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LUCIA, A MICROFOCUS SOFT XAS BEAMLINE

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The microfocus X-ray beamline LUCIA (Line for Ultimate Characterization by Imagery and Absorption) is devoted to microspectroscopy in the 1-8 keV energy range. The energy domain covers the K edges of low Z elements (from sodium to iron), the L edges from nickel to gadolinium, and the M edges of lanthanides and actinides. Thus, at the same time, it gives an unique access to the major elements constituting minerals (low Z elements) and it is also of importance in geosciences as well as in environmental sciences for which the energy range covers metals and other heavy pollutants. The goal of the beamline is to achieve a spot size on the sample of the order of 1x1 μm^2, while allowing energy scans on the entire range. Structural investigations of spatially complex systems will be therefore considered with various applications, including archeometry, Earth and extraterrestrial sciences or environmental science. This latest topic contains typical examples for which such *in situ* spatial investigations are particularly powerful. Indeed, it is now well known that toxicity and bioavailability of many compounds depends not only on their nature and bulk concentration but much more on their spatial distribution and chemical speciation.

Born from a collaboration between LURE, SOLEIL and PSI, this beamline installed on the Swiss Light Source is now in its commissioning phase. An Apple II insertion device has been installed (SCHMIDT et al., 2003) during the summer 2003. This undulator (54mm period length) provides X-rays in an energy range which corresponds to the best performances in term of brilliance of both machines, SLS and SOLEIL. This device emits linear light with variable polarization direction as well as circular polarized light. The period length was set such that no 'energy gap' appears between the harmonics in the 1-8 keV energy range. The horizontal photon source size is demagnified by a fixed spherical mirror. Two plane mirrors reject the higher harmonics contributions. The final focusing is accomplished through a Kirkpatrick-Baez (KB) mirror system aligned automatically (IDIR et al., 2003). A fixed exit double-crystal monochromator is equipped with five different types of crystals to cover the full energy domain. A motorized (xyz) stage allows the precise positioning and mapping of the sample. XAS measurements can be done by measuring the transmitted beam, the total electron yield or the fluorescence yield. For micro-XRF cartography, a single-element silicon drift detector is used.

Proposals can be submitted to the SLS Users Office. The next program committee is in September for beamtime allocation starting in December.

References

IDIR, M. et al. (2003): AIP conference proceedings: Eight International Conference on Synchrotron Radiation Instrumentation, San Francisco.

SCHMIDT, T. et al. (2003): PSI Scientific Report Volume VII.