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ANSTO's National Deuteration Facility: Recent advancements and an overview on molecular deuteration capabilities for neutron applications.

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The National Deuteration Facility (NDF) at the Australian Nuclear Science and Technology Organisation (ANSTO) provides deuteration through both biological and chemical techniques for a diversity of molecules and applications and is the only facility of its type in the Southern Hemisphere with the specialised expertise and infrastructure for both biological and chemical molecular deuteration. Molecular deuteration of organic compounds and biomolecules significantly increases the options in complex structure function investigations using neutron scattering and reflectometry, nuclear magnetic resonance (NMR), mass spectrometry (MS) and other techniques. Deuteration (substitution of the naturally occurring hydrogen stable isotope deuterium (2H or D) for 1H (or H)) can provide contrast and improved resolution to assist investigations into the relationship between molecular structure and function of molecules of both biological and synthetic origin.

By developing a suite of capabilities in both *in vivo* deuteration of biomolecules and chemical deuteration of small organic molecules, the NDF provides access to a broad range of deuterated molecules for research and industry. Variably deuterated proteins can be produced via recombinant expression in *Escherichia coli* and other microbial systems utilised to produce deuterated cellulose and cholesterol. By tailoring deuteration approaches with the ongoing development of chemical deuteration protocols for a broader range of molecular classes than available commercially, the NDF has increased the range of systems that can be investigated using deuterated molecules. Lipids, phospholipids (including head or tail or head/tail deuterated mono-unsaturated lipids such as POPC and DOPC), heterocyclics, aromatics, surfactants, ionic liquids, saturated and unsaturated fatty acids, sugars and match-out detergents have been deuterated.

Common neutron applications include partially deuterated proteins for SANS experiments investigating multi-protein systems, neutron crystallography of perdeuterated proteins, neutron reflectometry of lipid bilayers systems and SANS using saturated lipid vesicles, or detergents amongst others.

An overview and update on the NDF will be provided which will include details on the NDF User Program (e.g. information on the available modes of access), recent advancements in custom deuterated molecules available and brief highlights of deuterated molecule utilisation for neutron experiments at ANSTO's Australian Centre for Neutron Scattering (ACNS).

Speakers Gender

Female

Level of Expertise

Expert

Do you wish to take part in the poster slam

No

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