Energy Theme

Paul S. Clegg

University of Edinburgh

Outline - Understanding

- Young researchers
- Plasma research
- Perovskite research
- Fuel cells
- Energy efficiency

- ~25 academics, ~30 postdocs, and ~40 PhD students across the 8 SUPA institutions with energy as a core element of their research
- Almost all members of this theme are members of other themes

Theme Management Committee:

Paul Clegg (**Edinburgh**) – Theme Leader

Murilo da Silva Baptista (**Aberdeen**)
Steve Reynolds (**Dundee**)
David Hamilton (**Glasgow**)
Tadhg O'Donovah (**Heriot-Watt**)
Ifor Samuel (**St. Andrews**)
Zheng-Ming Sheng (**Strathclyde**)
Des Gibson (**UWS**)

Young researchers

University of St Andrews

Dr Lethy Krishnan Jagadamma is a Marie Curie fellow doing excellent work on organic and perovskite photovoltaics – St. Andrews University

Dr Aruna Ivaturi is an EPSRC Fellow and Chancellor's Fellow Lecturer leading the Smart Materials Research and Device Technology (SMaRDT) Group – Strathclyde University

University of Strathclyde

energy technology partnership

Energy Innovation Emporium
6th June 2019
Glasgow

Plasma research

EUROfusion

University of Strathclyde

EPSRC Programme grant:
Multiscale turbulent dynamics of tokamak plasmas £4.3M

Turbulence, typically at the millimetre-centimetre scale in tokamaks, interacts in a complex way with the global equilibrium profiles (density, temperature and flow gradients), which are on the metre-scale. This needs to be understood.

Kevin Ronald et al.

Plasma research

Zheng-Ming Sheng

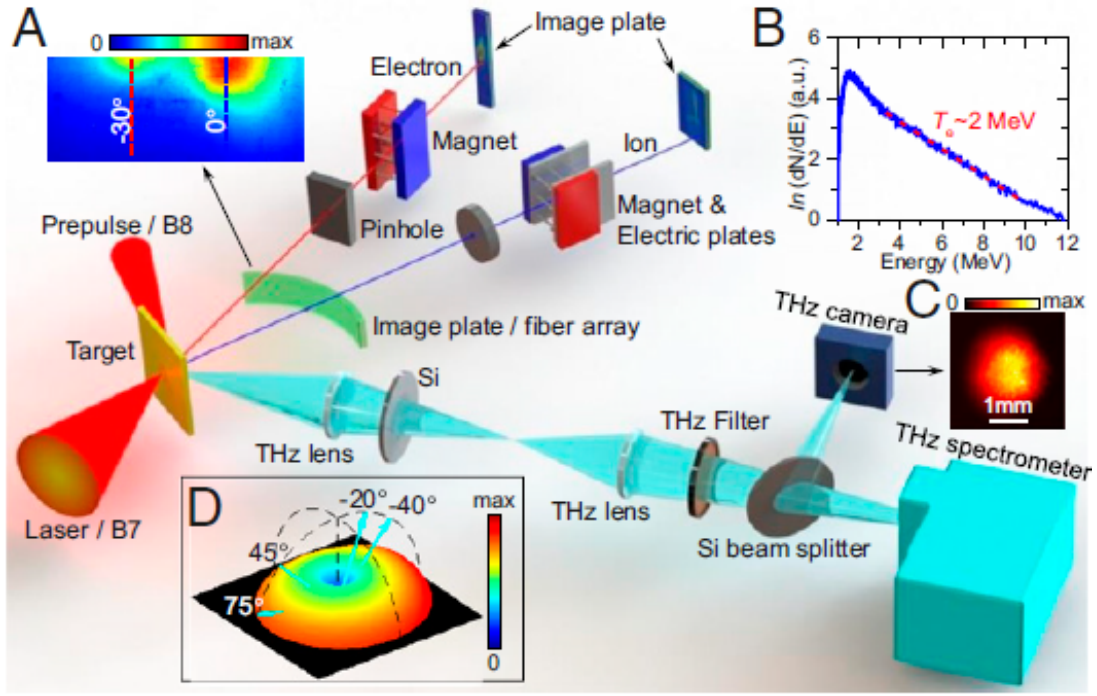
University of Strathclyde

Experiments carried out at the Rutherford Appleton Laboratory using Vulcan laser

Generate the most powerful terahertz (THz) radiation with energy up to ~ a few tens of mJ.

