



Molecule-based materials for cryogenic refrigeration

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

The studentship is fully funded for 42 months by the University of Edinburgh and covers tuition fees and an annual stipend (starting at £18,662 per annum) for a candidate satisfying EPSRC residency criteria. <https://www.ukri.org/councils/esrc/career-and-skills-development/funding-for-postgraduate-training/eligibility-for-studentship-funding/#contents-list>

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 ^3He , which is employed for sensing neutrons and nuclear threat detection. Recently, the shortage has also extended to the more abundant ^4He , whose supply is characterised 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. This PhD project will examine the synthesis of high symmetry Transition Metal and Lanthanide Metal molecules that display an enhanced magnetocaloric effect and may therefore act as cryogenic refrigerants. Candidates should have a MSc degree in Chemistry, with experience in synthetic chemistry and materials characterisation.

In the first instance, the initial application (including cover letter and CV) should be directed to: Professor Euan Brechin, School of Chemistry, University of Edinburgh, David Brewster Road, Edinburgh EH9 3FJ, UK. ebrechin@ed.ac.uk
The position will remain open until filled.

References

A $\{\text{Gd}_{12}\text{Na}_6\}$ molecular quadruple-wheel with a record magnetocaloric effect at low magnetic fields and temperatures. T. G. Tziotzi, D. Gracia, S. J. Dalgarno, J. Schnack, M. Evangelisti, E. K. Brechin, C. J. Milios. *J. Am. Chem. Soc.*, **2023**, *145*, 7743-7747.

Odd and Even Numbered Ferric Wheels. D. J. Cutler, A. B. Canaj, M. K. Singh, G. S. Nichol, S. H. Hansen, D. G. Alcalde, S. Piligkos, H. Nojiri, M. Evangelisti, J. Schnack, E. K. Brechin, *Adv. Sci.*, **2023**, 2304553.

IMPORTANT

Before Submitting your cover letter 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>