

High pressure X-ray Absorption Spectroscopy: state of the art and future developments

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Recently (December 2003) the D11 dispersive EXAFS beamline of LURE has been definitively closed. In the last three years a lot of modifications had been done in order to improve the acquisition of data under high pressure: (i) a new detector one order of magnitude more sensitive and with a larger energy range accessible, (ii) a new way for data collection which has strongly reduced the deformation of the spectra and the number of extra glitches on the spectra and (iii) the use of perforated diamonds to reduce the absorption of the diamonds and therefore give access to lower energy edges.. Using the perforated diamonds, XAFS experiment can be performed at the LIII, LII rare earth edges and combined with XMCD, these experiments allow to study the effect of pressure on the material structure, on the electronic configuration and on the magnetic properties for ferromagnetic materials. The extension of the energy range available improves the accuracy of the determination of the bond length and of the disorder parameters. These points will be presented and illustrated by different examples: the γ - α transition of Ce, the zinc blend to rocksalt transition for nanocrystalline ZnSe, the coordination change in FePO₄ and the phase transitions in YbAl₂, everything being induced by the application of pressure. This beamline will be transferred to the new French synchrotron (SOLEIL) and will be available for experiments in 2006.