Localized Interaction between the Magnetic Centers of $[Fe^{II}(\Delta)Fe^{II}(\Lambda)(ox)_2(Phen)_2]_n$

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The felid of molecular magnets has attractive lots of study due to the possible magnetic applications under sub-micrometer, such as magnetic RAM. $[Fe^{II}(\Delta)Fe^{II}(\Lambda)(ox)_2(Phen)_2]_n$ (denoted as FeII)is a newly discovered material which owns 1-D chain structure with two local distinguishable iron sites and weak interaction of π-stacked layers forming 3-D lattice structure. Neutron diffraction, magnetization, and specific heat measurements below 8.6K all support long-range anti-parallel spin arrangement but however shows ferromagnetic hysteresis. [1]

X-ray absorption spectroscopy (XAS) (Fig. 1.) shows the difference of our FeII single crystal and other standard iron oxide compounds. If we carefully check the whole energy regime of spectrum, only the peak of 710 eV could be referred to other reference materials. There is no other features could be easily compared. It shows that the complex chemical environment of two iron sites. We know that XANES could provide the variation of local electronic state. In the O K-edge, we could see only a peak located near 532 eV, however a additional spike shows at 360 eV. In the circumstance of iron, four nitrogen atoms and two oxygen atoms are surrounding with it and magnetic exchange interaction would be intermediated with oxalic ligand. The obvious difference in spectrum of O K-edge and Fe L-edge would provide a strong evidence to study the magnetic mechanism.

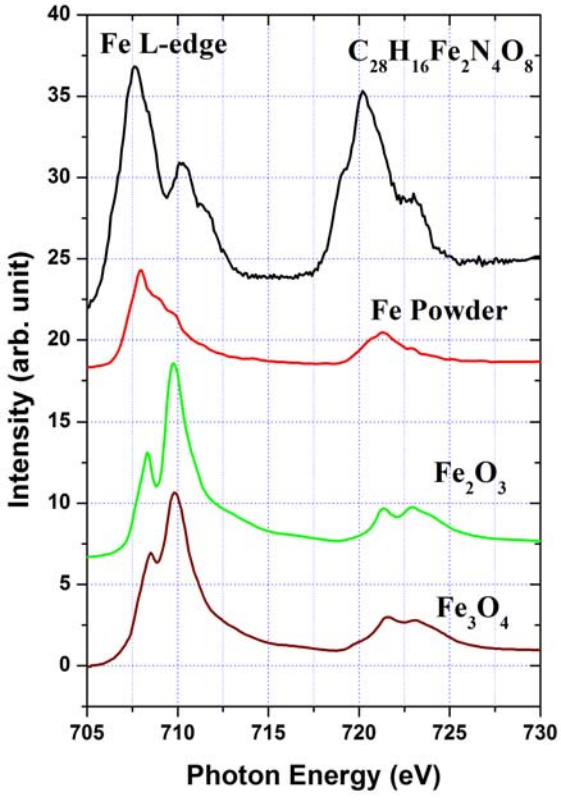

Figure 1. Fe L-edge XANES of $[Fe^{II}(\Delta)Fe^{II}(\Lambda)(ox)_2(Phen)_2]_n$ and standard samples

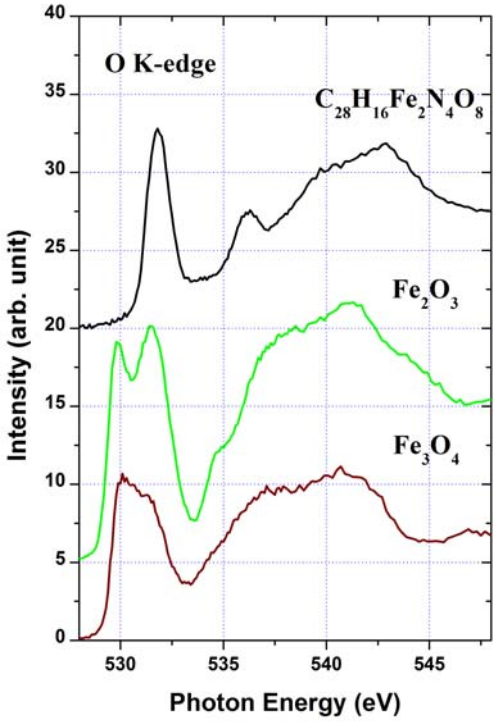

Figure 2. O K-edge XANES of $[Fe^{II}(\Delta)Fe^{II}(\Lambda)(ox)_2(Phen)_2]_n$ and standard samples

[1] C. J. Ho, J. L. Her, C. P. Sun, C. C. Yang, C. L. Huang, C. C. Chou, Lu-Lin Li, K. J. Lin, W. H. Li, J. W. Lynn, and H. D. Yang, Phys. Rev. B **76,** 224417 (2007).