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Versatile x-ray reflector extension setup for grazing-incidence experiments at SAXS Facilities for liquid surface study at Beamline P03/PETRA III

Tuesday 16 September 2025 17:00 (1 hour)

Existing beamlines for in situ GISAXS on liquids are either limited in angular range or incompatible with the large sample-detector distance required for submicron resolution. We present a low-cost, easily assembled beam-tilting extension for synchrotron-based ultra-small-angle X-ray scattering (USAXS) facilities, enabling grazing-incidence (GI-) and transmitted scattering (GIUSAXS, GTUSAXS) studies on liquid surfaces. The setup is compatible with standard USAXS beamlines and requires only ~0.5 m of space at the sample stage. It allows X-ray beam incidence angles of up to ~0.6° at the liquid surface, equal to twice the angle of incidence on a reflector and below its critical angle of reflector materials, and provides access to a q-range of approximately 0.003–0.5 nm⁻¹. The system was tested at P03 beamline (DESY) using polystyrene nanoparticles, self-assembled at the air/water interface. The proposed scheme enables selective depth profiling and expands the research capabilities of existing SAXS synchrotron facilities for in situ studying submicron nanostructured objects at liquid surfaces under GI-geometry, combined also with GIWAXS and TXRF techniques.

Footnotes

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