

# MAnufacture of Safe and Sustainable Volatile Element Functional Materials

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## Research Highlights

**Triboelectric nanogenerators for wearable applications** Researchers at the University of Surrey in the **Advanced Technology Institute** and **Functional Nanomaterials** group have demonstrated a wearable, self-sufficient electronic system based on triboelectric nanogenerators (TENGs), energy generating devices which work on



*Energy Environ Sci*, 2017, 10, 1801-1811

the principle of producing usable electricity from the static charge developed between different materials in contact through friction. The Surrey work incorporates TENG technology into 'smart' items of clothing and shoes which allow energy to be generated by the wearer's movements, with potential applications in low power consumption micro/nano-systems including mobile sensors and portable personal electronics. Contact: [s.silva@surrey.ac.uk](mailto:s.silva@surrey.ac.uk), [r.dorey@surrey.ac.uk](mailto:r.dorey@surrey.ac.uk)

**Thermoelectric Oxides** MASSIVE project researchers and colleagues at the University of Manchester have published a comprehensive review of TE oxides, including precursor production, processing/properties relationships, commonly used oxide systems and future

*Thermoelectric Mats & Devices*, RSC Energy & Environ, Vol. 2017-Jan, Issue 17, 60-82

commercialisation of these materials. Contact: [robert.freer@manchester.ac.uk](mailto:robert.freer@manchester.ac.uk)

challenges for scaling up the

*In this issue we feature some of the recent journal articles arising from projects aligned with MASSIVE carried out at our academic partners at Manchester, QMUL and Surrey.*

**Processing of TE materials** A recent paper from colleagues at Queen Mary University of London investigates the feasibility of processing thermoelectric materials by flash sintering, involving direct high heating rate Joule heating of green compacts without the use of a graphite die and avoiding bypassing of the current through the die, which occurs in a conventional SPS system. Promising results were obtained with flash sintering of a magnesium silicide stannide

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compound, with significant lowering of the onset densification temperature and rapid densification in a controllable and repeatable manner. Flash sintering could open a new way for rapid densification of dense nanostructured and/or textured TE materials with low electrical resistivity by optimising the distribution or removal of the surface oxidation of the powder grains. Contact: [m.j.reece@qmul.ac.uk](mailto:m.j.reece@qmul.ac.uk)

## MagMat Collaboration at QMUL

Professor Mike Reece and Dr Salvatore Grasso in the Materials Department at Queen Mary University of London are leading the **MagMat** project, a unique UK capability supported by EPSRC and QMUL that extends materials engineering in a strong magnetic field to new synthesis and processing techniques, with a field strength of up to 15 T and upper temperature of 700°C. Recent developments include installation of a custom built Hall coefficient measurement system and a fully functional computer-controlled stage for achieving a rotating magnetic field, producing materials having crystallographic alignment along any direction.



The facility will support research activities on thermoelectrics and the MagMat team also welcomes expressions of interest in collaboration from researchers in other universities and in industry. [www.magmat.uk](http://www.magmat.uk)  
Contact: [m.j.reece@qmul.ac.uk](mailto:m.j.reece@qmul.ac.uk)



## Sustainable Functional Materials Conference



Following on from the **inaugural SFM meeting** held in Scarborough in 2016, **SFM2018** will be held on 17<sup>th</sup> and 18<sup>th</sup> April 2018 in Weston-Super-Mare, Somerset, UK. The conference will be co-chaired by Robert Dorey (Surrey) and Ian Reaney (University of Sheffield),

principal investigators of the EPSRC projects **MASSIVE** and **SUBST**, respectively. SFM2018 will focus on the functional materials substitution and sustainability issues likely to become critical over the next decade, with sessions covering piezoelectric and thermoelectric materials and devices, energy harvesting, properties and characterisation, sustainability and risk, and scale-up of processing and manufacturing techniques.

Invited speakers include Andrew Bloodworth (British Geological Survey); Rebecca Boston (University of Sheffield); Steve Dunn (Deregallera Ltd) and Jon-Paul Maria (North Carolina State University). Registration and abstract submission are now open via the **conference webpage**. We look forward to seeing you at SFM2018. Contact: [sfm2018@surrey.ac.uk](mailto:sfm2018@surrey.ac.uk)

Events	Collaborate with MASSIVE	Contact Us
<p><b>MASSIVE Industrial Advisory Group Meeting</b> 13<sup>th</sup> March 2018, Institute of Materials, Minerals &amp; Mining, London</p> <p><b>Sustainable Functional Materials SFM2018</b> 17-18<sup>th</sup> April 2018 Weston-Super-Mare, Somerset, UK</p>	<p>The project team is continually looking to grow industrial engagement through its advisory group, extending its industry partner base and developing new collaborative projects. Co-funding from MASSIVE is available for industry collaborations, including short-term <b>Feasibility Studies</b> which enable exploration of novel manufacturing concepts and evaluation of their potential to lead to longer-term strategic <b>Industry Development Projects</b>. Please get in touch if you would like to discuss how we can work together.</p>	<p><b>Professor Robert Dorey</b> MASSIVE project lead <a href="mailto:r.dorey@surrey.ac.uk">r.dorey@surrey.ac.uk</a> +44(0)1483 689608</p> <p><b>Lynn Boniface</b> MASSIVE liaison <a href="mailto:l.boniface@surrey.ac.uk">l.boniface@surrey.ac.uk</a> +44(0)1483 682359</p>