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**Magnetic engineering with molecular bricks**

STEPHEN BLUNDELL, University of Oxford

Magnetic materials can be constructed using molecular components to build up novel and unusual architectures. This approach provides an exciting opportunity for exploring the physics of magnetism. Gaining control of the building blocks of magnetic materials and thereby achieving particular characteristics will make possible the design and growth of bespoke magnetic devices. While progress in the synthesis of molecular materials, and especially coordination polymers, represents a significant step towards this goal, the ability to tune the magnetic interactions within a particular framework remains in its infancy but promising advances are being made, including the production of single molecule magnets and a variety of extended structures. We have recently found a chemical method which achieves dimensionality selection via preferential inhibition of the magnetic exchange in an S = 1/2 antiferromagnet along one crystal direction, switching the system from being quasi-two- to quasi-one-dimensional while effectively maintaining the nearest-neighbour coupling strength [1]. We have also demonstrated that single molecule magnets can be used to store quantum information and have devised a strategy for extending the spin coherence time by chemical adjustment [2]. Very recently we have found that introduction of a molecular spacer layer can produce a greater than fourfold enhancement in the superconducting transition temperature of iron selenide [3]. The experimental techniques used in this work include ESR, muSR and high magnetic fields.

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