Small Angle Neutron Scattering Capability at ANSTO

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Replacing traditional solvents with ionic liquids modifies how dissolved species behave in solution, notably how they may self-assemble into larger more complex structures. To deliver on their promise as designer solvents, we must understand how ionic liquids change the solution structures of molecules such as polymers and surfactants. Small angle scattering is a technique which is highly suitable to answer questions about how solvents influence the size, aggregation and overall shape of suspended macromolecules.

Small angle scattering may be performed either with X-rays (Small Angle X-ray Scattering – SAXS) or neutrons (Small Angle Neutron Scattering – SANS). SAXS offers the ability to work on extremely small sample volumes with high flux, while SANS is often used in conjunction with contrast variation to highlight structures not always visible in SAXS due to the neutron's unique interaction with atomic nuclei.

Australia is particularly well-positioned with regards to SANS instrumentation, with ANSTO being home to three world-class instruments: a monochromatic SANS instrument, Quokka[1], a time-of flight SANS instrument, Bilby[2], and an Ultra-SANS instrument, Kookaburra[3]. Together they enable the study of structures at space scales between 1 nm and 20 μm, and this presentation will highlight their suitability to study ionic liquids. The SANS instruments are complemented by a co-located laboratory based SAXS instrument. Measurements on all instruments may be made directly in the solution state while changing parameters such as sample temperature and shear rate.

References

1. Wood, K., et al. *J. Appl. Crystallogr.* **2018,** *51(2)*, 294-314.
2. Sokolova, A., et al. *J. Appl. Crystallogr* **2019**, *52,* 1-12.
3. Rehm, C. et al. *J. Appl. Crystallogr.* **2018,** *51(2)*, 294-314

Kathleen (Katy) Wood is an instrument scientist in the Quokka instrument team and is also jointly responsible for the Xenocs SAXS instrument. She enjoys working with users from the wide range of scientific and cultural backgrounds who come to use our instruments.