# Conference on Energy Materials and Interfaces

## Newcastle University

## 29 July – 1 August 2019

### Monday 29th July

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| **17:30** | **Registration open 2nd floor, Old Library Building** |
| **18:00** | *Welcome reception, The Courtyard, Old Library Building* |
| **19:55 – 20:00** | **Welcome address Prof. Ulrich Stimming, NECEM Director** |
| **20:00 – 21:00** | **Plenary lecture, Old Library Building, Room 2.21**<br>**Prof. Daniel Nocera, Harvard University**<br>Chair: Dr Elizabeth Gibson<br>Artificial and bionic leaf: A sustainable and renewable cycle for producing food and fuels |

### Tuesday 30th July

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| **8:00-8:30** | **Registration, Armstrong Building, Room 1.06** |
| **8:30 – 9:30** | **Plenary lecture, Armstrong Building, Room 2.98**<br>**Prof. Saiful Islam, University Of Bath**<br>Chair: Dr Chris Groves<br>From Lithium Batteries to Perovskite Solar Cells: Atomic-Scale Insights into Energy Materials |
| **9:30 – 10:00** | *Coffee Break* and posters, *Armstrong Building, Room 1.06* |
| **10:00 –11:00** | **Plenary lecture, Armstrong Building, Room 2.16**<br>**Prof. Jawwad Darr, University College London**<br>Chair: Prof. Ulrich Stimming<br>Continuous Hydrothermal Synthesis of Energy Storage Materials; From Materials Discovery to Pilot Plant |
| | **Session 1a, Armstrong Building, Room 2.98** |
| **11:00 – 11:30** | **Invited talk**<br>**Dr Donald Maclaren, University Of Glasgow**<br>**Chair: Prof. Lidija Siller** |

Nanocharacterisation of TiNiSn Heusler alloys for thermoelectric applications

**11:30 – 11:50** **Contributions**

Dr J. Wang, Newcastle University

Nanoparticles embedded in silica aerogels for thermoelectric application

**11:50 – 12:10** **Contributions**

Dr S. Sahin, Bilecik Şeyh Edebali University

Development of carbon nanotube-ferrocene-nafion based enzymatic anodes for biofuel cell applications

**Session 1b, Armstrong Building, Room 2.16**

**11:00 – 11:30** **Invited talk**

**Prof. Magdalena Titrici, Imperial College London**

**Chair: Dr Fabio Cucinotta**

Hydrothermal Carbon Nanocrystals – A New Generation of Sustainable Optically Active Materials

**11:30 – 11:50** **Contributions**

Dr S. Goldie, Durham University

One Pot Cobalt Catalysed Production of Graphene Foams

**11:50 – 12:10** **Contributions**

Dr Michael Hunt, Durham University

Evaluating High-Shear Exfoliated Graphenes for Supercapacitor Electrodes

**12:10-14:00** *Lunch and Posters, Armstrong Building, Room 1.06*

**14:00 – 15:00** **Plenary lecture, Armstrong Building, Room 2.98**

**Prof. Andrea Ferrari, University Of Cambridge**

Chair: Dr Michael Hunt

Applications of Graphene and Related Materials

**Session 2a, Armstrong Building, Room 2.98**

**15:00 – 15:30** **Invited talk**

**Dr Sara Walker, Newcastle University**

**Chair: Dr Budhika Mendis**

Energy systems - tackling uncertainty in building energy demand

**15:30 – 15:50** **Contributions**

Prof. N. Wright, Newcastle University

Use of New Materials in Power Conversion Electronics

**15:50 – 16:10** **Contributions**

Mr M. Littlefare, Durham University

Solid State Transformers for Smart-Grids

**Session 2b, Armstrong Building, Room 2.16**

**15:00 – 15:30** **Invited talk**

**Dr Adelio Mendes, University Of Porto**

**Chair: Prof. Andrew Houlton**

Redox Flow Batteries – Technological Advancements

**15:30 – 15:50** **Contributions**

Dr E. Yu, Newcastle University

Fast start-up of biocathodes with polymer-modified Gas Diffusion Electrodes for conversion of CO2 via Microbial Electrosynthesis

