

Current Status and Development of Small-Angle Scattering

Instruments at MLZ

Small-angle neutron scattering (SANS) is a vital technique for probing the nanoscale to mesoscale architecture of complex materials. Within the Heinz Maier-Leibnitz Zentrum (MLZ) framework, a collaborative synergy among Forschungszentrum Jülich (FZ-Jülich), the Technical University of Munich (TUM), and Hereon has established the world's highest-density suite of SANS instruments at a single facility. This presentation provides a comprehensive overview of this premier instrumental ecosystem and its impact on multidisciplinary research.

The suite currently comprises three state-of-the-art conventional pinhole SANS instruments (KWS-1, KWS-2, SANS-1), a focusing-lens SANS instrument (KWS-3), and several neutron spectrometers capable of specialized SANS functions (REFSANS and RESEDA) offering exceptional versatility across diverse structural length scales. Developed and continuously upgraded over decades, these instruments are optimized for high neutron flux, excellent resolution, and highly adaptable sample environments.

This infrastructure serves a global user community investigating large-scale structures across various fields, including soft matter, magnetic materials, thin films, biomaterials, and engineering materials. We will highlight how these SANS capabilities drive breakthroughs in complex systems and emphasize the suite's vital role in advanced material characterization, particularly through the implementation of complex in-situ and operando sample environments for real-time testing.

Ultimately, this overview demonstrates how the MLZ SANS suite empowers researchers to address challenging structural questions and foster innovation across both fundamental and applied sciences.