From heptanuclear Fe(II), Ni(II) complexes to single-chain magnets

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In pentagonal bipyramidal geometry 3d metal complexes exhibit magnetic anisotropy[i] that is a key factor in magnetic materials. For instance, it is at the origin of the slow relaxation of magnetization in SMMs (Single Molecular Magnets)[ii]. We have considered a series of seven coordinate Fe and Ni complexes constructed with a neutral pentadentate cyclic ligand. (Figure 1). Five Nitrogen atoms located in equatorial positions maintain coordination geometry upon axial ligand substitution, which enables systematic modification of the coordination environment without compromising the geometry. These Fe(II) and Ni(II) complexes possess easy-axis of magnetization characterized by a negative D parameter depending on axial substituents.

We will show that association with other paramagnetic units can lead to the formation of different heteronuclear species. Trinuclear complex and 1-D coordination polymer were obtained in reaction of $[NiL^{N5}]^{2+}$ with $[Cr(L^{N3O2Ph})(CN)_2]^{-}$[iii] (Figure 1). The second one shows SCM behavior characterized by an energy gap for magnetization reversal (Δ_{eff}/k_B) about 50 K.

The series of $FeL^{N5}X_2$ and $NiL^{N5}X_2$, (X= Cl, Br, I, N_3, NCS, MeOH) complexes, as well as polynuclear compounds and their magnetic properties, will be presented.

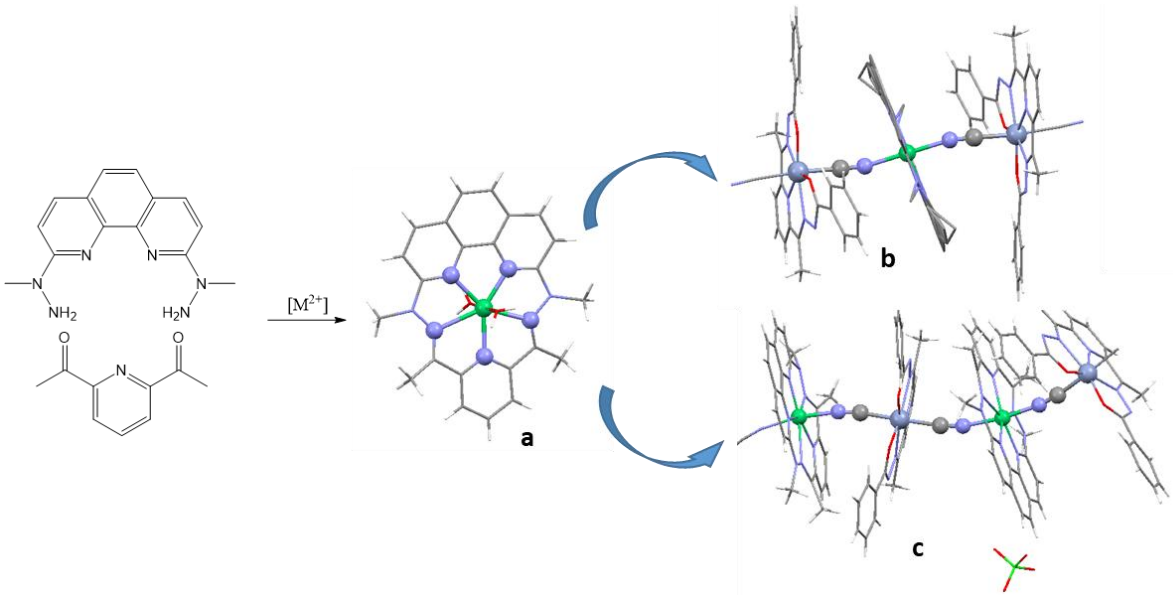

Figure 1.(a) $[NiL^{N5}(H_2O)_2]^{2+}$ complex, (b) Cr_2Ni complex (c) Ni(II)-Cr(III) chain

i A. K. Bar et al., *Coord. Chem. Rev.*, **2016**, *308*, 346.
ii D. Gatteschi, R. Sessoli, J.Villain, *Molecular Nanomagnets,* **2006**.
iii C.Pichon, B. Elrez, V. Béreau, C. Duhayon, J.-P. Sutter , *Eur. J. Inorg. Chem.* **2018**, 340.