OIM2 SYMPOSIUM
Talk Abstract Submission

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Talk Title *

Advancing Nanoscale Analysis: KWS-X and the Comprehensive Characterization Ecosystem

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ABSTRACT

Maximum 300 words, you can add figures to your abstract.

This contribution introduces KWS-X, a customized, world-class in-house small- and wide-angle X-ray scattering (SAXS/WAXS/USAXS) facility that serves as a vital cornerstone of the modern analytical suite for nanoscale characterization. Developed by XENOCS and officially commissioned for users in April 2023, the instrument is equipped with a high-flux metal-jet source, a moveable Eiger 2R 4M SAXS detector, a 4-axis motorized WAXS detector, and a Bonse-Hart USAXS setup. Covering an exceptionally broad scattering vector (q) range from 0.0002 to 7 $Å^{-1}$, this configuration enables high-resolution, multiscale structural characterization of diverse materials from few Å to few µm.

A defining feature of KWS-X is its highly versatile, large-capacity sample environment station. With accessories facilitating *in-situ* testing at extreme temperatures (-150°C to 1000°C) and under varying mechanical stresses (shear, tensile), KWS-X effectively bridges the gap between fundamental research and applied engineering. For academia, it allows deep exploration of soft matter, biomaterials, polymers, and complex fluids. Crucially for industrial and political decisionmakers, these dynamic testing capabilities accelerate technology transfer and R&D in advanced manufacturing, polymer science, and novel energy materials by capturing real-time structural evolutions under actual operational conditions.

Beyond its standalone capabilities, KWS-X achieves its maximum potential when integrated into a broader analytical ecosystem. It serves as an indispensable bridge and complementary tool to other essential nanoscale techniques, including neutron scattering (SANS), Electron Microscopy (TEM/SEM), Atomic Force Microscopy (AFM), and Dynamic Light Scattering (DLS). By providing accessible, high-quality preliminary screening and environmental debugging, KWS-X significantly improves the efficiency of these complementary methods and highly competitive experiments at large-scale synchrotron facilities. To provide a large overview of these synergies, this talk will also highlight selected multi-technique case studies from our user community, demonstrating how this comprehensive approach drives the development of future technologies.

Keywords *

SAXS, WAXS, USAXS, KWS-X, Multiscale Characterization

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