Generated by high-intensity, picosecond laser pulse irradiation onto a metal foil.

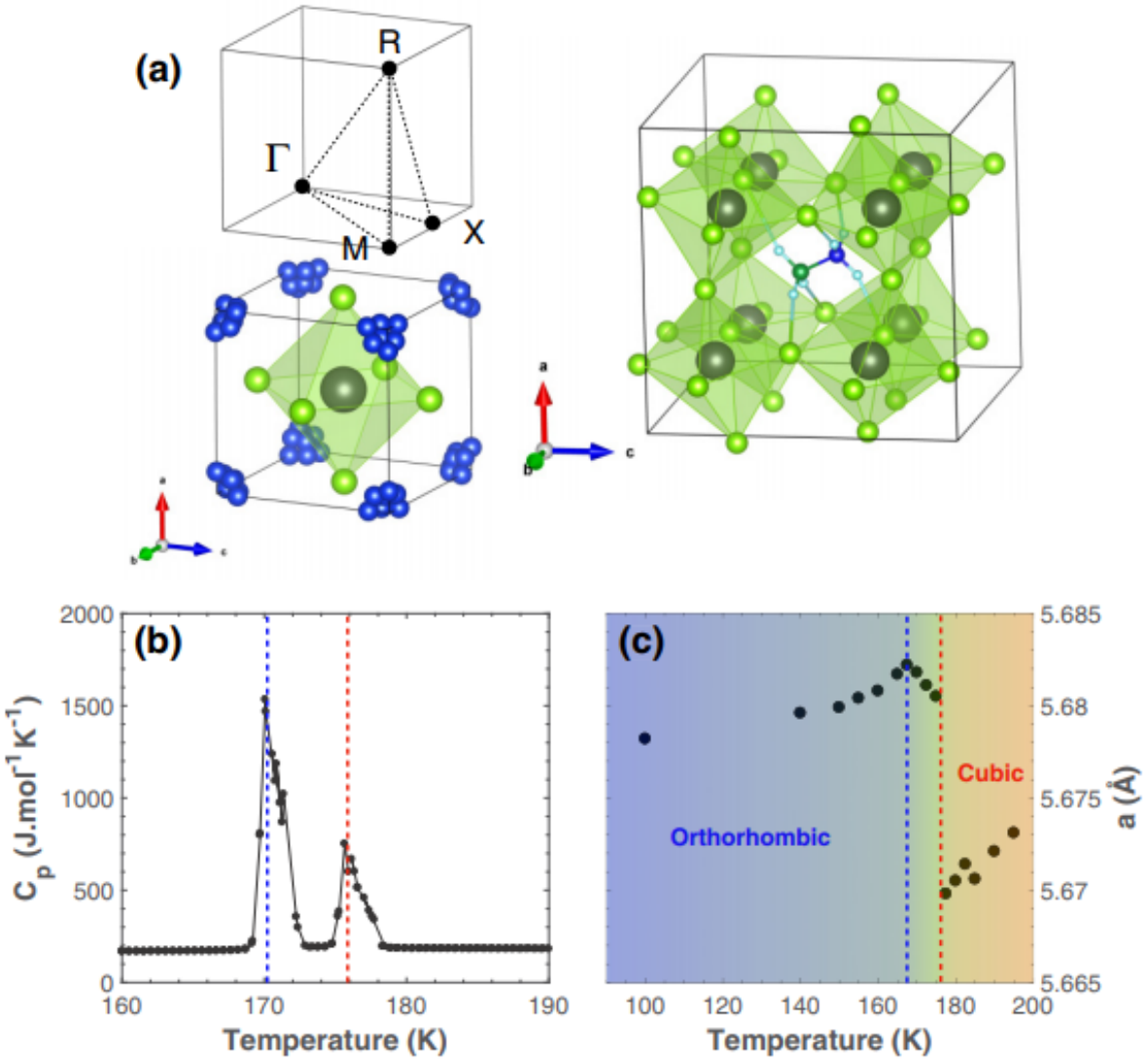
Presented first THz source that enables a THz pulse energy up to tens of mJ.



