Spin crossover complexes and $[\text{M}_3\text{Ln}]$ macrocyclic single-molecule magnets

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Our interests in spin crossover (SCO) started when we identified that a dicobalt complex of a [2+2] Schiff-base macrocycle based on 3,6-diformylpyridazine, $L$, $[\text{Co}^{\text{II}}_2L(NCS)_2(SCN)_2]$, had unique SCO behaviour. Our focus in the area of SCO then moved on to the formation of related triazole-based complexes of iron(II). The first iron complex we prepared, $[\text{Fe}^{\text{II}}_2(\text{PMAT})_2](\text{BF}_4)_4\cdot\text{DMF}$, utilised a bis-terdentate triazole ligand, PMAT, and led to the first structural characterization of a mixed spin state dimetallic complex.

Figure: left $[\text{Co}_2L(NCS)_2(SCN)_2]$; middle $[\text{Fe}_2(\text{PMAT})_2](\text{BF}_4)_4\cdot\text{DMF}$; right $[\text{Zn}_2\text{Dy}(L^{\text{Pr}})_6(\text{NO}_3)_3(\text{MeOH})_3]$.

More recently we have also started exploring the controlled preparation of Single-Molecule Magnets (SMMs). Inspired by the [3+3] macrocycles described by Nabeshima and MacLachlan, we have prepared $\text{M}_3\text{Ln}$ SMMs using Schiff-base macrocycles such as $(L^{\text{Pr}})_6$ with approximate 3-fold symmetry.

This lecture will describe our recent results in the SCO and SMM fields. It will focus on self-assembling systems featuring transition metal complexes of (a) related triazole-based ligands, (b) new pyrazine-based ligands for SCO and (c) a new class of macrocyclic 3d-4f SMMs.

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