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Small-Angle and Inelastic Neutron Scattering from Polydisperse Oligolamellar Vesicles Containing Glycolipids

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Glycolipids are known to stabilize biomembrane multilayers through preferential sugar-sugar interactions that act as weak transient membrane crosslinkers [1, 2]. We use small-angle and inelastic neutron scattering on oligolamellar phospholipid vesicles containing defined glycolipid fractions in order to elucidate the influence of glycolipids on membrane mechanics and dynamics.

Small-angle neutron scattering (SANS) reveals that the oligolamellar vesicles (OLVs) obtained by extrusion are polydisperse with regard to the number of lamellae, n , which renders the interpretation of the inelastic neutron spin echo (NSE) data [3] non-trivial. To overcome this problem, we propose a method to model the NSE data in a rigorous fashion based on the obtained histograms of n and on their q -dependent intensity-weighted contribution. This procedure yields meaningful values for the bending rigidity of individual lipid membranes and insights into the mechanical coupling between adjacent membrane lamellae, including the effect of the glycolipids.

[1] Latza et al., Biophys. J., 118, 1602 (2020)

[2] Kav et al., Nanoscale, 12, 17342 (2020)

[3] Hoffmann et al., J. Chem. Phys., 148, 104901 (2018)

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