

Electronic Structure of $\text{VO}_x[\text{C}_p\text{N}_q\text{H}_r]_n$ Nanowires

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Room temperature ferromagnetic nanotubes are synthesized and controlled by electron and hole doping in 2004[1]. $\text{VO}_x[\text{C}_p\text{N}_q\text{H}_r]_n$ are nano-scale fibers with stratiform structure. The x-ray absorption spectroscopy (XAS) could provide the local electronic structure of specific element. Here we measure the K-edge of oxygen and nitrogen and L-edge of vanadium to study the magnetic mechanism in between vanadium fiber and the precursor, Viologen. The samples could be synthesized by hydrothermal method precisely.

In FIG. 1, we perform a MCD measure on this vanadium fiber sample to check whether the ferromagnetic interaction exists or not. It is clear to see that obvious difference of peak intensity on vanadium L-edge and oxygen K-edge when different polarized lights. It could support the existence of different population on the spin polarized density. Moreover, we also perform K-edge of nitrogen to check the possibility of magnetic exchange through ligend in (a) of Fig.2. Based on the result of magnetization data, we find $\text{C}_p\text{N}_q\text{H}_r$ (Methyl Viologen, MV) which has magnetic hysteresis loop at room temperature, while MVCdI_4 -Y(2), EVCdI_4 and MV-2Cl don't. However, the absorption spectrum of different Viologen series is not very different. Based on all the absorption result of different edge, we have observed some features on the various series. It needs more investigation on these peculiar materials.

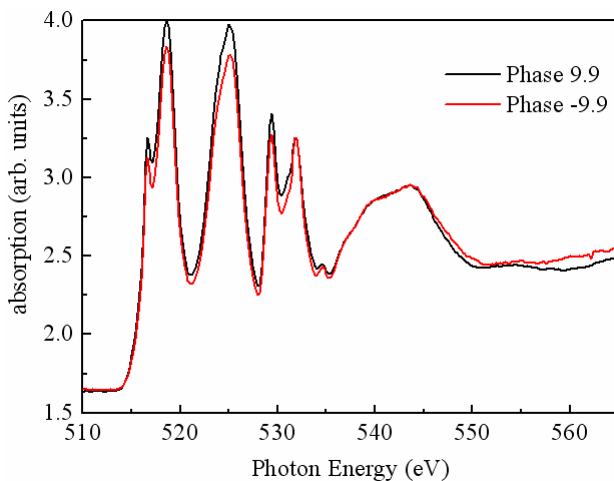


Figure 1. L-edge of Vanadium and K-edge of Oxygen in $\text{VO}_x[\text{C}_p\text{N}_q\text{H}_r]_n$

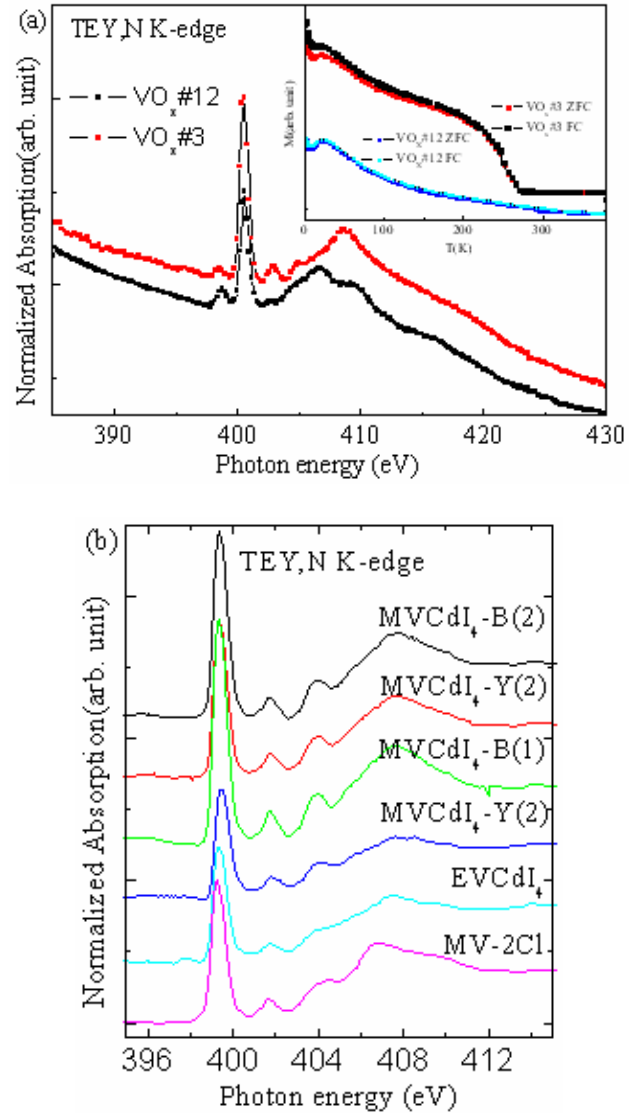


Figure 2. (a) The temperature-dependent magnetization of $\text{V}_2\text{O}_5\#3$ and $\text{V}_2\text{O}_5\#12$ in the inside; K-edge of Nitrogen in $\text{VO}_x[\text{C}_p\text{N}_q\text{H}_r]_n$; (b) K-edge of Nitrogen in Viologen; MV(Methyl Viologen);EV(Ethyl Viologen)

Reference

[1] L. Krusin-Elbaum, D. M. Newns, H. Zeng, V. Derycke, J. Z. Sun & R. Sandstrom, *Nature* **431**, 672 (2004).