natural gas, bottled/tanker hydrogen, bottled/tankerated ammonia integrating with battery and smart energy management systems including provision of grid services
- **Hydrogen generation:** for example, generation from methane (biomethane or natural gas) with graphene as co-product, electrolysis especially from grid-constrained wind/solar sites

Infrastructure, Equipment and Facilities

- BlueGEN Demonstration Model
- Installed BlueGEN client sites available for site visits for BlueGEN briefing events, for example Edinburgh Napier University
ITM Power

Integrated hydrogen energy system manufacture specialist

Marcus Newborough, Development Director

Email: mn@itm-power.com
Phone: +44 (0)114 244 5111
Website: www.itm-power.com

Background

ITM Power is a British manufacturer of PEM electrolyzers and hydrogen systems based on electrolysis. ITM focuses on the development and implementation of multi-MW electrolyzers; hydrogen refuelling stations; power-to-gas systems for injecting hydrogen admixtures and SNG into gas networks; and the decarbonisation of industrial processes with green hydrogen. In the UK, ITM owns and operates an expanding network of public hydrogen refuelling stations, which refuel road vehicles with 350 or 700bar hydrogen.

Commercial Technology and Economic Development Focus Areas

- PEM electrolyzers
- Hydrogen refuelling stations
- Power-to-Gas systems
- Renewable chemistry
Background
Johnson Matthey’s global Fuel Cell business is dedicated to the supply of high quality fuel cell components for automotive and stationary applications. They work closely with customers and suppliers to develop tailored products for specific applications, designs and operating conditions in order to achieve the best possible performance.

Johnson Matthey also has extensive experience in hydrogen manufacture and offers the full range of catalysts used in the process including desulphurization, pre-reforming, steam reforming and water gas shift catalysts. All these catalysts are fully supported with technology and services for both large and small industrial hydrogen units.

Johnson Matthey’s range of CATACEL fuel processing solutions for the fuel cell industry include catalytic and heat-exchanging materials and devices, tightly integrated fuel reforming and combustor/reformer packages, catalytic devices for system startup, tailgas combustion, and coated inserts for other purpose-designed reactors. Processing solutions are available for all fuels of interest.

Commercial Technology and Economic Development Focus Areas
- Automotive and stationary fuel cells – catalysts and components for PEM, DMFC, PAFC
- Fuel processing catalysts and purification solutions for all fuel cell types
- Decarbonised hydrogen as an energy vector
- Electrochemical synthesis
- Hydrogen storage/transportation/compression

Infrastructure, Equipment and Facilities
- Catalyst preparation and scale-up (research to industrial scale)
- Fuel cell component preparation and scale-up (research to industrial scale)
- Catalyst and component testing facilities
- Advanced modelling and characterisation

Research Interests
- Catalyst design, development and scale-up
- Fuel cell component design, development and scale-up
- Advanced H2 concepts across a range of scales
National Physical Laboratory (NPL)
The National Measurement Standards Laboratory

Dr Gareth Hinds
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Background
NPL is the UK’s National Measurement Institute, and is a world-leading centre of excellence in developing and applying the most accurate measurement standards, science and technology available. We are supporting the rollout of hydrogen technologies through the development of in situ diagnostic techniques, modelling tools and standard test methods for fuel cells and electrolysers, and by taking a leading role in the establishment of standards for hydrogen purity. NPL is host to London’s first public electrolyser-powered hydrogen refuelling station, which opened in 2016, and has also leased a Toyota Mirai pool car for use by staff on business trips.

Commercial Technology and Economic Development Focus Areas
• PEM fuel cells
• PEM water electrolysers
• Hydrogen purity

Research Interests
• In situ diagnostics
• Standard test methods
• Multiscale modelling
• Hydrogen purity measurement
• Degradation mechanisms

Infrastructure, Equipment and Facilities
• Fuel cell test stations (up to 2 kW)
• Potentiostats/galvanostats (up to 80 A)
• Localised measurement of potential, temperature and humidity
• Gas chromatography
• State-of-the-art materials characterisation facilities
Pure Energy Centre

The innovative energy storage company

Elizabeth Johnson (MBE), Dr Ross Gazey, Vincenzo Ortisi

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Website: pureenergycentre.com

Background

The Pure Energy Centre (PEC) is a manufacturer of small, medium and large scale hydrogen systems. PEC’s focal point is on the development of projects centered on electrolysers, compressors, and complex hydrogen refuelling stations operating at 350 and 700 bar. The PEC also provides power-to-gas solutions and is certified to develop renewable projects to produce green hydrogen. The PEC design, integrate and install fuel cell systems. The PEC is involved in the €9 million NWE GenComm hydrogen project, €2.5 Hylantic Atlantic Area hydrogen project and the OHLEH Bio-Hydrogen fuel cell project.

