Experimental report

15/07/2025

Proposal: CRG-3236 **Council:** 10/2024

Title: PIGISANS for Cardiolipin and POPC mixtures around NPs scaffolds

Research area: Soft condensed matter

This proposal is a new proposal

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Samples: Lipids

Instrument	Requested days	Allocated days	From	To
SUPERADAM	3	3	11/06/2025	14/06/2025

Abstract:

The vast majority of studies published in the literature regarding the curvature of biological membranes and curvature-related phenomena are based on fluorescence microscopy techniques which, in the best cases, are limited to a spatial resolution of hundreds of nanometres and require the use of lipids chemically modified with fluorophores to enable their detection. To increase the resolution down to sub
nanometre distances, real-space techniques such as microscopy must be complemented with reciprocal-space methods such as neutron scattering. However, there are currently very few model membranes amenable to be used in the study of curvature-related lipid sortingusing scattering techniques. Our goal is to tackle this open challenge by creating a supported lipid bilayer on top of an ordered array of
hexagonally packed silica nanospheres and use them to study lipid demixing as a function of curvature. We have shown that we can make such samples by microscopy and neutron reflection and now we plan to study lipid demixing at different curvature using pi-gisans

CRG-3236.

PIGISANS for Cardiolipin and POPC mixtures around NPs scaffolds.

To carry out this experiment, a special holder was manufactured to fasten two blocks together, thereby reducing the background signal typical of a standard solid-liquid cell. GiSANS spectra for blocks pre-coated with silicon oxide nanoparticles of 100 and 120 nm in size are shown in Fig. 1.

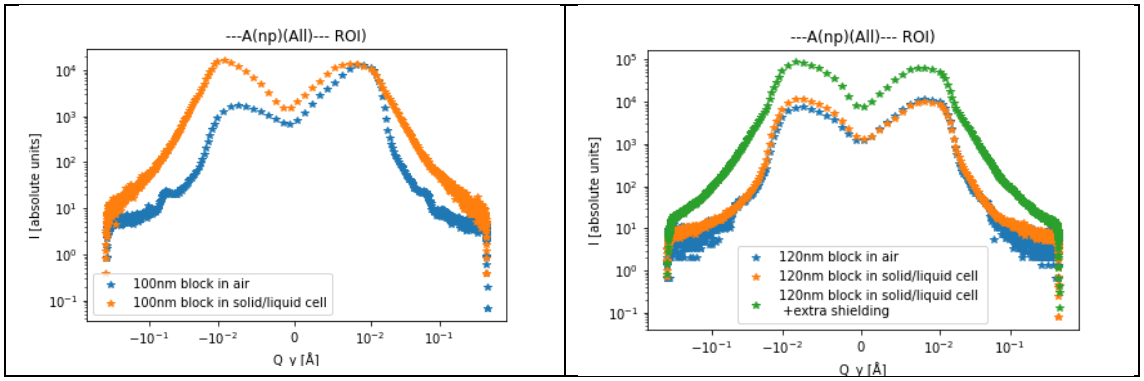

Fig.1 PiGiSANS data for the pre-coated blocks with 100 nm (left) and 120 nm (right) of SiO2 NPs.

Although peaks were detected at the air–solid interface, transition to the liquid–solid interface makes peak registration extremely difficult, even after six hours of measurement. The measurements were conducted with a 20 µm thick Teflon spacer between the blocks, which minimized the volume of liquid exposed to the neutron beam.

Based on the obtained spectra, further improvements to the cell and sample design will be made.

Additionally, measurements of a supported lipid bilayer (SLB) on the block with 100 nm nanoparticles were performed in reflectometry mode (Figure 2). The fitting results indicate the presence of lipid phase separation and flip-flop following EDTA washing.

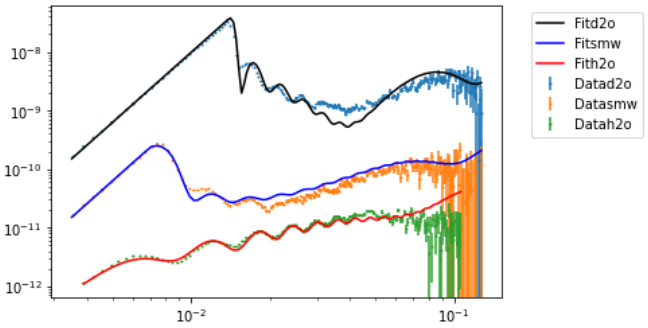

Fig.2 NR spectra of SLB on the block with 100 nm nanoparticles.