MICRO-SPECTROSCOPIES EXTENDED TO THE SOFTER X-RAY DOMAIN.

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Following the huge progress of third generation sources in term of brilliance, an increasing number of beamlines are equipped with focusing devices, providing combined techniques associated to spatial resolution. These synchrotron based analytical techniques offer unique capabilities in the study of complex systems. Microspectroscopies like fluorescence mapping and XAS are dealing with co-localization, speciation of elements in heterogeneous systems, and mapping of the chemical state of elements. The main peculiarity of "LUCIA" (Line for Ultimate Characterization by Imaging and Absorption) [1] is that it covers the energy range 0.8 – 8 keV. Using the micro-step gap-scan technique, and a fixed-exit monochromator, EXAFS spectra can be recorded over a large energy range. The focusing of the beam is achieved by two elliptical mirrors (KB) and special care has been taken to insure the spatial stability of the beam on the sample. Elemental mapping and most XAS spectra are recorded in the total fluorescence yield mode using a silicon drift diode (SDD). Depending on the energy, XAS spectra can also be measured in the transmission mode or by collecting the drain current. Technical aspects, as well as performances of the beamline will be described in details. Examples illustrating the "LUCIA"'s possibilities are numerous, and applications are found in a range of topics covering physics, materials science, or environmental studies. Furthermore, such a small beam combined with the high brilliance of the source, allows one to probe very small samples volumes under extreme conditions of pressure in diamond anvil cells and of temperature in heating wires, extending these techniques to low energies, which was not possible up to now. A description of the capabilities of the beamline will be given through examples from different fields of applications and for various sample environments.

[1] A.-M. Flank et al, Nucl. Instr. and Meth. in Phys. Res. B 246 (2006) 269-274.