Commercial Technology and Economic Development Focus Areas

• Electrolyser up to 30 bars
• Compressors up to 900 bars
• Hydrogen refueling stations up to 700 bars
• Turnkey hydrogen solutions
• Fuel cell systems design, integration and installations

Research Interests

• Filling stations
• Advance AI hydrogen systems
• Novel modeling techniques for H2 systems
• Hydrogen storage, compression, and transportation

Infrastructure, Equipment and Facilities

• The PEC operates from two sites one in the UK and one in Italy
• Filling station
• Compressor and storage
• Advance modeling and control systems
Ricardo Plc

Global strategic engineering and environmental consultancy

Prof. Neville Jackson and Jane Patterson
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Phone: +44 (0)127 345 5611
Website: www.ricardo.com

Background
Ricardo is a global strategic engineering and environmental consultancy that specialises in the transport, energy and scarce resources sectors. The company engages with a range of market sectors, including passenger cars, commercial vehicles, rail, defence, motorsport, energy and environment, with a client list that includes transport operators, manufacturers, energy companies, financial institutions and government agencies. In-house engineering capabilities include design and development expertise to deliver high-quality prototypes and low-volume manufacturing of complex products and assemblies, including engines, transmissions, electric motors and generators, battery packs and fuel cell systems. Specific hydrogen and fuel cell capabilities and projects include future transport energy strategies, business case analysis for hydrogen supply and re-fuelling, fuel cell system simulation and optimisation, fuel cell test facilities and complete prototype fuel cell vehicle build, test and development.

Commercial Technology and Economic Development Focus Areas
• Fuel cell system design, simulation and application optimisation
• The role of hydrogen in the future energy system
• Hydrogen infrastructures and business case
• Design & development of hydrogen reformers
• H2FC vehicle system design, build, test and development

Research Interests
• Improving component and system models and simulation tools
• H2FC economics and business case analysis
• Future energy systems integration

Infrastructure, Equipment and Facilities
• Bespoke simulation and system integration tools
• SiL & HiL facilities for control system design and development
• Fuel Cell characterisation & benchmarking
• Prototype and niche production vehicle build and test facilities
Scottish Hydrogen & Fuel Cell Association (SHFCA)

Promoting Scottish fuel cell and hydrogen expertise
Nigel Holmes
Email: nigel.holmes@shfca.org.uk
Website: www.shfca.org.uk

Background
SHFCA represents the sector interests for the development and deployment of hydrogen and fuel cell technologies. Hydrogen and Fuel Cell technologies are playing an increasingly important role in helping businesses and organisations to reduce their overall carbon footprint and improve local air quality. Local Authorities such as Aberdeen, Fife, and the Orkney Islands are deploying of zero emission transport, using hydrogen from renewable sources. Innovative uses of hydrogen technologies are generating considerable interest in communities such as the Orkney Islands for grid balancing and maximising local economic value. Using hydrogen to overcome grid constraints will also help deliver the ambitious climate change targets for Scotland and the UK. SHFCA is widely recognised as one of the most proactive hydrogen & fuel cell industry associations in Europe, with over 80 members.