**15:50 – 16:10** **Contributions**
Dr A. Hudson, Newcastle University
Synthetic antibodies for the thermal detection of antimicrobial resistant bacteria

***16:10 – 16:40*** *Coffee Break and Posters, Armstrong Building, Room 1.06*

**Session 3a, Armstrong Building, Room 2.98**

**16:40 – 17:10** **Invited talk**
**Dr Martial Duchamp, Nanyang Technological University**
**Chair: Dr Budhika Mendis**
Study of devices interfaces, at atomic scale, in situ inside a transmission electron microscope

**17:10 – 17:30** **Contributions**
Dr R. Williams, Durham University
Microstructural defects in antimony selenide solar cells

**17:30 – 17:50** **Contributions**
Dr U. Cappel, KTH - Royal Institute of Technology
Operando photoelectron spectroscopy for the characterization of solar cells

**Session 3b, Armstrong Building, Room 2.16**

**16:40 – 17:10** **Invited talk**
**Dr Jeremy Shears, Shell Research Limited**
**Chair: Prof. Andrew Houlton**
Getting to Net-Zero: the Unfolding Energy Transition

**17:10 – 17:30** **Contributions**
Dr K. Goodwin, Centre for Process Innovation
Supporting the Industrialisation of Battery Manufacture

**19h00** Social Event: Wylam Brewery

## Wednesday 31st July

**8:30 – 9:30** **Plenary lecture, Armstrong Building, Room 2.98**
**Prof. Sarah Haigh, University Of Manchester**
Chair: Dr Alton Horsfall
Probing defects and interfaces in 2D van der Waals materials

***9:30 – 10:00*** *Coffee Break and Posters, Armstrong Building, Room 1.06*

**Session 4a, Armstrong Building, Room 2.98**

**10:00 – 10:30** **Invited talk**
**Dr Nicolas Plumere, Ruhr-University Bochum**
**Chair: Dr Fabio Cucinotta**
Protection of $O_2$-Sensitive Catalysts in Thin Films for Energy Conversion

**10:30 – 10:50** **Contributions**
Dr O. Frank, J. Heyrovsky Institute of Physical Chemistry of the CAS

Local Photovoltaic Properties of Graphene-Silicon Schottky junctions – Pros and Cons of AFM-Based Methods

**Session 4b, Armstrong Building, Room 2.16**

**10:00 – 10:30** **Invited talk**
**Dr Han-Yi Chen, National Tsing Hua University**
**Chair: Dr Michael Probert**
In Operando Synchrotron X-ray Studies of Advanced Metal

**10:30 – 10:50** **Contributions**
Dr J. Cooper, ISIS Neutron and Muon Source
Neutron Reflectometry for Energy and Energy Materials

**Session 5a, Armstrong Building, Room 2.98**

**10:50 – 11:20** **Invited talk**
**Dr Pau Farras, Nui Galway**
**Chair: Dr Eileen Yu**
Towards a widespread production and use of green hydrogen

**11:20 – 11:40** **Contributions**
Dr C. Schnedermann, Cambridge University
Long-Range Ballistic Propagation of Carriers in Organic-Inorganic Metal-Halide Perovskites Thin Films

**11:40 – 12:00** **Contributions**
Dr P. Kumar Sharma, Ulster University
Enhancement of photoelectrochemical performance of titanium dioxide by surface modification with copper oxide clusters

**Session 5b, Armstrong Building, Room 2.16**

**10:50 – 11:20** **Invited talk**
**Dr Nuria Garcia, University Of Southampton**
**Chair: Prof. Ulrich Stimming**
Promoting the desired reactions in metal-oxygen/sulfur batteries using redox mediators and environmentally-friendly electrolytes

**11:20 – 11:40** **Contributions**
Dr R. Ward, National Institute of Materials Science, Japan
Simulating cooperative diffusion in $MgAl_2O_4$, investigating the effects of local chemistry

**11:40 – 12:00** **Contributions**
Dr R. Kumar, Newcastle University
Protic Ionic liquid Electrolytes for Humid Air Water Electrolysis

