Nano-magnetic Materials Based on Lanthanides

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Multimetallic rare-earth systems and especially Dy$^{III}$, Er$^{III}$-based materials have sparked much interest in the area of molecular magnetism due to the large intrinsic magnetic anisotropy of the lanthanide ions. When such a unique property is combined with a high-spin ground state ($S$) in a molecular complex, it causes slow relaxation of the magnetization as seen for Single-Molecule Magnets (SMMs). Lanthanide only SMMs are rare due to the difficulty in promoting the magnetic interactions via the overlapping bridging ligand orbitals with the contracted 4$f$ orbital of the ions. Toward the goal of inducing significant magnetic interaction between lanthanide ions and subsequently isolating high-energy barrier SMMs, our research is currently focused on the use of phenoxide bridges as superexchange pathways between spin carriers.$^{1-4}$ In addition, organometallic lanthanide sandwich complexes provided an alternative approach for understanding intriguing quantum mechanical properties of SMMs.$^{5-8}$

References: