	Experiment title: Real Part EXAFS on multilayer Bragg reflections	Experiment number: MI-478
Beamline: BM08	**Date of experiment**: from: 6.9 to: 12.9	**Date of report**: 27.2.01
Shifts: 15	**Local contact(s)**: F. D'Acapito	*Received at ESRF:*

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Diffraction Anomalous Fine Structure (DAFS) is effective in extracting local structural and electronic information from selected phases and crystallographic sites [1]. Recently, we have demonstrated the possibility to collect DAFS data even in the soft X-ray regime on Ni/V multilayers [2]. On the other hand, it has been shown that the deviation of the position of a multilayer Bragg peak at an absorption edge is directly related to the changes of the real part of the scattering factor f' [3]. Thus the EXAFS signal $\chi(k)$ can be obtained by measuring the deviations of a multilayer Bragg peak position in excess to the expected dependence on the photon wavelength λ when crossing the absorption edge of a given element. Here we show for the first time that the collection of extended EXAFS spectra in the hard X-ray regime is possible using refraction and that the data quality is good enough to perform quantitative analysis.

Energy dependent Bragg reflections for a [Co/C] multilayer were measured at the GILDA CRG beamline at the ESRF. The position from a Gaussian fit is plotted against the energy in Fig 1. After background correction and normalization, we obtained the EXAFS signal, which is visible up to $k=10Å^{-1}$ (Fig 1). The spectrum was then analyzed in the standard way, including a backscattering phase shift of $\pi/2$ to account for the shift between the real and the imaginary parts of the χ function (Fig. 2). The Co-Co bond length is found to be 2.47 ± 0.03Å, i.e. slightly contracted with respect to the bulk metal value (2.51 Å).

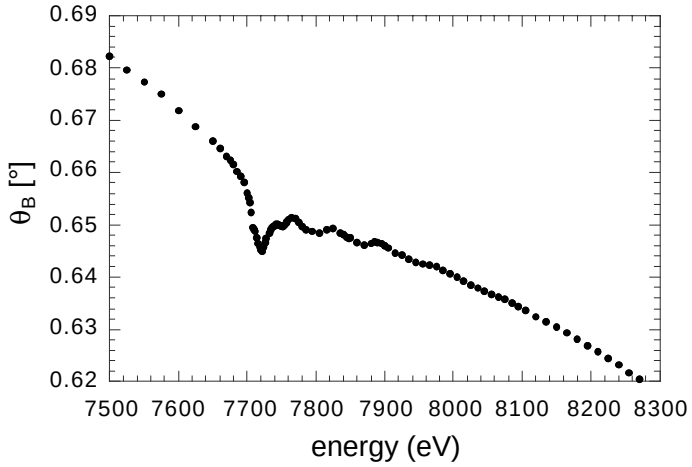

Fig. 1: Energy dependence of the first multilayer Bragg reflection of the Co/C multilayer.

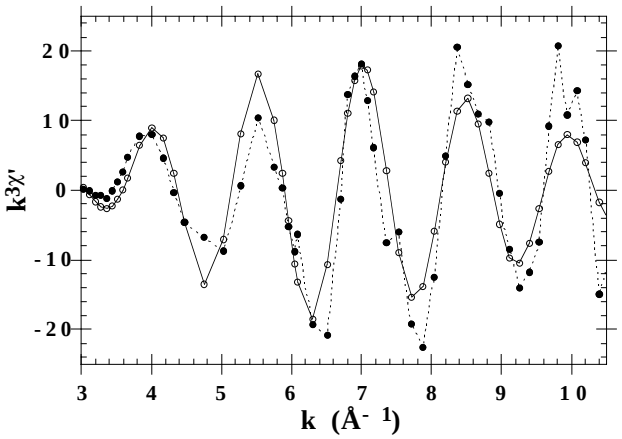

Fig. 2: $k^3\chi(k)$ (full circles; dotted line) and corresponding fit (open circles, full line).

We have thus shown for the first time the possibility of obtaining structural information directly from the real part of the scattering factor. This new method makes accessible local order information with phase sensitivity on any material (molecule) that can be deposited as multilayer without the need of complex data corrections.

REFERENCES

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