



## **Project Title**

### **Synthesis and characterisation of functionalized hybrid composites and molecule-based magnetocaloric materials**

A PhD studentship is available in the group of Professor Euan K. Brechin, School of Chemistry, University of Edinburgh, see <https://www.chem.ed.ac.uk/staff/academic-staff/professor-euan-k-brechin-frse>.

This PhD project corresponds to the Doctoral Candidate no. UK2 (DCUK2) vacancy notice of the MSCA “Molecule-based magneto-/electro-/mechano-calorics” ([MolCal](#)) Doctoral Network composed of 8 beneficiaries and 6 associated partners from France, Germany, Greece, Italy, Netherlands, Spain, United Kingdom and United States. The overarching scientific goal of MolCal is the preparation of new molecular assemblies with outstanding potential as caloric materials for refrigeration and heat pump applications at near-ambient and very-low temperature, and their exploitation in prototype devices. The successful candidate will enrol in the PhD degree programme in Chemistry at the University of Edinburgh and be employed for 36 months within MolCal. This multidisciplinary and multisectoral network with strong research and training excellence, will ensure optimal knowledge transfer via shared hosting and joint supervision. A personalised career development plan will be established to support the needs of the candidate.

## **We offer**

The gross salary (not including social security deductions) will be £33,195-42,773 per annum plus mobility (£5,359 per annum) and family allowances (£5,984) as applicable and in-line with the EC rules for MSCA Doctoral Networks. The studentship is fully funded for 36 months.

## **Project Summary**

The academic push to develop molecule-based materials for cryogenic refrigeration stems from society’s requirement to find a suitable replacement for Helium, a finite and non-renewable resource. The Helium shortage originates from the high demand for <sup>3</sup>He, which is employed for sensing neutrons and nuclear threat detection. Recently, the shortage has also extended to the more abundant <sup>4</sup>He, whose supply is characterized by tight conditions in the face of growing demand driven by, for example, the market for cryogen-free magnetic resonance imaging scanners in hospitals. The EU Critical Raw Materials List includes Helium due to concerns surrounding its supply, and it is therefore of significant strategic interest to discover novel magnetocaloric (MC) materials that will secure an alternative to cryogenic refrigeration based on Helium technology. In the UEDIN-based project the Doctoral Candidate will: (a) prepare thermally conducting hybrid MC composites, (b) functionalise molecule-based MC materials for surface deposition on Si, (c) functionalise Si substrates for the deposition of molecule-based MC materials, and (d) perform surface characterisation of the deposited molecule-based MC materials.

The selected Doctoral Candidate will be hired by UEDIN and will be based at the EaStCHEM School of Chemistry in Edinburgh (United Kingdom). There will also be secondments with experienced MolCal partners at: CSIC in Zaragoza (Spain; M. Evangelisti) for thermal measurements, CNR in Bologna (Italy; G. Lorusso) for grafting onto microrefrigerators, and Quantum Design, Inc. (United States; R. K. Dumas) for training on surface characterization.

## **We seek**

The candidate should have a strong background in materials characterisation or molecular simulation, with a Master’s degree in Chemistry or related fields. Further information for PhD enrolment at The University of Edinburgh, including English language requirements, can be found [here](#).

Specific eligibility criteria of the Horizon Europe MSCA programme apply, including:

PhD status: applicants must not already be in possession of a doctoral degree at the date of the recruitment.

Mobility rule: applicants must not have resided or carried out their main activity in the country of the host organisation for more than 12 months in the 3 years immediately before their recruitment date.

### **How to apply**

In the first instance, the initial application (including cover letter outlining your suitability for the PhD, transcripts and CV) should be directed to:

Professor Euan K. Brechin, School of Chemistry, University of Edinburgh, David Brewster Road, Edinburgh EH9 3FJ, UK.

[e.brechin@ed.ac.uk](mailto:e.brechin@ed.ac.uk)

The position will remain open until 21<sup>st</sup> April 2024.

Additional information is available on the MolCal website <https://molcal.eu/dcs/>

### **IMPORTANT**

Before Submitting your cover letter, transcripts and CV, please complete the online [School of Chemistry Equality, Diversity and Inclusion Form 2024](#).

**The form will automatically generate a unique “Receipt Number” that you MUST include in your cover letter.**

### **Equality and Diversity**

The School of Chemistry holds a Silver Athena SWAN award in recognition of our commitment to advance gender equality in higher education. The University is a member of the Race Equality Charter and is a Stonewall Scotland Diversity Champion, actively promoting LGBT equality. The University has a range of initiatives to support a family friendly working environment. See our University Initiatives website for further information. University Initiatives website: <https://www.ed.ac.uk/equality-diversity/help-advice/family-friendly>