Exploring the landscape of biological solutions with the BioSAXS-2000[nano]

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Small angle X-ray scattering (SAXS) is a useful technique for extracting structural information from biological samples in solution. Most biological SAXS samples are aqueous solutions with proteins present in low concentration. In other cases, it may be of interest to study macromolecules at high concentration, at high viscosity or at conditions in which macromolecules are expected to crystallize. In such cases, SAXS can provide useful information about the inherent structure and phase of macromolecules.

Rigaku Oxford Diffraction's BioSAXS-2000[nano] system is well suited for analysis of all types of biological samples, independent of concentration, viscosity and phase. The BioSAXS-2000[nano] system uses 2D Kratky collimation with confocal optics to achieve maximum X-ray flux on the samples. The system includes Rigaku's hybrid photon counting detector (HPC), the HyPix-3000. The HyPix-3000 is ideal for measuring scattering from biological solutions because the detector combines ultra-low noise, high dynamic range and direct detection of X-ray photons. New features of the BioSAXS-2000[nano] add further capabilities, such as variable q-range, measurement of anisotropic samples and grazing incidence (GI) compatibility. These capabilities come in the form of hot swappable attachments and use auto-detection methods, including capillary and flow cell support with the automatic sample changer (ASC).

In this study, we describe the versatility offered by the new BioSAXS-2000[nano] system for biological SAXS and demonstrate the capabilities have been extended for samples types other than dilute protein solutions. In particular, we describe experiments with non-typical macromolecular samples, whether for the purposes of optimization of biological pharmaceuticals, for characterizing crystallization suspensions prior to measurement at an XFEL and for characterizing structural changes in response to solution conditions.