



	Experiment title: Study of the temperature dependent local structure of doped HgBa ₂ CuO _{4+d} superconducting material by EXAFS	Experiment number: CH-407
Beamline:	Date of experiment: from: 22 Feb. 1998 to: 24 Feb. 1998	Date of report: 31.08.98
Shifts:	Local contact(s): J.L. Hazemann	<i>Received at ESRF:</i> 03 SEP. 1998

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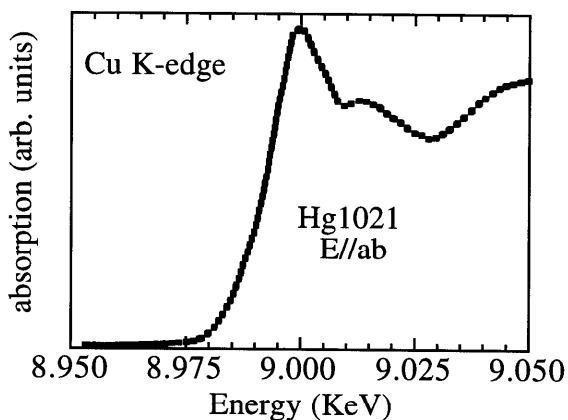
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Report:

The proposal was addressed to study of local structure of Hg-based high T_c superconducting single crystals by polarized EXAFS. We had focussed our attention to derive pair distribution function of CuO₂ plane of the system by Cu K-edge x-ray absorption spectra. During the allocated beamtime we measured high quality Hg1021 single crystal samples. However, we were obliged to use small single crystals with a size of ~250x250x80 microns. It should be mentioned that we had already shown feasibility of the measurements on small samples on the BM32 during our earlier experiments where we had measured Hg 1212 single crystal sample of the same size [1].

The sample with a T_c of 94K was used for the EXAFS measurements. Due to small size of the sample it was hard to have the samples measured in the correct polarization but we were successfully able to do the measurements at the Cu K-edge. A typical E//ab Cu K-edge XANES is shown in the Fig. as a representative spectrum. However, we had to record several scan at a constant temperature to have good signal to noise ratio upto high k-range of the EXAFS spectra. We had advantage of a multielement solid state fluorescence detector which was used for all these measurements to separate the

absorption cross section only due to Cu. The monochromator crystal was Si(111) with sagittal focussing making the experimental conditions suitable for the proposed work. Due to this non-trivial experimental conditions, we could measure spectra only at few temperatures. The results are being analysed. The preliminary analysis of the data show a qualitative agreement with the the anomalous local structural changes across the superconducting T_c as we have found in our earlier work on the same system using Cu K-edge EXAFS studies on powder samples at BM32 [2,3]. However, in the present case, the contribution of the Cu-O bonds is clearly separable from any higher shell contributions making the analysis simpler with reduced uncertainties in the extracted structural parameters.



- [1] *Temperature dependent local instability of the Hg1212 structure by polarized EXAFS*
 N. L. Saini, M. Brunelli, A. Lanzara, A. Bianconi, P. Bordet, J.L. Hazemann and J. Karpinski **J. Phys. IV 7, C2 12451246 (1997).**
- [2] *Anomalous Local Atomic Correlations in $HgBa_2CuO_{4+\delta}$* A. Lanzara, N.L. Saini, A. Bianconi, F. Due, P. Bordet **Physical Review B** to be published
- [3] *Structural Instability Around T_c observed in Hg-1201 by Neutron Diffraction Powder Diffraction and EXAFS* P. Bordet, F. Duc, P.G. Radaelli, A. Lanzara, N.L. Saini, A. Bianconi, E.V. Antipov **Physica C 282, 1081-1082 (1997)**