

Modulating magnetic anisotropy in coordination complexes using hydrostatic pressure

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Large magnetic anisotropy arising from a single 3d transition metal ion in a suitable ligand field [1], and high pressure studies of metal complexes [2] are both hot topics in coordination chemistry. The former offers the possibility of using synthetic chemistry to achieve magnetic anisotropies that are an order of magnitude beyond that observed in polynuclear assemblies. Meanwhile, pressure can flip the orientation of Jahn-Teller axes, and control magnetic ordering temperatures [3]. Herein, we will describe the structures and magnetic anisotropy of the compounds Na₅[Mn(L-tart)₂] \cdot 12H₂O (1, L-tart = L-tartrate) and [Ni(MeDABCO)₂Cl₃](ClO₄) (2, MeDABCO = 1-methyl-4-aza-1-azoniabicyclo[2.2.2]octanium cation). Compound 1 is a 3D network containing Mn(III) ions in a distorted octahedral coordination geometry, leading to observation of slow relaxation of the magnetisation under an applied magnetic field. Compound 2 is a discrete molecular complex with Ni(II) ions in an approximately trigonal bipyramidal coordination environment, which induces giant magnetic anisotropy. The ambient pressure crystallographic and magnetic properties of both compounds will be described, before discussion of the contrasting effects of hydrostatic pressure, which lead to very different changes in the magnetic anisotropy.

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