Multimillijoule coherent terahertz bursts from picosecond laser-irradiated metal foils

Guoqian Liao, Yutong Li, Hao Liu, Graeme G. Scott, David Neely, Yihang Zhang, Baojun Zhu, Zhe Zhang, Chris Armstrong, Egle Zemaityte, Philip Bradford, Peter G. Huggard, Dean R. Rusby, Paul McKenna, Ceri M. Brenner, Nigel C. Woolsey, Weimin Wang, Zhengming Sheng, and Jie Zhang

Perovskite research



Manila Songvilay

Chris Stock

THE UNIVERSITY OF EDINBURGH

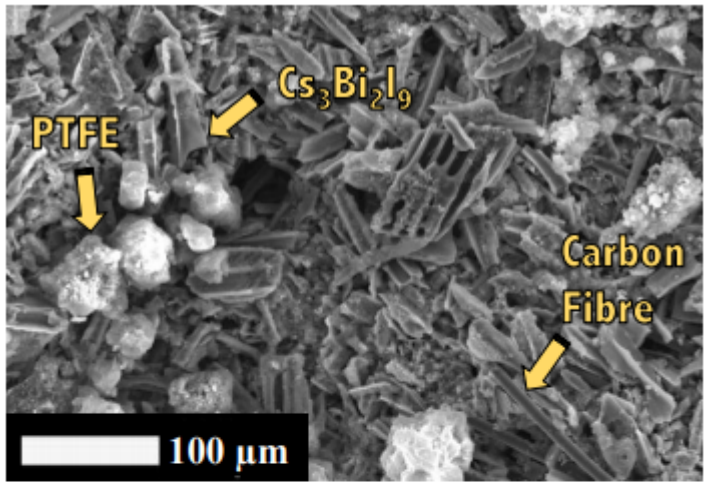
Lead halide hybrid perovskites consist of an inorganic framework hosting a molecular cation located in the interstitial space.

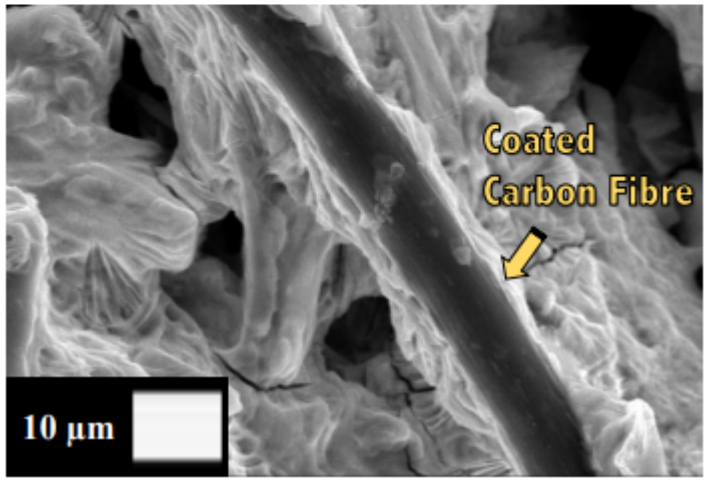
Promising materials for photovoltaic applications: high power conversion efficiency exceeding 20%.

Interaction between the molecular cation and the inorganic framework implicated as influential for the electronic properties.

Use elastic neutron scattering to evidence of a coupling between the inorganic framework and the molecular cation.

