Abstract No. igna722

Y K-edge XAFS of Brominated $YBa_2Cu_3O_6$

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Beamline(s): X11B

Introduction: The recovery of superconductivity in underdoped $YBa_2Cu_3O_{6+y}$ (YBCO) by exposure to bromine is a long-standing unresolved problem. Whether Br is incorporated in one of the crystallographic sites dopes the system or if it causes a local decomposition reaction to occur, liberating oxygen, and re-oxygenating underdoped regions remains in dispute.

Methods and Materials: We have performed polarized Y *K*-edge measurements on brominated YBCO (Br/Cu~1/30, y~0.6) with a T_c~88 K. All data were collected in FY, using a PIPS detector at 300 K.

Results: In contrast to Cu *K*- and Ba L_3 edges, Y *K*-edge data exhibit minor changes upon the bromination. Y *K*-edge data of Br_YBCO were fit in terms of single-phase and two-phase models. The former corresponds to the local implies that the local distortions in Y-O(2,3) and Y-Cu(2) pairs are homogeneously distributed other the sample. The latter associates the local distortions with the decomposed phase, while the major phase remains undistorted. From Cu K-edge XAFS analysis, the mixture of major and distorted phase was fixed at the ratio 2:1. Y-O(2,3) and Y-Cu(2) distances and oxygen and copper coordination numbers remain the same within the resolution of our experiment and consistent with the diffraction results. The only parameters to differ the models are the DW factors, which are slightly larger in the distorted phase. As will be shown in [2], combined analysis of Cu *K*-, Ba L_3 and Y-*K* edge data require a mixture of two phases.

Conclusions: regardless of the model used for Y *K*- edge data, extracted structural parameters provides clear evidence that the local structure of superconducting Cu(2)-$O(2,3)_2$ planes is not affected by bromination.

Acknowledgments: This research was supported by NSF-Career grant DMR-9733862.

References:

[1] See also 2001 Reports on Beamlines X18B and X23A2 for Br *K*- and Cu *K*-edge XAFS data.

[2] L. Dieng *at al*., submitted to *Phys. Rev. B* (2002).