ESRF	**Experiment title:** Phason dynamics in the archetypal quasicrystal AlCuFe studied by EXAFS	**Experiment number**: HS-1195
Beamline: BM29	**Date of experiment**: from: 18.02.2000 to: 21.02.2000	**Date of report**: 27.02.2000
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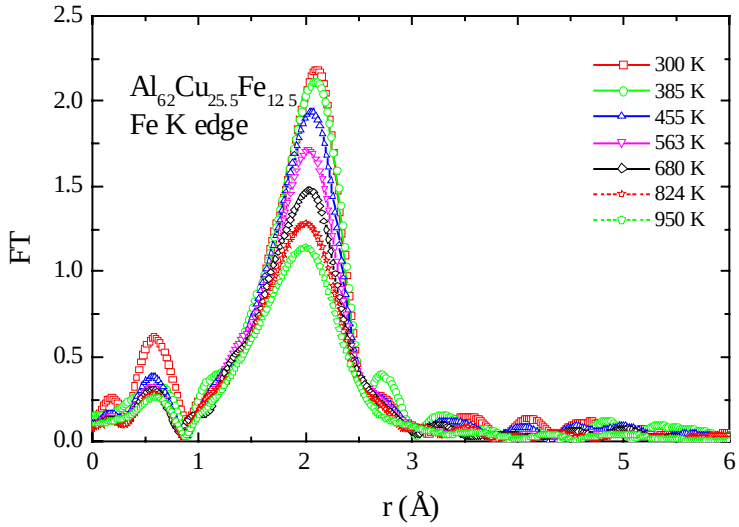
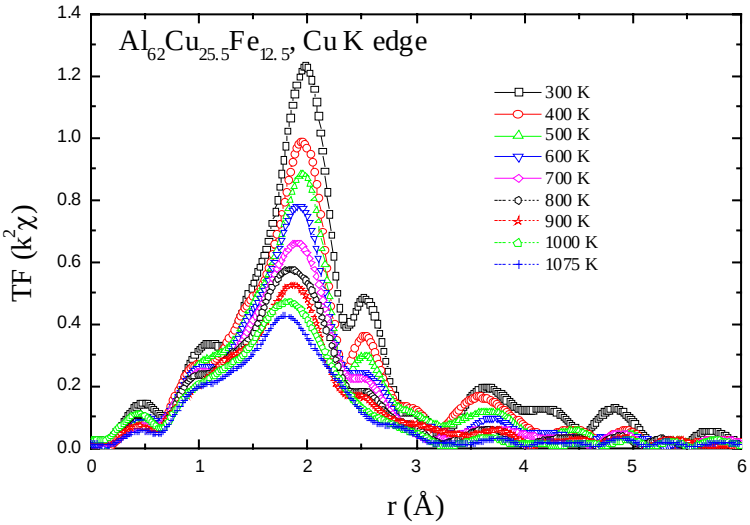
Report:

This is a preliminary report of an experiment just finished one week ago. The icosahedral quasicrystal $Al_{62}Cu_{25.5}Fe_{12.5}$ was studied at the EXAFS Cu-K and Fe-K edges. The experiments were performed using the beamline oven. The samples were 30 micron powders pressed in BN. A first series was performed with the sample enclosed by two additional BN wafers. Because of the low energy of the Fe-K edge, only the Cu-K edge could be studied here. A second series, where the sample was not enclosed between the BN wafers, allowed to investigate the Fe-K edge. We obtained good EXAFS data over the range of 300 to 950 K although some problems were experienced in temperature reproducibility.

The goal of the experiment is two fold: (1) investigate the (thermal) Debye-Waller (DW) factor and compare this with measurements on the vibrational density of states; (2) observe the onset of phason hopping by an anomalous temperature dependence of the DW factor at high temperature suggested in [1]. The EXAFS spectra analysis is now being performed. Preliminary Fourier Transforms (FT) of $k^2\chi$ are shown hereafter.



The figure shows the Fe K-edge FT of EXAFS oscillations from 300 to 950K. The spectra exhibit a broad first atomic shell, as observed in [2] at 300 K, that can be analysed by a very wide distribution of neighbours (mainly Al) which implies a large static disorder. Such a contribution to the total DW factor means that we will be obliged to use the cumulant expansion methods to obtain a reliable determination of the thermal DW factor.



The figure shows the FT of Cu K-edge EXAFS oscillations from 300 to 1075 K. In contrast with the Fe case, the first shell around Cu includes at least two sub-shells. They exhibit a complex temperature evolution.

The analysis of these EXAFS data using structural models [3] should allow us to extract the DW factor at different temperatures. However, the uncertainties on the temperature measurements may impede an accurate determination of the anomalous dynamic behaviour of these systems.

References:

[1] R. Brand *et al*. Hyperfine Interactions (2000) in press; *ibid*., Mater. Sci. Engineering (2000), in press.
[2] A. Sadoc, *et al*., Phil. Mag. B 68 (1993) 475
[3] D. Gratias *et al*., in Proceedings of the Spring School on Quasicrystals, Aussois 2000, in press