Small angle X-ray scattering

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Small-angle X-ray scattering (SAXS) is a versatile technique implemented at virtually all synchrotron facilities and in many laboratories worldwide. It provides structural information on the nanoscale, including characteristic dimensions, shape, and aggregation state, over a size range from approximately 1 nm to more than 100 nm.

All states of matter—solids, liquids, and gases—as well as surfaces and interfaces can be investigated. One of the major strengths of the technique is the possibility of studying samples in their natural or application-relevant environments, combined with high time resolution.

This lecture is divided into two sections. The first provides a general introduction to the theory of small-angle scattering, with particular emphasis on the relationship between experimental scattering data in reciprocal space and their Fourier transformation into real-space structural information. Basic concepts of BioSAXS will also be introduced.

The second part focuses on applications of small-angle scattering to a variety of systems ranging from chemistry and materials science to structural biology, highlighting the ability of the technique to address specific problems in current research. Particular emphasis will be placed on in situ and operando investigations and on time-resolved experiments extending down to the picosecond regime, which represent an important focus of current research at the Austrian SAXS beamline at ELETTRA.