***12:00-14:00*** *Lunch and Posters, Armstrong Building, Room 1.06*

**14:00 – 15:00** **Plenary lecture, Armstrong Building, Room 2.98**
**Prof Lee Cronin, University Of Glasgow**
Chair: Dr John Errington
Ultra-Reduced and Protonated Aqueous Solutions of Polyoxometalate Clusters for Flexible Energy Storage

**Session 6a, Armstrong Building, Room 2.98**

**15:00 – 15:30** **Invited talk**
**Dr Tao Liu, University Of Nottingham**
**Chair: Prof. Lidija Siller**
Self-healing Epoxy Foams for Lightweight Wind Turbine Blades

**15:30 – 15:50** **Contributions**
Dr N. Giesbrecht, University of Munich
Alcohol-Induced-Formation of the 2D Antimony-Based Phase for Lead-Free Perovskite Solar Cells

**15:50 – 16:10** **Contributions**
Dr A. Jalalian-Khakshour, Swansea University
NASICON Solid Electrolyte Processing Optimisation

**Session 6b, Armstrong Building, Room 2.16**

**15:00 – 15:30** **Invited talk**
**Prof. David Fermin, University Of Bristol**
**Chair: Dr Neil Beattie**
Solution Processed Inorganic Semiconductor Thin-Film PV

**15:30 – 15:50** **Contributions**
Dr A. Roy, University of Exeter
Insights of $BaSnO_3$ Nanorods for Third Generation Solar Cells

**15:50 – 16:10** **Contributions**
Dr D. Lewis, University of Manchester
Soft processing toward layered and 2D materials: expanding the palette

***16:10 – 16:40*** *Coffee Break and Posters, Armstrong Building, Room 1.06*

**Session 8a, Armstrong Building, Room 2.98**

**16:40 – 17:10** **Invited talk**
**Prof. Yingping Zou, Central South University**
**Chair: Dr Mohamed Mamlouk**
High Performance Single Junction Organic Solar Cell Using Electron-Deficient-Core-based Fused-Ring Ladder Molecule as Acceptor

**17:10 – 17:30** **Contributions**
Dr Q. Yu, Northumbria University
In situ TEM Investigation of The Selenisation Mechanisms of Earth Abundant Nanoparticles for Thin Film Solar Cells

**17:30 – 17:50** **Contributions**
Dr P. Maughan, Lancaster University
In-situ Pillared $Ti_3C_2$ MXene as a new Zinc-ion Host for Hybrid Capacitor Applications

**Session 8b, Armstrong Building, Room 2.16**

**16:40 – 17:10** **Invited talk**
**Dr Robin White, TNO**
**Chair: Dr Neil Beattie**
Catalysing Routes to Platform Chemicals and Energy Storage – R&D Activities at TNO

**17:10 – 17:30** **Contributions**
Dr E. Gibson, Newcastle University
Dye-sensitized photocathodes for solar fuel devices

**17:30 – 17:50** **Contributions**

Dr Q. Tang, Newcastle University
Machine Learning for the Diagnosis of Battery State of Health from Impedance Spectra

**19h00** Conference Dinner: The Baltic

## Thursday 1st August

**8:30 – 9:30** **Plenary lecture, Armstrong Building, Room 2.98**
**Prof. Karen Wilson, RMIT University**
**Chair: Dr Noel Healy**
Designing advanced catalytic materials for energy applications

***9:30 – 10:00*** *Coffee Break and Posters, Armstrong Building, Room 1.06*

**Session 9a, Armstrong Building, Room 2.98**

**10:00 – 10:30** **Invited talk**
**Dr Edward McCarthy, University of Edinburgh**
**Chair: Prof. Steve Bull**
Composite Solutions to Tidal Energy Challenges – New Technologies

**10:30 – 10:50** **Contributions**
Dr P. Agrawal, Northumbria University
Leidenfrost heat engine: Sustained rotation of levitating rotors over turbine-inspired substrates

**Session 9b, Armstrong Building, Room 2.16**

**10:00 – 10:30** **Invited talk**
**Dr Piers Barnes, Imperial College London**
**Chair: Dr Pablo Docampo**
The Device Physics of Perovskite Solar Cell Interfaces

