Experimental report

04/03/2020

Proposal: EASY-575 **Council:** 10/2019

Title: Liposome characterisation by SANS

Research area: Soft condensed matter

This proposal is a new proposal

Main proposer: Olga MATSARSKAIA

Experimental team:

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Samples: C40H80NO8P

Instrument	Requested days	Allocated days	From	To
D11	12	12	11/01/2020	12/01/2020

Abstract:

Liposomes consisting of phosphatidylethanolamine conjugated 2 kDa polyethylene glycol (PEG) in D2O will be characterised using SANS.

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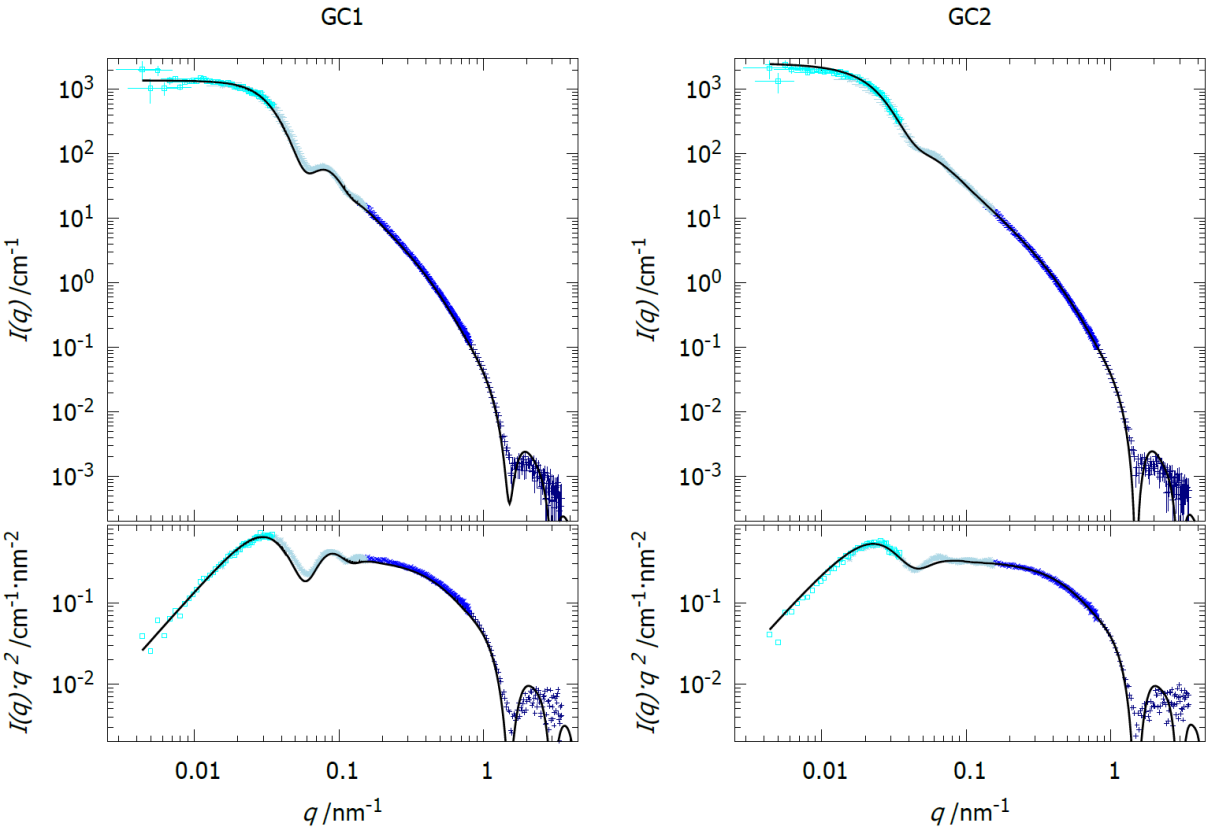
Context: Liposomes can be efficiently used as drug carriers with low cytotoxicity; in this case, a specific lipid mixture is tested for the transport of cAMP inhibitors in retinal cells.

Scientific question: The goal of this experiment was to investigate the shape and interactions of PEGylated liposomes composed of POPC and cholesterol. Two samples with identical composition where measured, to test the reproducibility of the preparation method. Indeed the size, size distribution, shape and number of lamellae of phospholipids is known to be strongly affected by details of the preparation.

Two samples were received prepared in D_2O with 4 mg/mL lipids: POPC, cholesterol and DSPE-mPEG (2 kDa PEG) (63.3/31.7/5 by mol).

Samples were measured at 20 °C on D11 at 4 configurations: at SD=1.4, 8 and 39 m (collimations at 5.5, 10. 5 and 40.5 m) with λ = 6 Å and at 39 m with λ = 20 Å (bouncing guide) (10 min / sample / configuration). Figure 1 presents merged data after subtraction of the scattering by the solvent D_2O and an additional constant accounting for incoherent contribution.



Analysis: A model of two population of uni- and bilamellar spherical vesicles, with a common hard sphere structure factor of corresponding number density, was used. The shell thickness was found to be 42 nm for one lamella, with 15 % (by number) liposomes having 2 lamella. The mean core radii are 47 and 56 nm for GC1 and 2 respectively, with relative standard-deviations of 0.20 and 0.33 respectively.

Outcome: The data analysis allows the experimenters to characterise the liposomes in terms of size, polydispersity and number of lamellae. This information lays the foundation for future experiments using the liposome systems, including their drug-loaded versions.

Acknowledgement: Joachim Kohlbrecher (PSI, Switzerland) fixed bug in sasfit 0.94.11, releasing a pre-version of sasfit 0.94.12, and gave useful advices on the model to use for these data.