From 2D STXM to 3D Imaging: Soft X-ray Computed Laminography at PolLux

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3D imaging techniques based on computed tomography (CT) are used today as a standard medical diagnostic tool. By using high-brilliance synchrotron radiation instead of conventional X-ray tubes, CT is also an established method for answering current scientific questions for example in geosciences [1], cultural heritage [2] and condensed matter research [3].

A disadvantage of CT, however, is that the object has to provide a columnar shape or be small enough that the entire sample volume remains in the field of view at all times of the scan to allow artefact-free reconstructions. This places strong restrictions on the sample shape and support, especially in soft X-ray CT measurements [4], where focal distances and attenuation length are typically measured in the few millimeter and sub-micron range.

Computed Laminography (CL) overcomes this limitation by inclining the sample rotation axis by the laminography angle $\theta < 90°$ so that it is no longer perpendicular to the incident X-ray beam [5]. The great advantage of this geometry is that the sample (and its support) can be laterally extended without further modification and without risking collisions during rotation.

For the first time, a new setup at the Scanning Transmission X-ray Microscope (STXM) of the PolLux beamline at the Swiss Light Source combines CL and STXM using soft X-rays. We will present the instrumental realization of Soft X-ray Computed Laminography (SXCL) as well as the first 3D reconstructions of thin film samples and micrometer sized objects from nanomaterial science, biology and functional magnetic materials.

This technique will be particularly advantageous for the investigation of modern electronic devices based on thin-film technologies and functional materials such as magnetic composites due to the chemically sensitive interaction properties of soft X-rays with matter. Furthermore, the implementation into an existing STXM renders future time-resolved investigations feasible.

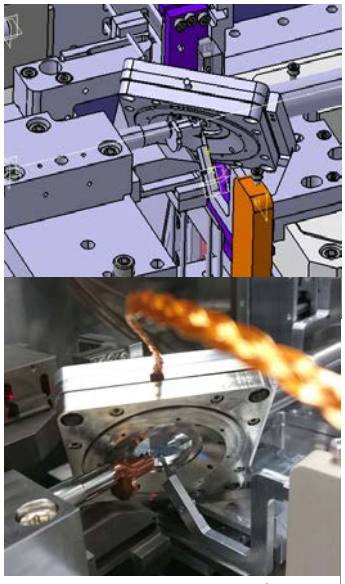


Fig. 1 CAD drawing of SXCL-rotation stage (top) and implementation in the actual PolLux STXM setup (bottom).

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