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Research Interests: synthesis of solids, electronic and magnetic properties of solids, X-ray and neutron diffraction, structure-property relationships

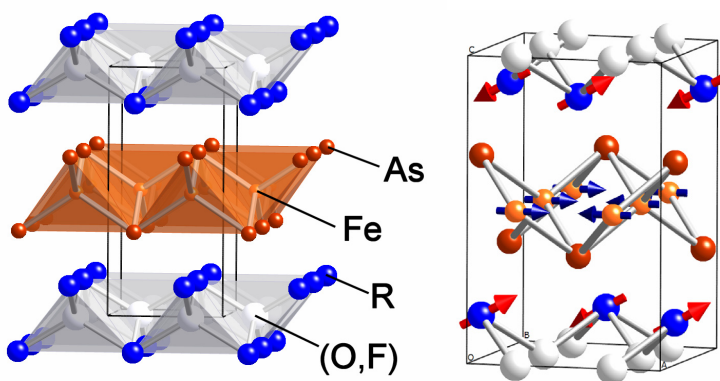


We use solid-state chemistry methods to identify, synthesise and characterise new materials with interesting magnetic and electronic properties. The aim is to understand the interplay between composition, structure and physical properties, and to use this to design improved functional materials.

Recent areas of interest are iron pnictide high-temperature superconductors and magnetic insulators that may exhibit magnetoelectric coupling. Other areas of interest include materials for thermoelectric power generation and refrigeration, and magnetoresistance materials.

Iron Pnictide High- T_c Superconductors

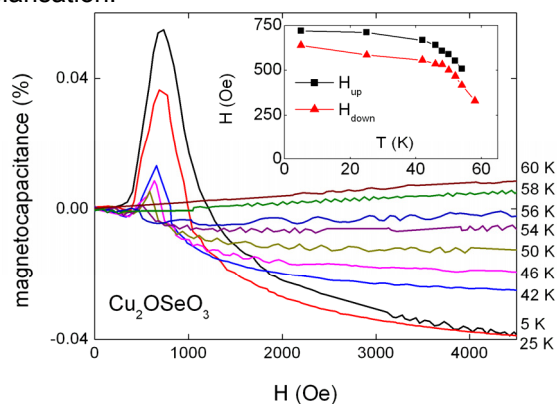
These materials were discovered in early 2008 and are a current hot topic in solid-state chemistry. Our work focuses on the synthesis and characterisation of new superconductors based on tetrahedral iron pnictide layers.



(Left) Crystal structure of the $RFeAs(O,F)$ high- T_c superconductors (R = Lanthanide). (Right) Coupled Nd/Fe spin-ordering in the parent material $NdFeAsO$.

Magnetoelectric Materials

This work is aimed at designing new insulating ferromagnetic materials that may show a large coupling between magnetism and electric polarisation.



Evidence for magnetoelectric coupling in the cubic ferrimagnetic insulator Cu_2OSeO_3 . The peak corresponds to a metamagnetic transition.

All research is underpinned by detailed structural investigations carried out at the central neutron and synchrotron facilities such as ISIS and Diamond near Oxford and the ILL and ESRF in Grenoble, France. We are also associated with the Centre for Science at Extreme Conditions (www.csec.ed.ac.uk).

SELECTED RECENT PUBLICATIONS

1. Coupled spin-ordering in the Ln_2LiRuO_6 double perovskites, S.J. Makowski, J.A. Rodgers, P.F. Henry, J.P. Attfield and J.W.G. Bos, *Chemistry of Materials* **21**, 264 (2009).
2. Magnetoelectric coupling in the cubic piezoelectric ferrimagnet Cu_2OSeO_3 , J.W.G. Bos, C.V. Colin and T.T.M. Palstra, *Physical Review B* **78**, 094416 (2008).
3. High pressure synthesis of late rare-earth $RFeAs(O,F)$ superconductors: R = Tb and Dy, J.W.G. Bos, G.B.S. Penny, J.A. Rodgers, D.A. Sokolov, A.D. Huxley and J.P. Attfield, *Chemical Communications*, **3634** (2008).
4. Structures and thermoelectric properties of the infinitely adaptive series $(Bi_2)_m(Bi_2Te_3)_n$, J.W.G. Bos, H.W. Zandbergen, M. Lee, N.P. Ong, and R.J. Cava. *Physical Review B* **75**, 195203 (2007).
5. Superconductivity in Cu_xTiSe_2 , E. Morosan, H.W. Zandbergen, B.S. Dennis, J.W.G. Bos, Y. Onose, T. Klimczuk, A.P. Ramirez, N.P. Ong and R.J. Cava. *Nature Physics* **2**, 544 (2006).