Equilibrium and Time-Resolved SAXS At Biocat

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The BioCAT beamline (Sector 18) at the Advanced Photon Source is a mixed-use user facility that supports both muscle fiber diffraction experiments as well as equilibrium and time- resolved small-angle X-ray scattering (SAXS) experiments. Our equilibrium capabilities include both traditional batch SAXS as well as in-line chromatography-coupled SAXS, including in-line multi-angle light scattering (SEC-MALS-SAXS). Time resolved SAXS (TR- SAXS) uniquely allows global solution measurements of kinetic intermediates after an initiating event. The time-resolved SAXS setup at BioCAT utilizes chaotic and laminar flow microfluidic mixers to measure time ranges from ~80 us to 1.5 s. Recent notable advances include: new mixer designs to optimize accessible time ranges and sample consumption; improved microbeam focusing and mixer fabrication techniques to reduce parasitic scattering; improved positioning and exposure triggering for optimal reliability; and a new, easy to use GUI for controlling all aspects of the experiments. These advances have significantly improved data quality and ease of use. Time resolved experiments can now be done with as little as ~200 uL of sample at modest concentrations for slower (>1 ms) reactions, whereas ultra-fast time resolved measurements can be done with as little as ~1 mL of sample. The TR-SAXS program at BioCAT is open to general users, and we anticipate the coming APS upgrade will further improve our experimental capabilities.