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Lamellar diffraction from lipid bilayers on MIRA, a triple axis spectrometer at the MLZ

Tuesday 21 March 2023 16:00 (2 hours)

Diffraction used in conjunction with molecular deuteration provides a model independent means to examine detailed structural and compositional information of model and real biological membranes in the lamellar phase. The technique provides specific information of localization of molecules and smaller units with respect to the unit cell. Deuteration is used to provide specific labelling and to provide phasing for the crystallographic reconstruction. Typical data sets consist of a series of lamellar diffraction peaks, usually collected under conditions of 3 contrasts of a water. Accurately integrated the diffraction peaks can be used for a Fourier reconstruction of the composition of the lamellar unit cell in real space. Each diffraction peak which can be integrated for 3 contrasts contributes to an additional Fourier term in the reconstruction and optimization of the number of peaks enhances the spatial resolution of the crystallographic reconstruction. Here we report on the use of the flexibly configurable cold triple-axis spectrometer, MIRA, at the Heinz Maier-Leibnitz Zentrum (Garching, Germany) for investigations of different lamellar systems using this approach. The data sets are acquired from lamellar stacks in an sample environment with humidity and temperature control with exceptionally low background. We discuss further enhancements of the instrument and sample environment which will provide information on the composition and equilibration of the sample.

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