Commercial Technology and Economic Development Focus Areas
- **SHFCA membership include industry, consultants, government, academia, development agencies, and local authorities**
- **Key priority is facilitation of commercialisation, deployment, and scale-up of hydrogen and fuel cell technologies**
- **Build wider awareness, acceptance, and uptake for hydrogen and fuel cell deployment through advocacy**
- **Focus on use of hydrogen & fuel cells for the whole energy system: heat, power, transport, and industry**
- **Opportunity for use of hydrogen for decarbonising industry in manufacturing, and chemicals/fuels production**

Research Interests
- **The broad SHFCA membership base includes technology developers, researchers, and technical consultants**
- **Interest in maximising the use of low carbon & zero emission energy sources, using hydrogen & fuel cells**
- **Evidence base for impact of hydrogen and fuel cells: carbon emissions, air quality, economic benefits**
- **Insights on the drivers for adoption of new technologies, specifically consumer attitudes and behaviours**
- **Evidence and insights on local and national economic benefits, specifically for communities and clusters**

Infrastructure, Equipment and Facilities
- **For assistance with identifying relevant equipment and facilities in Scotland please contact SHFCA**
- **Also please refer to individual listings by our SHFCA members**
Systeng Consulting
Low Carbon Energy & Transport Solutions
Dr Enrique Troncoso
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Phone: +44 (0)771 812 3487
Website: www.systengconsulting.com

Background
Systeng Consulting is a leading consultancy focused on low carbon energy & transport solutions, led by Dr Enrique Troncoso.
Enrique is a senior engineering consultant and has worked in the H2FC sector for the past 20 years, including 8 years as a project leader with Boeing Research & Technology, where he developed and led several R&D and demonstration programs on hydrogen applications and fuel cells. Enrique is involved in several pilot & demonstration programs across UK and Europe, focused on locally integrated energy systems and biogas & hydrogen as clean flexible energy vectors. He is the technical coordinator of the BIG HIT project.
He also works as a technical advisor to the European Commission (DG MOVE/ENERGY, INEA, European Institute of Technology & Innovation, REA, and Fuel Cell & Hydrogen Joint Undertaking).

Commercial Technology and Economic Development Focus Areas
Systeng provides technical, strategic and project management services in:
• Technology & product development
• Technical due diligence
• International Project development
• Management & technical coordination of demonstration and pilot programs
• Technology & commercial roadmap development

Research Interests
• Locally Integrated Energy Systems
• Renewable-based energy systems for islands & remote regions
• Integration of hydrogen and flexible energy vectors across the entire energy system (“sector-coupling”)

Infrastructure, Equipment and Facilities
Through an extensive network of contacts across UK, US and Europe, Systeng can provide access to:
• Hydrogen supply, distribution and end-use infrastructure (mobility, heat, power and industry end-uses)
• Hydrogen production, storage and fuel cell testing facilities
• Hydrogen supply, distribution and end-use equipment
Trilemma Consulting Ltd
Delivering Technology Innovation with Insight
Dr David Kane, Director
Email: david.kane@trilemmaconsulting.co.uk
Phone: +44 (0)797 953 5678
Website: www.trilemmaconsulting.co.uk

Background
Trilemma Consulting support technology development and commercialisation within the energy sector, with a focus on distributed generation, energy storage, Micro-grids, Demand Side Response (DSR)/Virtual Power Plants (VPP). We provide technical innovation (through simulation, design, prototyping, lab testing, cost engineering, certification support and field trial) coupled with commercial insight (by modelling income streams, customer propositions, and DSR/VPP opportunities).

Our team has a track record designing, certifying and trailing Fuel Cell-based micro Combined Heat and Power systems (mCHP), and experience assessing fuel cells and electrolysers as part of grid-connected and stand-alone Micro-Grid opportunities (in kW to MW scale). Trilemma explore commercial models to support the deployment of low carbon technology, for example “Energy-as-a-Service” or “Hydrogen-as-a-Service”, modelling system performance, CAPEX, time-of-use electricity costs, and grid ancillary service value streams.

Commercial Technology and Economic Development Focus Areas
- Fuel Cell Combined Heat and Power
- Fuel Cell-based Micro-Grid solutions
- Virtual Power Plant/Demand Side Response

Research Interests
- System design to aid low cost retrofit of Fuel Cell Combined Heat & Power into existing buildings
- Controls systems to optimise Fuel Cell operation within buildings
- Control systems to optimise Fuel Cell operation within Micro-Grids
- Assessing Virtual Power Plant & Demand Side Response

Response opportunities for Fuel Cells
- Understanding Hydrogen-as-a-Service with flexible electrolysis, low carbon micro-grid, time-of-use tariffs, and grid ancillary services

