

Analytical X-ray Microscopy in the Soft and Tender Spectral Range with the AnImaX endstation

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The AnImaX endstation (Analytical Imaging with X-rays) is a versatile microscopy endstation for synchrotron radiation facilities. The design focusses on strong analytical nanoscopy by combining multiple imaging modes with spectroscopy techniques, while targeting a resolution down to the tens of nanometer range. Since AnImaX is a portable instrument, it can be considered an X-ray microscope on-demand. It has been initially built for operation at the XUV beamline P04 at PETRA III, Hamburg. Up until now the endstation has also been put to work at BESSY II, Berlin.

AnImaX combines scanning transmission X-ray microscopy (STXM) with X-ray fluorescence detection (XRF) [1,2]. With the current set of zone plates, the instrument can make use of the full energy range of the P04 beamline starting from 250 eV up to 3000 eV. The use of a spatial resolved transmission detector enables the simultaneous acquisition of multiple imaging modes. At the same time the emission of characteristic fluorescence photons is measured to acquire X-ray fluorescence maps on the fly. The AnImaX endstation can also switch operation to a full-field transmission X-ray microscope (TXM).

To further enhance the analytical imaging capabilities, the ability to perform near edge X-ray absorption fine structure (NEXAFS) spectroscopy has been integrated into scanning mode. Among other use cases, AnImaX is currently being used for investigations in environmental sciences. Results from XRF and NEXAFS studies of soil and sediment samples will be presented.

[1] L. Lühl et al, "Scanning transmission X-ray microscopy with efficient X-ray fluorescence detection for biomedical applications in the soft and tender energy range", *J. Synchrotron Rad.* 26, 2019, 430-438

[2] A. Haidl et al, "A Portable Endstation for Analytical X-ray Microscopy Using Soft X-ray Synchrotron Radiation", *Microsc. Microanal.* 24(S2), 2018, 230-231