Title: Developments in Equilibrium and Time-Resolved SAXS.

Abstract

Small angle X-ray scattering experiments are a powerful method for describing three dimensional biomolecular structures in solution. The combination of high-brilliance 3rd generation synchrotron sources such as APS, advances in focusing optics and efficient computational methods resulted in significant advances in both static and time-resolved solution scattering techniques and enabled important insights into the structure and dynamics of macromolecules of bio-medical importance.

The quality and interpretability of SAXS data is largely contingent on sample homogeneity. Size-exclusion chromatography (SEC) – SAXS, which was pioneered at BioCAT has therefore emerged as a powerful mode of data acquisition as it ensures optimal sample quality by purification immediately before exposure to x-rays. We will show examples of projects that have benefitted from the implementation of this approach and also touch upon proposed future enhancements.

The new frontier in the field is the development of microfluidic chips that facilitate real-time monitoring of structural alterations in complex biological systems as a response to very specific environmental stimuli such as a change in denaturant concentration, ionic strength, pH or ligand binding. We will present state of the art time-resolved solution scattering methods developed and implemented at APS sector 18 (BioCAT). We will provide an overview of time-resolved SAXS experimental capabilities and data processing and structural analysis methods, as well as discuss challenges and future directions.