Infrastructure, Equipment and Facilities
- A range of modelling and simulation tools for fuel cells, energy storage, building energy systems and DSR/VPP value streams
TUV SUD NEL
Leading flow consultancy / calibration authority for industry
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Background
TUV SUD NEL has been part of the UK’s National Measurement System (NMS) holding the National Standards for flow and density for over 30 years. It is actively involved in research and infrastructure development relating to the flow metering of hydrogen for transport, domestic heating and industrial applications, with the aim of realising the NMS goal of accelerating the UK’s transition to a clean fuels economy. It specifically focuses on flow related issues and the development of British and International Standards that enable widespread industry adoption. Flow metering and related standards for carbon dioxide (for CCUS linked to hydrogen production) also fall within the current remit of the organisation.

Commercial Technology and Economic Development Focus Areas

• Flow metering of hydrogen
• Standards development for the flow metering of hydrogen
• Flow metering of carbon dioxide for CCUS
• Standards development for the flow metering of carbon dioxide

Research Interests

• Flow metering
• Density measurement
• Standards development
UK HFCA

Representing the UK Hydrogen and Fuel Cell Industry

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Background
The UK HFCA is the UK’s industry Association campaigning to deliver the best possible outcomes for the UK via hydrogen and fuel cells. Acting as a ‘collective voice’ for the sector, and covering the full breadth of hydrogen and fuel cell (H&FC) opportunities and interests, it engages regularly with national policy makers and the political community to achieve this. UK HFCA members include the leading UK H&FC companies as well as organisations from the academic community and a range of other stakeholders with an interest in these clean energy solutions and the associated elements of the supply chain.

The UK HFCA has a particular focus on optimising the role for hydrogen and fuel cells in the energy transition and across the energy system.

Commercial Technology and Economic Development Focus Areas
The UK HFCA’s campaigning activities encompass:

- Raising the profile of H&FC solutions, and generating ‘buy-in’ across the political community, including via Committees and similar groupings
- Optimising policy to reflect the benefits offered by H&FCs in the UK – both through ongoing engagement with the policy community and through formal participation in Consultations etc.
- Providing a ‘common voice’ for the breadth of sector interests and opportunities
- Providing a link between industry and academia.

Research Interests
UK HFCA membership encompasses:

- All fuel cell types and applications;
- The full fuel cell supply chain (from research into material science through to systems integration and distribution);
- Hydrogen production and storage;
- Hydrogen infrastructure; and
- Other issues around the delivery, storage and use of associated fuels.
ULEMCo Ltd
Ultra Low Emission Mileage Company
Amanda Lyne, Managing Director
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Background
ULEMCo Ltd is the world’s first hydrogen commercial vehicle conversion company, enabling fleet, commercial and niche vehicle owners to have access to zero emission hydrogen fuel, as part of their strategies to reduce transport related carbon emissions.

ULEMCo is based in Liverpool, UK and was founded in 2014 as a spin out of Revolve Technologies, to commercialise intellectual property and capability in hydrogen combustion engine technology. The company converts vehicles, having started with diesel Ford Transit vans, to enable them to run on commercially available hydrogen. The technology allows vehicle fleet managers to reduce their carbon dioxide emissions to ultra-low levels.

Commercial fleets across the UK benefit from a reduced carbon footprint while still having the full range capability of standard diesel vehicles. Alongside various partners, ULEMCo already supports a fleet of vehicles across a range of hydrogen hubs in the UK. The company is targeting commercial fleet conversions to grow the market significantly over the next 18 months, and then expand into other vehicle types over the longer term. Its growth plans include creating a hydrogen re-fuelling network, to capitalise on the existing local infrastructure for this ‘green’ fuel.

Commercial Technology and Economic Development Focus Areas

- **Supply of commercial vehicles (large vans to HGV) that run on hydrogen**
- **Innovative novel approach (and IP) to hydrogen transport based on efficient combustion (either dual fuel or 100%)**
- **Supply of converted systems for other applications such as stationary generation and marine (including the hydrogen engine components, on board storage systems and operational support)**
- **Zero emission fuel cell range extended electric vehicle power module**
- **Engineering designs and support for hydrogen transport systems (road, rail or marine)**
For enquiries and to join H2FC SUPERGEN, please contact:

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