

Small and Ultra Small Angle Scattering at ACNS, ANSTO: Case Studies in Structural Characterisation of Complex Materials

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Small and Ultra-small angle X-ray and neutron scattering (SAXS, USAXS, SANS, USANS) are versatile techniques for investigating the nanoscale and microscale structure of hard and soft condensed materials such as minerals, alloys, magnetic materials, food, surfactants, polymers, proteins, colloids, and emulsions. These techniques have been exceptionally useful for studying complex materials with hierarchical structures in recent years. The use of small angle scattering (SAS) in combination with traditional techniques offers a unique insight into the structure, size, shape, and morphology of materials. Different processes such as aggregation, structural transitions, crystallisation, porosity, and phase separation can be directly studied using SAS. SAS techniques, well-established for characterisation at length scales ranging from 1 nm to 10 μm , are mostly nondestructive and particularly useful for studying systems in-situ and within complex sample environments. The use of deuterated molecules and partial deuteration has also enhanced the applicability of these methods for studying soft materials using SANS/USANS. In this talk, I will discuss the advantages and limitations of these techniques and provide examples of recent applications in various areas of science.

Australia is the home of state-of-the-art reactor-based SANS and USANS instruments known as Quokka, Bilby, and Kookaburra (at the ACNS, ANSTO). Combining these with on-site lab based SAXS instrument provides a versatile characterisation suite to study complex materials especially for industrial applications. ANSTO is known for its high-class neutron scattering based science, and associated exceptional sample environment options, as well as outstanding deuteration facility.



Reference: <https://www.ansto.gov.au/facilities/australian-centre-for-neutron-scattering>