

Ferromagnetic Interaction in a One-Dimensional Fe(II) Complex: [Fe(μ -bpt)(μ -COOC₅H₄N)] · H₂O

Szu-Miao Chen (陳思妙)¹, Jey-Jau Lee (李之釗)², and Yu Wang (王瑜)¹

¹Department of Chemistry, National Taiwan University, Taipei, Taiwan

²National Synchrotron Radiation Research Center, Hsinchu, Taiwan

The discovery of a dodecanuclear Mn complex as the first “single-molecule magnet” (SMM) has given considerable impetus to research in the field of polynuclear complexes of paramagnetic transition metals. Another binuclear Mn(III) complex which presents one of the strongest intramolecular ferromagnetic interactions.(Figure 1).

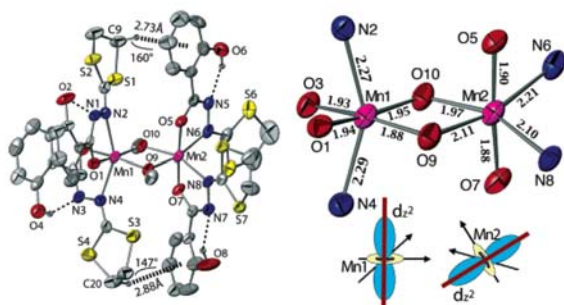


Figure 1. ORTEP view of Mn(III)₂(*i*-OMe)₂(HL)₄ (left) showing specific intramolecular hydrogen bonds. The other hydrogen atoms have been omitted for clarity. Thermal ellipsoids enclose 50% of the electron density. Selected distances (Å) are gathered in the partial view of the molecular core (right) with an indication of the relative orientation of Jahn-Teller elongated (d_{z^2}) axes around both Mn(III) atoms.

J. AM. CHEM. SOC., 128, 3140-3141, (2006)

We are currently working on the modulation of the magnetic interaction by modifications of the chemical bridge and/or peripheral ligand. Fortunately, with solvothermal synthesis we have successfully synthesized the one-dimensional chain complex [Fe(μ -bpt)(μ -COOC₅H₄N)] · H₂O (Figure 2).

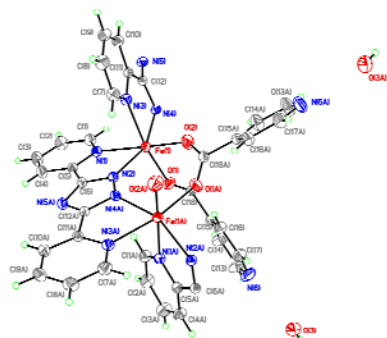


Figure 2. ORTEP view of [Fe(μ -bpt)(μ -COOC₅H₄N)] · H₂O with 30% thermal ellipsoids.

The hydrogen bonds between the packing water molecules and the ligands play an important role in the intermolecular interactions. After removing the waters,

the transition temperature increases and the ferromagnetic interaction becomes stronger. It means the molecular chains are closer. In order to know the packing structure will crash or not after removing water molecules, we use 01C XRD beamline to check the powder patterns of the one-dimensional complex. In summary, we can make sure that the packing structure will not crash without solvent and it can refill water molecules again.

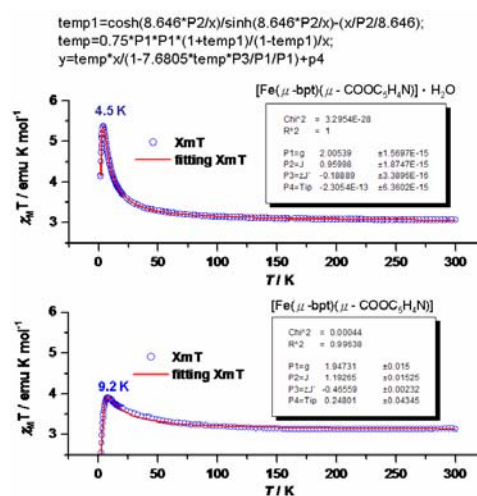


Figure 3. The magnetic measurement of complex [Fe(μ -bpt)(μ -COOC₅H₄N)] · H₂O with (above) and without (below) water molecules.

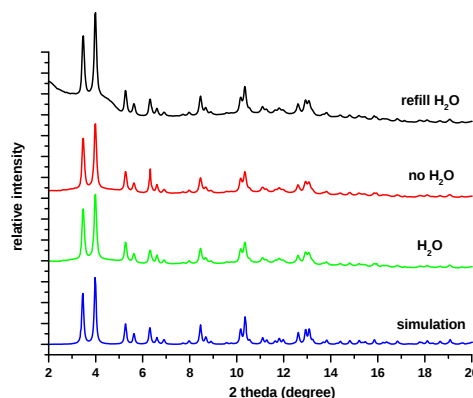


Figure 4. The XRD patterns of the chain complex [Fe(μ -bpt)(μ -COOC₅H₄N)] · H₂O.