



## **Synchrotron Radiation Laboratory for Environmental Studies: A combinatory approach with X-ray methods**

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Samples required to environmental questions are often complex (e.g., contaminated soils, lake and dump sediments). They consist of mixtures of mineral phases (often with small particle sizes), microbes, and living tissues. Elemental distribution, spatially resolved chemical speciation and mineral phase identification are helpful to uncover relationships between mineral phases, main and trace elements and finally to comprehensively understand anthropogenic affected systems. Such problems can be addressed by a combination of microfocused synchrotron X-ray techniques as they have been setup with the Synchrotron Radiation Laboratory for Environmental Studies (SUL) at the synchrotron radiation facility ANKA. The lab consists of a microfocus X-ray beamline (SUL-X) that enable elemental mapping using X-ray fluorescence analysis (XRF), chemical speciation with X-ray absorption spectroscopy (XAS) and mineral phase determination by X-ray diffraction (XRD), successively at the same sample position. Moreover, the laboratory is supplemented with an infrared microscope (SUL-IR) at an IR beamline. The experimental station of SUL-X is equipped with various detectors for different X-ray techniques: Ionization chambers, 7 element solid state detector for XAS and XRF-spectroscopy; a CCD detector for X-ray diffraction and a light microscope in transmission and reflection for adjusting sample positions. Research fields during the first commissioning period comprised speciation of As from mining activities, incorporation of Pb in the human body and mineral precipitations that may have an influence on the carbon exchange between ocean water and atmosphere. SUL-X is now open from 4 to 16 keV for users. To meet the demand of speciation of low Z elements like Al, Si, P, S for environmental questions, it is planned to offer XAS at energies from about 20 keV down to the Al K edge (1.5keV). Because

of the low energy option the experimental station can be operated under vacuum.