**10:30 – 10:50** **Contributions**
Dr N. Beattie, Northumbria University
Development of $Cu_2ZnSn(S,Se)_4$ Photovoltaics on Flexible Foil Substrates for Distributed Power Applications

**Session 10a, Armstrong Building, Room 2.98**

**10:50 – 11:20** **Invited talk**
**Dr Aruna Ivaturi, University Of Strathclyde**
**Chair: Dr Natasha Shirshova**
Dopant-free conductivity tuning of hole transport materials for Perovskite solar cells

**11:20 – 11:40** **Contributions**
Dr J. Errington, Newcastle University
Electron Storage in Polyoxometalates: Insights into the Chemical Effects of Reduction

**11:40 – 12:00** **Contributions**
Dr N. Ahmad, Northumbria University
ZnSe as an alternative n-type buffer layer for antimony selenide thin film solar cell

**Session 10b, Armstrong Building, Room 2.16**

**10:50 – 11:20** **Invited talk**
**Dr Francesca De Giorgio, University Of Bologna**
**Chair: Dr Pablo Docampo**
Next-Generation Lithium Batteries: Challenges in High-Energy Semi-Solid Lithium/Oxygen Flow Batteries

**11:20 – 11:40** **Contributions**
Dr F. Pesci, Imperial College London
Solid State Batteries – Understanding Ionic Transport in Garnet Electrolytes

**11:40 – 12:00** **Contributions**
Dr S. Nwankwo, Northumbria University
Influence of Heat Treatments and Se/S Substitution on SnS Solar Absorbers

**12:00-14:00** *Lunch and Posters Armstrong Building, Room 1.06*

**Session 11a, Armstrong Building, Room 2.98**

**14:00 – 14:30** **Invited talk**
**Dr Andrew Cook, Centre For Process Innovation**
**Chair: Dr Eileen Yu**
Roll-to-roll ALD production of large-area moisture barriers for electronic applications

**14:30 – 14:50** **Contributions**
Dr C. S. Ni, National Tsing Hua University
Transparent and stretchable supercapacitor based on PEDOT:PSS/transition metal hydroxide composite electrodes

**14:50 – 15:10** **Contributions**
Dr Toby Hallam, Newcastle University
Printed Electronics from Solution-Processed 2D Materials

**Session 11b, Armstrong Building, Room 2.16**

**14:00 – 14:30** **Invited talk**
**Prof. Neil Robertson, University Of Edinburgh**
**Chair: Prof. Steve Bull**
Bismuth-based Materials for Supercapacitors

**14:30 – 14:50** **Contributions**
Dr B. Horrocks, Newcastle University
DNA-templated nanowires

**14:50 – 15:10** **Contributions**
Dr R. Crapnell, Manchester Metropolitan University
The Heat-Transfer Method: Thermoelectric Detection of Bioanalytes

**Session 12a, Armstrong Building, Room 2.98**

**15:10 – 15:40** **Invited talk**
**Dr Valeska Ting, University of Bristol**
**Chair: Dr Guillaume Zoppi**
Filling the void: Investigations into extremely high densities of hydrogen in nanoporous carbon materials

**15:40 – 16:00** **Contributions**
Dr Y. Sun, Clemson University

Carbon Dots for Energy Conversion Applications

**15:50 – 16:10** **Contributions**

Dr A. Talmantaite, Durham University

Electron Compton Scattering: Towards The Measurement Of Electron Momentum Distributions In Energy Materials

**Session 12b, Armstrong Building, Room 2.16**

**15:10 – 15:40** **Invited talk**

**Dr Alpha Lee, University of Cambridge**

**Chair: Dr Mohamed Mamlouk**

Combining machine learning with electrochemical impedance spectroscopy to forecast battery health

**15:40 – 16:00** **Contributions**

Dr I. Benesperi, Uppsala University

Tetradentate Copper Complexes for Hybrid Solar Cells

**16:00 – 16:20** **Contributions**

Prof. S. Bull, Newcastle University

Mechanical Assessment of thin organic semiconductor coatings

***16:20 – 16:40*** *Prizes and Concluding Remarks*