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New Contrast Options - Diversity and Specificity of Deuteration

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The Australian National Deuteration Facility (NDF) continues to develop new capabilities in molecular deuteration. The tailoring of deuteration approach to solve specific contrast problems has greatly increased the range of systems that can be investigated and recent capability development and new applications will be described. The common problem of how to obtain good contrast during SANS of membrane proteins solubilised in detergent micelles has been solved by specific deuteration of detergent head groups and hydrophobic tails to different levels to contrast match at 100% D₂O buffer. Likewise, in investigating the location of a purely hydrophobic transmembrane peptide in bicontinuous cubic phase liquid crystals suitable for drug delivery, a mixture of deuterated and hydrogenated phytanoyl monoethanolamide was used to perfectly contrast match out either gyroid or diamond phase lipids to pinpoint the peptides location.

In Soft Matter, investigation of structure of the ligands in the shell layer of self-assembled monolayer-protected nanoparticles has been made possible by use of various combinations of immiscible deuterated or hydrogenated Phenylethanethiol (PET) and Dodecanethiol (DDT) and MONSA modelling of SANS data showed the janus and belt like distribution of the ligands on the surface and the effects of nanoparticle core size and ligand ratio on the patterning. Other case studies will include use of deuterated ionic liquids and new previously unavailable deuterated molecules will be highlighted.

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Topic

Neutron Instruments & Techniques

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