

Electronic Structure Study of Cu Doped SrHo 2116 Superconductor

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The monoclinic phase with space group P21/n by X-ray diffraction of bulk $\text{Sr}_2\text{HoRu}_{1-x}\text{Cu}_x\text{O}_6$ was verified by x-ray diffraction pattern as in figure 1. The electronic properties were investigated by X-ray near edge absorption structures spectroscopy measured at NSRRC 11A and 17C beamline. Figure 2 show the Ho $L_{3,2}$ -edge X-ray absorption structure (XAS). The lower energy peak a decreasing relative to high energy peak b upon the increasing of Cu concentration. The Cu doping induce larger crystal field cause electron redistributed among 4f orbitals of Ho^{3+} ion.

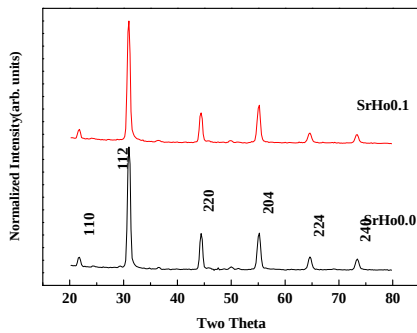


Figure 1. x-ray diffraction of $\text{Sr}_2\text{HoRu}_{1-x}\text{Cu}_x\text{O}$

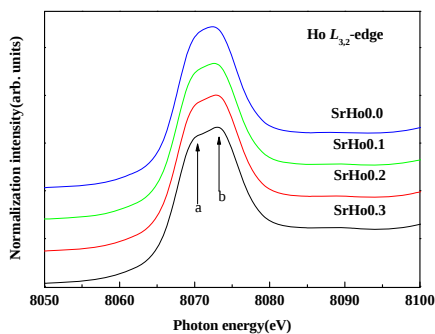


Figure 2. Ho $L_{3,2}$ -edge X-ray absorption structure

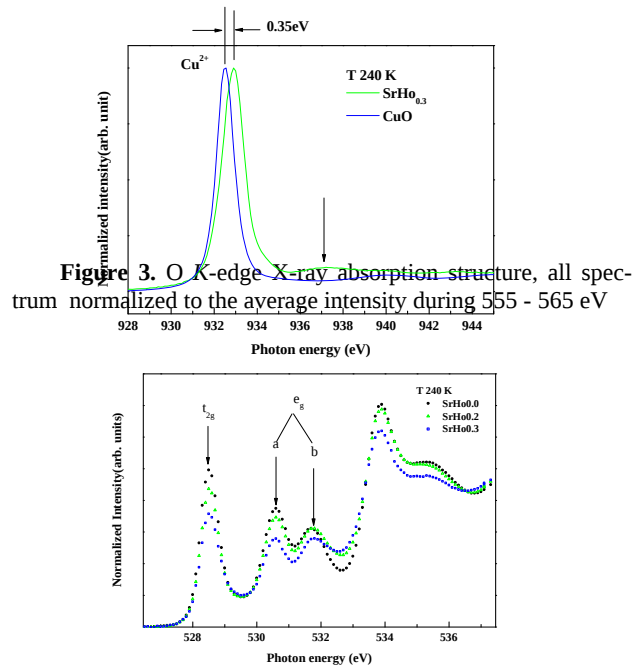


Figure 3. O K -edge X-ray absorption structure, all spectrum normalized to the average intensity during 555 - 565 eV

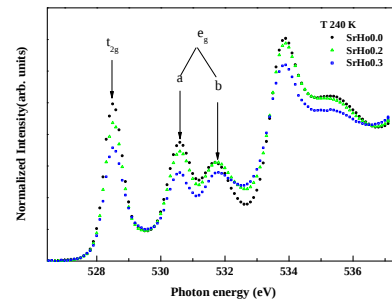


Figure 4. Cu $L_{3,2}$ -edge X-ray absorption structure. In figure 3, O k -edge XAS show Ru $4d - \text{O } 2p$ orbital hybridization peak t_{2g} and e_g decrease with Cu concentration. The Ru ion substituted by Cu ion remove the degree of Ru $4d - \text{O } 2p$ orbital hybridization.

In figure 4, Cu $L_{3,2}$ -edge XAS show the most of doped Cu is Cu(II) not Cu(III) in compound. The $s-d$ hybridization (indicated by arrow) is enhanced. Ru $M_{3,2}$ -edge not show here indicate Ru ion is 5+ which are not affect by Cu doping. (The project was financial supported by National Science Council, grand no. NSC-96-2112-M-606-001-)

References:

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2. S. M. Rao, M. K. Wu, J. K. Srivastava, B. H. Mok, N. Y. Yen, H. Y. Lin, H. Y. Tang, M. J. Ling and H. L. Liu, Cryst. Res. Technol. **41**, 859 (2006).