Fuel cells / materials research

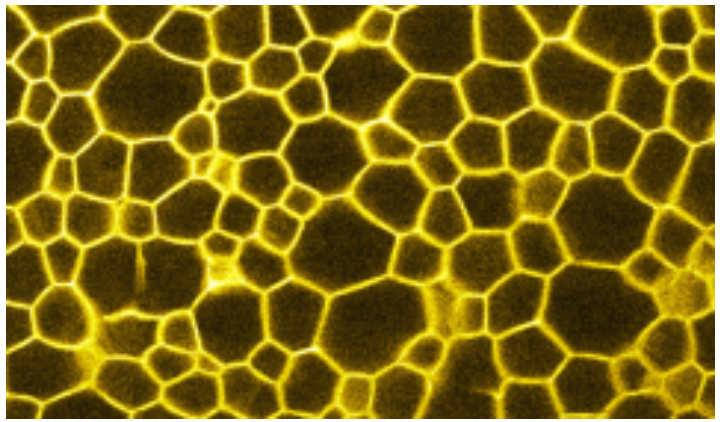




Intermittent energy sources and growing market for hybrid electric vehicles, motivating research into high performing and sustainable energy storage devices.

Supercapacitors have high energy densities compared to conventional capacitors and rapid charge-discharge rates and long-life cycle stabilities compared to batteries and fuel cells.

Demonstrated, the economical fabrication, superior capacitance, and outstanding cycle stability of the $Cs_3Bi_2I_9$ prove its excellent performance as the active supercapacitor electrode material.



Job Thijssen

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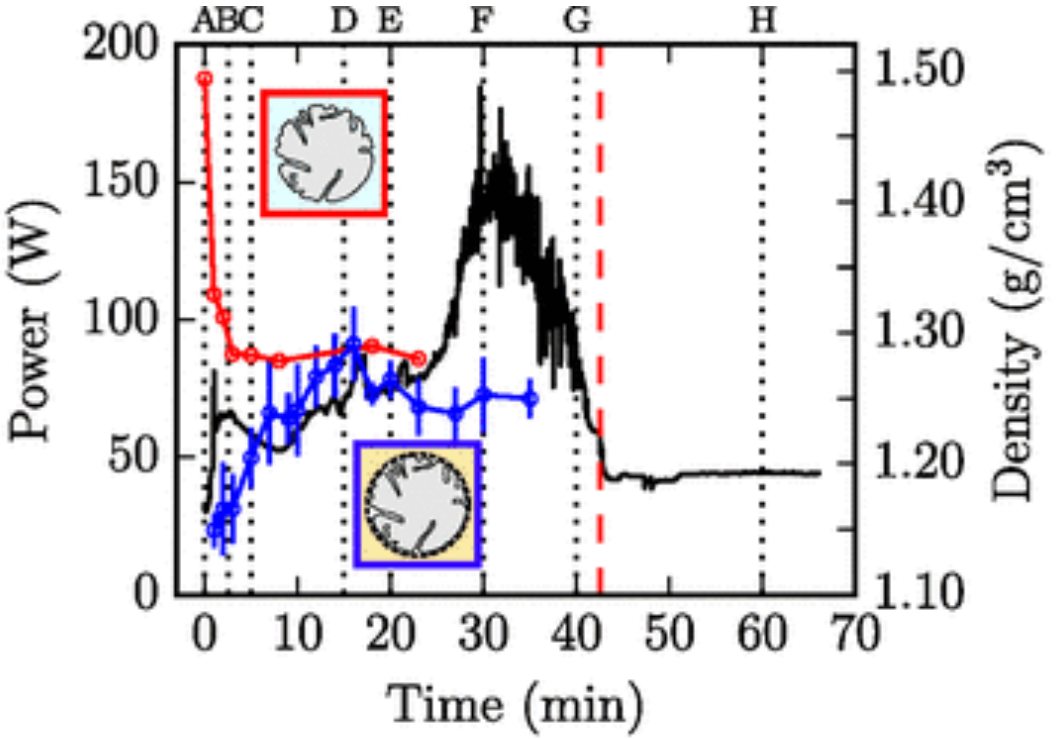
Energy efficiency

