Bilayers at the ILL

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Curved lipid interfaces studied with GISANS

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Curved cell membranes are important for the function of the cell, both for compartmentalization in organelles within the cell as well as for cellular mitosis. It has also been shown that the curvature of a lipid membrane can affect the concentration of membrane bound proteins. In this project we have used semiconductor nanowires to study the effect of curvature on phospholipid bilayers and membrane proteins. We have previously demonstrated the formation of a supported phospholipid bilayer on nanowires via vesicle fusion, which can be used as a proxy for curved membranes. Based on fluorescence recovery after photobleaching, FRAP, measurements, the phospholipid bilayers were found to follow the contours of the nanowires as continuous and fluid, locally curved bilayers. However, these data do not reveal the coverage, composition and the dimensions of the bilayer. In this project we aim to reveal this structure using grazing incidence small-angle neutron scattering (GISANS).

For this purpose, we have performed GISANS experiments with the KWS-1instrument at FRM II (Germany), with VSANS at NIST (USA) and SANS2D at ISIS (UK) with phospholipid covered nanowires. The nanowires were covered with the bilayer obtained from deposition from a vesicular dispersion of a mixture of 20mol% DOPE in DOPC. In these experiments we have successfully shown the formation of a lipid bilayer and the subsequent binding of membrane protein, streptavadin. These results show that nanowire supported lipid bilayer is an excellent way to study binding of membrane protein to curved lipid interfaces.

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