

BL 11.1

X-ray Absorption Fine Structure (XAFS)

EXAFS spectroscopy provides microscopic structural information of a sample through the analysis of its X-ray absorption spectrum. It allows the determination of the chemical environment of a single element in terms of number and type of neighbours, inter-atomic distances and structural disorder. This determination is confined within a distance given by the mean free path of the photoelectron in the condensed matter, which is between 4 and 8 Å radius from the element. EXAFS is a powerful local structural probe, which does not require long-range order. It is an important technique in several fields of natural sciences, from earth science to biochemistry.

Areas of research

Since EXAFS is a technique, selective towards a particular element and sensitive only towards short-range order, it is one of the most appropriate spectroscopic tools to apply in the following cases:

- amorphous solids, e.g. ceramics;
- liquids, e.g. solutions of ionic compounds or gels which cannot be studied with X-ray diffraction;
- biomolecules, e.g. solutions of metalloproteins;
- superconductors;
- homogeneous and heterogeneous catalysts;

Light source

Type	Bending Magnet
Bending magnet field	1.2 T
Storage ring energy	2 / 2.4 GeV
Characteristic	Energy $E_c=3.22$ keV ($\lambda_c=0.385$ nm)
Injection current	300 mA (@2 GeV) / 130 mA (@2.4 GeV)
Lifetime	11 hours at 250 mA

Optical characteristics

Cylindrical prefocussing mirror	
Double Crystal monochromator:	<ul style="list-style-type: none"> - Si 111 and Si 311 - Energy range 2.3÷25 KeV - Energy resolution $\sim 2 \cdot 10^{-4}$ (at 8 KeV)

Facilities in experimental station

At present (December 2001) the line is under commissioning. The salient features of experimental station will be:

- Experimental slits; they define the beam before the first ion chamber I_0 .
- Three ionisation chambers from Oxford instruments to detect the intensity before and after the sample and after the reference sample, respectively. An user friendly automated gas transfer system for changing gases in the ionisation chamber.

- A multi-sample holder with micrometric movement on vertical axis (measurements at room temperature of non air sensitive samples).
- A removable motorized table (1.5 x 1 m) with micrometric transversal and vertical movement (max 20mm) is placed between the first two ion chambers. The top of this table is about 80 cm below the beam and all this space is available for users' experimental apparatus.