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DEMAX: Deuteration and Macromolecular Crystallization Support labs for the European Spallation Source.

In soft matter and life science neutron scattering experiments, access to full or partially deuterated materials is critical. Such molecules may include proteins, lipids, fatty acids, small molecules, membranes and so on. These classes of molecules are of intense interest to the neutron research community, however they are often not used due to various reasons, including: deuterated molecules are not commercially available, or deuterated molecules are simply too difficult and expensive to produce. For small angle neutron scattering (SANS), neutron reflectometry (NR), and neutron protein crystallography (NPX), using deuterated samples has numerous benefits. For SANS, NR deuteration is most commonly used to enable contrast variation, allowing scientist to selectively “match out” components of complexes. In NPX deuteration is used to boost weak signal-to-noise ratios, reduce the incoherent background due to Hydrogen, improve neutron scattering length maps, and enable direct visualization of Hydrogen bonds and solvent networks.

DEMAX is the Deuteration and Macromolecular Crystallography support lab for soft matter and life science users of the European Spallation Source (ESS). DEMAX has three support pillars and will be available to all users of ESS instrument: chemical deuteration, biological deuteration, and large crystal growth. We have fully equipped chemistry and life science labs and during operations will offer service for specific classes of deuterated inorganic or organic small molecules (e.g. lactic acid), deuterated biomass/crude lipids/proteins, and access to our crystallization labs for large crystal growth. For biological deuteration and protein crystallization we have established a partnership with Lund University’s Lund Protein Production Platform (LP3), a cross-faculty support lab for the production and crystallization of proteins, both unlabeled and labeled (^{13}C , ^{15}N , ^2H) using bacteria, insect cells, and yeast. DEMAX and LP3 are co-located in the Biology Department of LU. Access to DEMAX will be granted on a proposal, peer-reviewed basis. We aim to solicit requests for support services and expressions of interest to help grow our competence and develop methods in early 2019. ESS is also the organizing node for DEUNET, a network of deuteration facilities around Europe, more information and news can be found at: <http://www.deuteration.net>.

Topic

Neutron Facilities

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