

# Scanning Transmission X-ray Microscopy (STXM) End-station at TPS 27A: Capabilities and Opportunities

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## Abstract

The Scanning Transmission X-ray Microscopy (STXM) end-station located at TPS 27A1 will host a photon in/photon out microscope mostly in transmission mode. STXM is designed ideally to investigate small world in different fields, including material and environmental science, chemical and biological materials, energy materials and magnetism. The microscope is able to conduct pixel by pixel imaging by collecting the transmitted photons passing through the sample.

With the elliptically polarized undulator and n-house designed active-mirror plane grating monochromator, high energy resolution/photon flux photons in the energy range of 90 to 3000 eV soft X-ray can be delivered. The delivered photons are focused down to 30 nm by the Fresnel zone plate ( $\Delta r = 25 \text{ nm}$ ) and order sorting aperture. In our design, multiple X-ray absorption spectroscopy (XAS) imaging capabilities can be achieved, such as (1) transmission mode, (2) fluorescence yield, (3) total electron yield and (4) polarization controlled (XMCD/molecular orientation). Moreover, an ultra-high spatial resolution can also be achieved by using a lensless imaging technique so called "Ptychography" by replacing the point detector (PMT) by a CCD/CMOS 2D detector. Besides, multiple in situ environment cells will also be designed to fit different user's requirements, for example, electrochemical cells, humidity cells, gas cells and heating cells. STXM system is now finished the construction and the 1st STXM image has been collected at TLS 08B. Technical capabilities, current status and scientific opportunities of the end-station will be reported in this presentation.

**Keywords – STXM, in operando, XAS, ptychography, energy material, environment science, chemistry**