ESRF	**Experiment title:** Study of the Stripe structure of CuO_2 plane in cuprate superconductors by polarized EXAFS	**Experiment number:** HE-372
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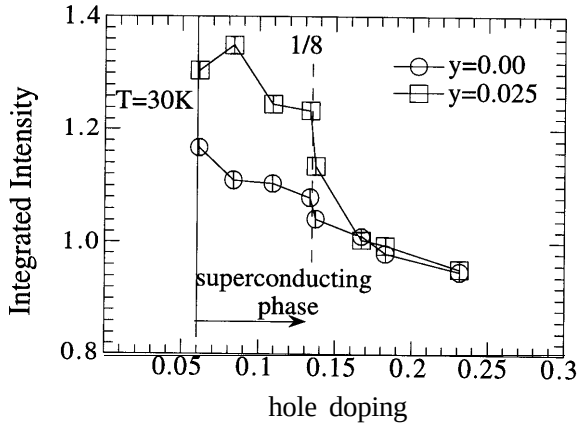
Report:

The aim of the proposed work was to study the local dynamical lattice fluctuations of the CuO_2 plane in the cuprate superconductors and related compounds. The EXAFS experiments on the topic haven opened a new field of the mechanisms of high Tc superconductivity: *stripes*. The striped phases in cuprates is one of the hot topics in the cuprates and it has been object of second international conference on stripes and high Tc superconductivity held in Rome during June 2-6, 1998. The EXAFS experiments in this field require a large k-range and high signal to noise ratio, i.e., a long data acquisition time and investigations of many temperatures and several samples with different doping of each families of cuprates. This was the reason for making a request for long term proposal. In fact, it results at out part that the proposal was accepted by the scientific committee as a long term proposal.

The proposal was based on the stripe structure in the cuprate superconductors observed by several experimental techniques. We have shown stripes of distorted and undistorted CuO_2 lattice by combination of diffraction and EXAFS at the optimum doping. During the allocated beamtime we made experiments on doping dependence of the local structural distortions of the $CuO2$ plane.

The model compound chosen for the work during the allocated beamtime was Bi2212 superconductor with a range of doping spanning underdoped to overdoped region of the superconducting phase diagram. We have studied 16 samples of $Bi_2Ca_{1-x}Y_xSr_2Cu_{1-y}Zn_yO_{8+d}$ with different Y and Zn concentrations, (x= 0,0.15, 0.2, 0.3, 0.3125, 0.4, 0.5, 0.6 for y=0 and y=0.025).

We have focused out attention on the study of the anomalous suppression of superconducting transition temperature at the l/8 doping that is a characteristic feature of all high Tc cuprates. We have measured high resolution Cu K-edge extended x-ray absorption fine structure (EXAFS) and X-ray absorption near edge structure (XANES) on samples ranging from underdoping to overdoping, across the critical l/8 doping and the optimum doping in the system. Our results suggest presence of two components with different Cu-O bondlength distribution that control the electronic properties of the system with the doping and temperature. The l/8 suppression appears to be a result of crossover between competing two components. The EXAFS and XANES features, associated with local structural distortions of the CuO_2 plane, are discussed in frame of two electronic components segregated in a striped phase of CuO_2 plane. In this work we clearly show that the Zn impurity in the CuO_2 plane affects the local fluctuations of the Cu site in the underdoped regime below a characteristic temperature T* while the CuO_2 remains unaffected in the optimum doping regime. This effect can be clearly seen in a representative Fig. 1, showing intensity of the XANES peak sensitive to distortions of the CuO2 plane. A part of the work was presented as an oral talk in the XAFS-X held at Chicago during Aug. 9-14, 1998 [l].



[I] Local structure and Tc suppression at l/8 doping in $Bi_2Sr_2Ca_{1-x}Y_x(Cu_{1-y}Zn_y)_2O_{8+d}$ ***superconductor,*** N.L. Saini, A. Lanzara, F. Natali, A. Bianconi, M. Akoshima, Y. Koike, H. Oyanagi, XAFS-X, Chicago, Aug. 9-14, 1998 (to be appear in **J. Sync. Rad.).**