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EXAFS IN A DISPERSIVE MODE

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In the last ten years the Extended X-ray Absorption Fine Structure (EXAFS) spectroscopy has shown to be a powerful tool to determine the local structure around the absorbing atom in a great variety of materials like amorphous metals and semiconductors, glasses, catalysts, solutions, biological systems and so on.

The best source for EXAFS studies is synchrotron radiation because of its continuous spectrum and of the small beam divergence: tunable monochromatic X-rays can be made available, the intensity of which is several orders of magnitude higher than conventional laboratory sources.

The standard EXAFS experimental apparata make use of X-ray monochromators which scan in small steps the energy range of interest, and require, in the best sample conditions, few minutes to collect the whole EXAFS spectrum.

This standard mode limits the physical informations achievable to static studies of the atomic arrangements, while a faster method to measure X-ray absorption spectra could permit time-resolved studies which are of great interest in fields like catalysis and biology.

For this reason a new experimental approach has been developed: it is an energy dispersive method which allows the collection of the whole EXAFS spectrum simultaneously, thus shortening the acquisition time from minutes up to few seconds (dispersive mode).

A dispersive EXAFS apparatus can be realized by focussing and dispersing a quasi-parallel polychromatic X-ray beam onto the sample using a cylindrically bent triangular crystal. The beam transmitted through the sample diverges toward a position sensitive detector or a film.

The characteristics and performances of a cylindrically bent crystal spectrometer realized in collaboration with the Physics Department of the Euratom of Ispra have been studied. This represents the first step of a project to build up a dispersive EXAFS facility in the National Laboratories of Frascati.