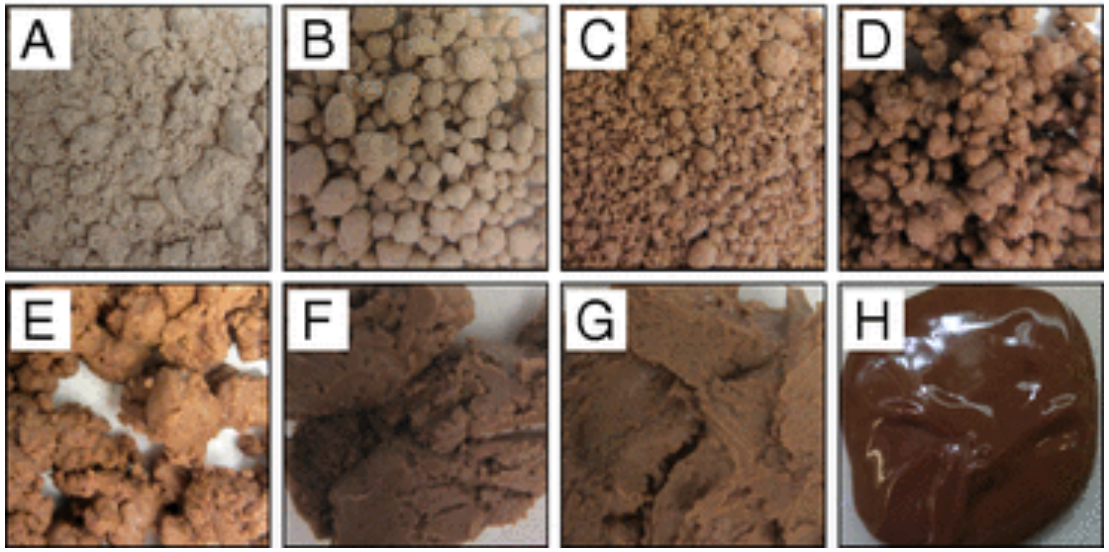
Wilson Poon

Conching consumes a significant amount of energy.

Hope that our work can help reduce this consumption and lead to greener manufacturing of the most popular confectionary product in the world.

Have been able to derive new insights into the fundamental physics of how complex mixtures flow, and then use these insights to help industries very far removed from chocolate manufacturing.





Conching chocolate is a prototypical transition from frictionally jammed solid to flowable suspension with maximal solid content

Elena Blanco, Daniel J. M. Hodgson, Michiel Hermes, Rut Besseling, Gary L. Hunter, Paul M. Chaikin, Michael E. Cates, Isabella Van Damme, and Wilson C. K. Poon

