

Current and future possibilities of XES and XAFS in the laboratory

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X-ray Emission (XES) and Absorption Fine Structure Spectroscopy (XAFS) are well-established methods at synchrotron facilities where it is being used routinely in various kinds of research fields. In order to enlarge its availability on a day-to-day basis we developed XES and XAFS spectrometers for the laboratory. The investigations are facilitated with polychromatic radiation in contrast to most of the XES and XAFS experiments at synchrotron sources.

The first type of XES and XAFS laboratory spectrometer is dedicated to the hard X-ray regime for investigation of mainly 3d transition metals' K absorption edges. Due to the use of Highly Annealed Pyrolytic Graphite (HAPG) as the wavelength dispersive element reasonable measurement times with sufficient spectral resolving power for both methods have become possible [1], [2]. A second type of XAFS laboratory spectrometer is operating in the soft X-ray regime. With this setup NEXAFS K edge spectroscopy of the main constituents of biological samples such as C, O and N is feasible. But also the L edges of all transition metals are accessible [3]. Moreover, by using the pulsed structure of its source dynamic XAFS investigations become possible. We already carried out single shot (1 ns) NEXAFS spectroscopy at the C K- edge of Cu Chlorophyllin. This paved the way for first pump-probe experiments.



Figure 1: HAPG as the decisive material of a wavelength dispersive element in laboratory spectrometers for reasonable measurement times.

The talk will present an overview of current possibilities for lab XES and XAFS investigations as well as perspectives for the future.

References

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