

A monochromatic confocal micro X-ray Fluorescence (μ XRF) spectrometer using polycapillaries for the lab

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Confocal μ XRF is a powerful tool to analyze the spatial distribution of major, minor and trace elements in 3 dimensions. Due to its non-destructiveness, confocal μ XRF is suited for a wide range of applications, including biological, geological or cultural heritage samples.

A typical (confocal) μ XRF measurement in the lab uses polychromatic excitation, which complicates quantification and fundamental parameter based corrections, and furthermore reduces peak-to-background ratios due to the scattered bremsstrahlung. The goal for the new setup was to remedy these problems, but without sacrificing spatial resolution, and moreover to keep it flexible for transportation and different excitation energies.

The source assembly consists of a water-cooled fine-focus XRD tube and a parallel beam-mirror, which produces a quasi-parallel, monochromatic beam. The presented results were obtained at the Atominstitut using a Molybdenum anode and a fitting mirror for Mo- $K\alpha$, but it is intended also to use a combination of tube and mirror for Cu- $K\alpha$, which is available at the X-Ray Center of TU Wien.

The confocal setup itself consists of two polycapillary half-lenses, one for the source side and one for the detector side, where a 50 mm² SDD is mounted. Both polycapillaries have a focus size of ~ 15 μ m for Mo- $K\alpha$. The second polycapillary can also be exchanged for a custom-designed collimator, in order to perform non-confocal μ XRF. The alignment of the sample is facilitated by an optical microscope with camera and a second down-looking camera.

Details of the technical setup as well as results from technical and biological samples and a comparison with a polychromatic μ XRF setup will be presented.