

Studying interfacial phenomena with Neutron Reflectivity: advantages and opportunities

Many significance processes occurring at interfaces surpasses our imagination, underscoring the crucial importance of comprehending interfacial phenomena. Various surface characterisation techniques are presently available and routinely employed to explore adsorption, deposition, and surface structures. These techniques offer diverse resolutions, ranging from micron to nano, each providing distinct types and qualities of information.

One of these techniques, Neutron Reflectivity (NR), stands out for its ability to provide both qualitative and quantitative information of exceptional quality. Utilizing the small neutron wavelength, NR can resolve structures at the Ångstrom length scale perpendicular to the interface. Moreover, recent advancements in flux, instrumentation and sample environments have enabled the routine resolution of sub-minute kinetics. Despite historically being considered niche due to limited accessibility and instrumentation scarcity globally, a notable shift has occurred over the past decade. Scientists outside the neutron expertise realm have increasingly adopted neutron scattering techniques, propelling these methods to the forefront of scientific exploration.

This presentation aims to provide a comprehensive overview of NR, elucidating its fundamental principles and detailing the criteria for beamtime application, which is solely granted based on scientific merit. Exploring how selective deuteration can heighten the technique's sensitivity by accentuating or contrasting match specific sample components will be discussed. Additionally, a range of sample environments that can be used will be outlined. Finally, selected examples demonstrating the extraction of qualitative and quantitative information from biophysics-related experiments will be presented.

The takeaway message of this discourse is to dispel the notion that neutron scattering techniques remain confined to niche applications. Through meticulous planning, these techniques can yield invaluable results across a wide spectrum of scientific disciplines.