

MASSIVE Newsletter

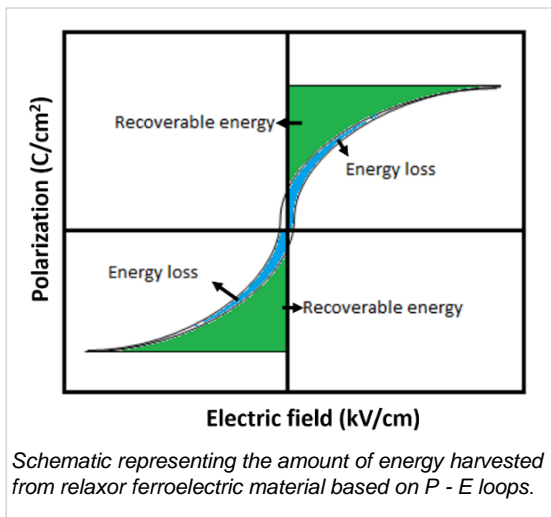
MA nufacture of Safe and Sustainable Volatile Element Functional Materials

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Lead-free functional ceramics for energy storage

The focus of MASSIVE-related research at Queen Mary University of London is to develop lead-free functional oxides for energy harvesting applications, mainly $\text{Ba}_{0.5}\text{Na}_{0.5}\text{TiO}_3$ (BNT)-based relaxor ferroelectrics. At present, lead-based thin films with antiferroelectric behaviour have high energy storage capacity of 14 J/cm^3 . However, since it is not feasible to obtain similar values in the bulk material and lead is toxic in nature, we have selected a lead-free BNT-based relaxor ferroelectric system due to its high spontaneous polarization ($>30 \mu\text{C/cm}^2$), which is the most crucial requirement for energy harvesting. A drawback of this BNT system is that the transition temperature where ferroelectric symmetry changes to antiferroelectric symmetry lies above 100°C . In order to improve the energy efficiency and lower the depolarization temperature, a series of A site and B site doping experiments was carried out in the BNT system to shift the transition temperature closer to room temperature without significantly compromising the polarization values. At present, an energy storage of close to 0.5 J/cm^3 has been achieved in bulk BNT-based ceramics. Further research is ongoing to further improve the energy storage capacity.



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Conflict minerals

Conflict minerals (defined as minerals for which a significant share of resources are located in conflict-affected and high-risk areas, where they may contribute, directly or indirectly, to armed conflict, including terrorist financing, human rights violations and hinder economic and social development) specifically include tin, tungsten, tantalum, and gold. Conflict minerals were flagged as a concern within the MASSIVE project at the last meeting of the project's Industrial Advisory Board in February 2016. A short survey was circulated by **Sophie Rocks**, MASSIVE co-investigator at Cranfield University, to the community to determine the extent of concerns. The majority of respondents were from the industrial field (using substances or preparations) with the minerals being mainly used for the manufacture of devices. There were 22 survey responses of which 73% identified that they were aware of the term **conflict mineral** before the survey, with 64% aware of the **US Dodd-Frank Wall Street Reform and Consumer Protection Act (2010)** and only 55% aware of the **OECD Due Diligence Guidance** for conflict minerals. Responders identified that their work involved the use of gold and tin (equal usage) with fewer using tungsten and tantalum. The users were asked to identify whether they used metals associated with conflict minerals; their use across the community was ranked as platinum, bismuth, antimony (=), niobium (=), palladium, tellurium, and selenium. More detailed analysis of the responses is being collated and will be passed to UK Government to help inform EU and OECD discussions on conflict minerals. The aim of this correspondence is to raise awareness about the impacts that regulation in this field could have on manufacturing within the UK.

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Conferences & Events

EPSRC Thermolectric Network Meeting

14-15 February 2017
University of Manchester

PIEZO2017: Electroceramics for End-users IX Conference

19-22 February 2017, Madrid

MASSIVE Industrial Advisory Group Meeting

21 March 2017
Institute of Materials, Mineral & Mining, London

Collaborate with MASSIVE

The MASSIVE project team is continually looking to grow its **industrial engagement** through maintaining an active **Industrial Advisory Group**, expanding its industry partner base and developing new collaborative projects. Co-funding from MASSIVE is available for collaborative projects, including short-term **Feasibility Studies** enabling exploration of novel manufacturing concepts and evaluation of their potential to lead to longer-term strategic **Industry Development Projects**. Please contact us if you would like to discuss opportunities for collaboration.

Contact Us

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