Energy efficiency

University of St Andrews

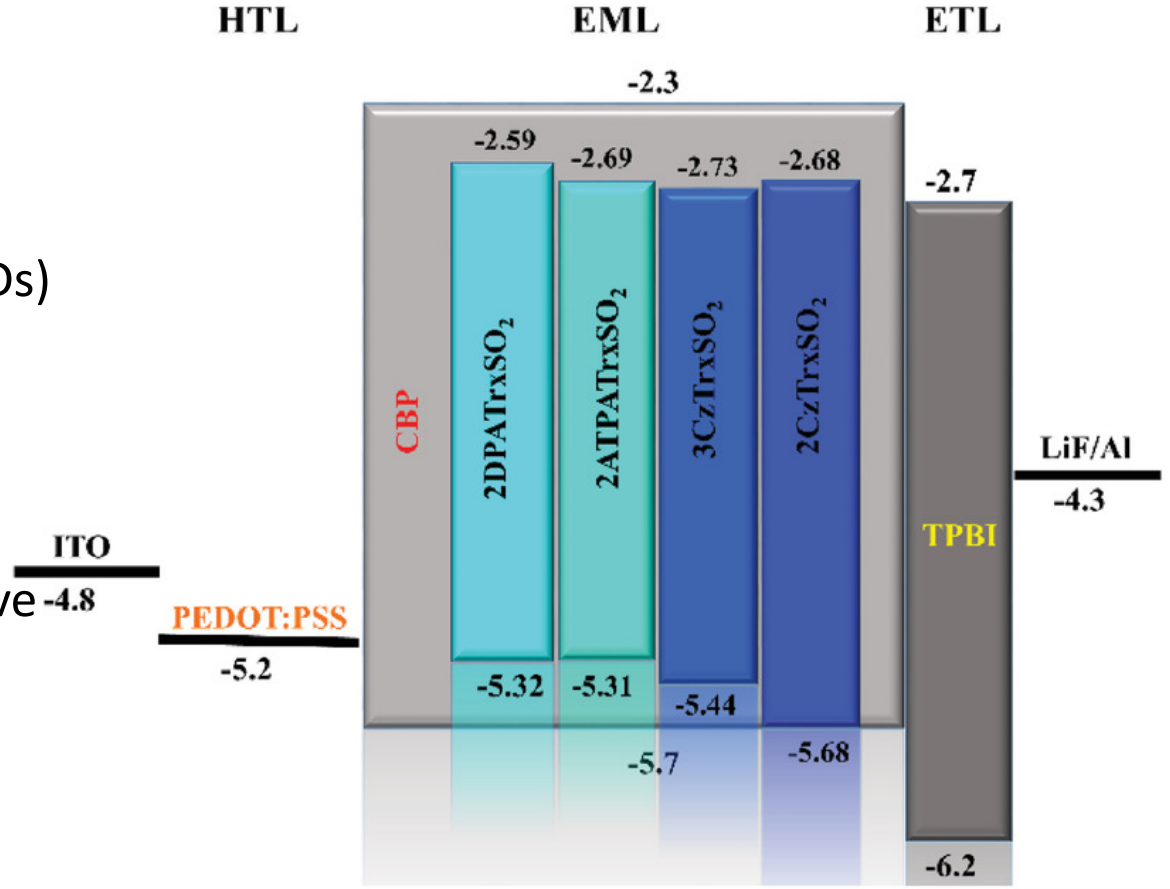
Ifor Samuel

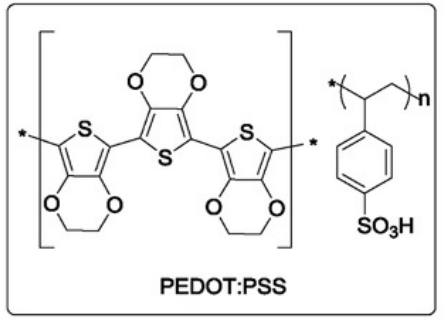
For organic light-emitting didoes (OLEDs) in displays and lightning applications.

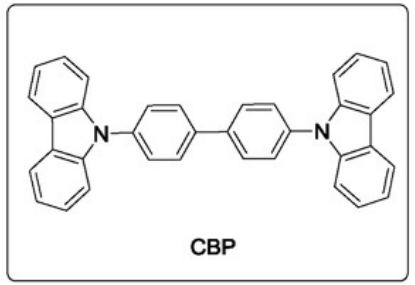
Unmet need: blue materials with good efficiency with excellent color purity, simple processing, and high thermal stability

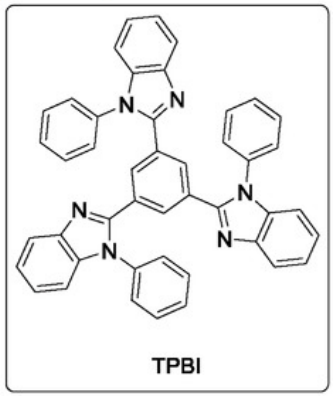
Features are typically mutually exclusive in practice.

Identified four novel green and blue light-emitting materials based on a monothiatruxene core - reported with performance in solution-processed OLEDs.









Monothiatruxene-Based, Solution-Processed Green, Sky-Blue, and Deep-Blue Organic Light-Emitting Diodes with Efficiencies Beyond 5% Limit

Michal R. Maciejczyk, Shuyu Zhang, Gordon J. Hedley, Neil Robertson, Ifor D. W. Samuel, Marek Pietraszkiewicz

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