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Experiments on the high-flux BioSAXS beamline: opportunities for dynamic studies of soft matter systems and advanced materials

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The BioSAXS beamline is one of the new beamlines to be constructed at the Australian Synchrotron within the BRIGHT program. BioSAXS will be dedicated to perform solution small-angle X-ray scattering (SAXS) experiments, offering access to a variety of researchers from Australia and New Zealand. Solution SAXS experiments continue to be a growing area of the current Australian Synchrotron SAXS/WAXS operations, particularly in regard to protein and DNA/RNA structure, polymer solutions, nanoparticles and liquid crystal phases. Highly radiation-sensitive samples will be studied on the BioSAXS beamline with unprecedented levels of flux, using the CoFlow sample environment, a pioneering development of the Australian Synchrotron. A highly-automated end-station combined with a versatile detector system will allow the BioSAXS beamline to accommodate most solution SAXS experiments, covering a q-range of ~ 0.001 – 3 Å-1, with low instrument background. The optical design is optimized for high flux (>5×1014 ph/s) x-rays and a focused beam size of 0.3 mm (H) × 0.03 mm (V).

Along with the CoFlow, a wide range of automated, in-situ sample environments are planned for users studying soft matter and nanoparticulate systems, with a focus on high throughput measurements and real-time dynamics to take advantage of the high flux beam and fast detector response time. These will include a stopped-flow and rheometer for dispersed polymer solutions, along with a novel, versatile magnetic-array system, optimized for small-angle scattering experiments on magnetic nanoparticles used in biomedical applications. The BioSAXS beamline will be developed as a highly-automated and versatile beamline that can accommodate a wide-range of solution scattering experiments, complementing the existing SAXS/WAXS beamline to ensure the world-leading capabilities of the SAXS offering at the Australian Synchrotron.

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