X-ray Magnetic Circular Dichroism of Heteronuclear Complexes in Isolation

J. M. Hewer[1], M. Tombers[1], J. Lang[1], G. Niedner-Schatteburg[1], V. Zamudio-Bayer[2], T. Lau[2]

[1] *Fachbereich Chemie & Forschungszentrum OPTIMAS, Technische Universität Kaiserslautern, Germany*

[2] *Helmholtz-Zentrum Berlin für Materialien und Energie, BESSY II, Berlin, Germany*

hewer@chemie.uni-kl.de

The combination of 3d and 4f metals is widely considered as a promising approach for the synthesis of Single Molecule Magnets (SMM). In order to get fundamental insights into the magnetic properties of mixed 3d-4f heteronuclear complexes, we applied synchrotron based X-ray magnetic circular dichroism (XMCD) spectroscopy to ligand stabilized $[MnLnMn]H^+$ complexes (Ln = Nd, Eu, Gd, Dy, Lu) [1] when isolated as individual ions under cryo conditions.[2] Such investigations allow for a magnetic characterization of these complexes void of any surface or packing effects. The element selectivity of the XMCD technique allows to determine the contribution of the individual metals to the total magnetic moment of the molecules. Furthermore, sum rule analysis of the recorded XMCD spectra allows to decompose the total magnetic moment into its spin and orbital contributions.[3] The variation of the incorporated lanthanoid ions is at the center of interest and interpretation. The manganese ions seemingly do not affect the magnetism of the lanthanide ions.

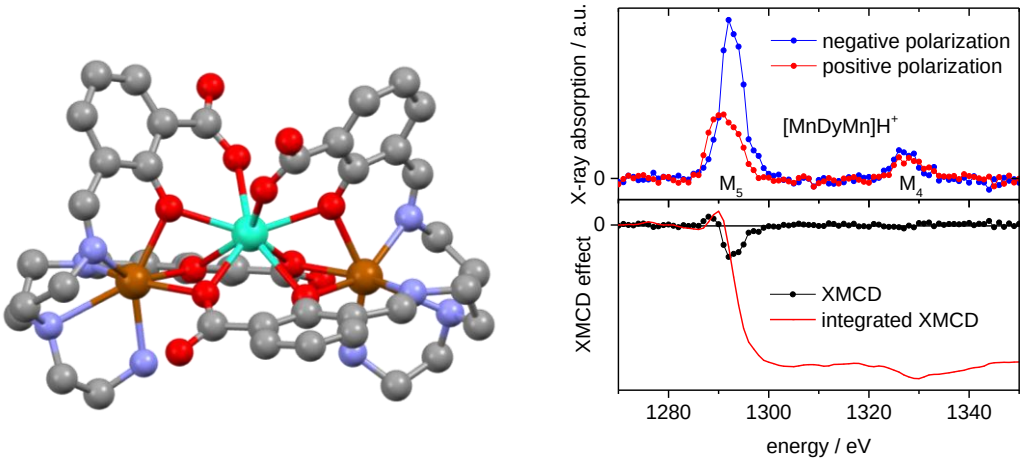

Figure 1: Left: Crystal structure of the 3d-4f mixed heterometallic complex [MnDyMn] (hydrogen atoms are omitted for clarity). Right: X-ray absorption spectra of $[MnDyMn]H^+$ for positive and negative circularly polarized light at the Dy $M_{4,5}$ absorption edge and the corresponding XMCD spectrum and the respective integrated XMCD signal.

[1] A. Bhunia et al., Inorg. Chem., 2012, 51, 9589-9597.
[2] S. Peredkov et al., J. Electron. Spectrosc. Relat. Phenom., 2011, 184, 113-118.
[3] J. Meyer et al., J. Chem. Phys., 2015, 143.