

## **Micro-Beam X-Ray Fluorescence and Absorption Imaging Techniques at the IAEA Laboratories**

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The capabilities of a scanning micro-beam X-ray fluorescence (XRF) spectrometer have been extended towards combined XRF and X-ray absorption mapping, determination of element concentrations in minute samples (mass ~ 1 mg), and 2D/3D tomographic imaging in X-ray fluorescence and X-ray absorption modes. The spectrometer utilizes high-power X-ray tube fitted with tapered glass capillary which focuses the primary beam down to a diameter of about 15 micrometers. The spectrometer is equipped with two energy dispersive X-ray detectors. A Si(Li) detector is used for collecting the X-ray fluorescence spectra, and a fast silicon drift detector (SDD) for acquisition of the primary X-ray beam attenuated by the sample. Both detectors operate simultaneously. The sample is mounted on a XYZ $\theta$  motorized stage. An additional, compact XY translation stage is used to correct the position of the rotation axis during tomographic experiments. For selection of the region(s) of interest for scanning a live image of the sample is used. It is obtained from an interactive sample monitoring system equipped with an optical microscope coupled to a color CDD camera. The scanning and the data acquisition are controlled by the SPECTOR software developed in collaboration with the Rudjer Boskovic Institute [1]. The program handles the sample positioning, the X-ray spectra acquisition and does a preliminary processing of the data. The results of the measurements are presented as single pixel or cumulative spectra, as element distribution maps or sinograms. The spectrometer has been applied for detection of heavy-Z elements in particulate matter samples, element mapping in heterogeneous matrices and micro-tomographic imaging, the results of which will be presented. The design of the system and the SPECTOR data acquisition software are very flexible. It has been proved recently when the spectrometer has been moved out from the laboratory and installed in less than one day at a synchrotron facility where it was successfully applied in a series of tomographic scanning experiments.

[1] Data Acquisition for X-Ray Microprobe, User's Manual, Computer Manual Series no. 17, IAEA, Vienna 2002.