“Spin Injection” in Molecule-Based Materials toward Conducting Magnets

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The magnetic properties of a complex or a material usually result from cooperative effects between the magnetic spins. The choice of the linker between the spin carriers is therefore a crucial element to control, as it mediates the communication and interactions between them. The use of a redox-active bridging ligand as a linker is a particularly attractive strategy. By oxidation(s) or reduction(s), it can act as a control switch of the magnetic interactions. While in its diamagnetic state, it mediates usually weak magnetic interactions, in its radical form, it can promote a better spin delocalization inducing large magnetic interactions and in the same time, a good electronic conductivity which could lead to new high T_C conductive magnets. In this presentation, the design of new magnetic systems based on redox-active ligands will be discussed and illustrated by (i) dinuclear M(II) complexes, $[M_2(tphz)(tpy)_2](PF_6)_4$ (Left part of the Figure below; M = Co or Ni; tpy = terpyridine; tphz = tetrapyridophenazine) and (ii) a two-dimensional coordination network, $Cr(pyrazine)_2Cl_2$ (Right part of the Figure below).[1,2] The electronic and magnetic properties of these systems were described using different physical characterization techniques including X-ray spectroscopy (XAS and XMCD) in the hard X-ray range.

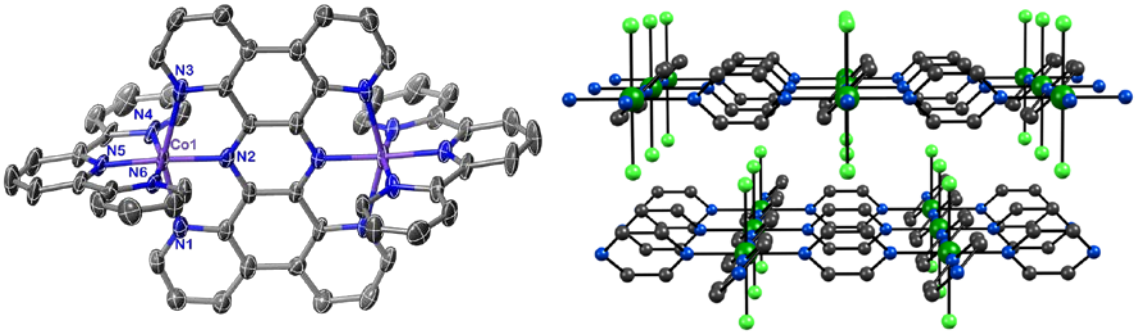

Figure Left: view of the molecular structure of the $[Co_2(tphz)(tpy)_2]^{4+}$ complex. Right: view of the 2D structure of $Cr(pyrazine)_2Cl_2$

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