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Complementarity of Neutrons and X-rays on the Example of Hydrocarbon/Fluorocarbon Small Unilamellar Vesicles

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The self-assembly of small unilamellar vesicles (SUVs) in mixtures of perfluorinated and hydrocarbon surfactants has been subject of intense studies in the past with a focus on the phase diagram [1,2], shape and kinetics of the aggregates depending on concentration and mixing ratio [3] as well as control thereof [4].

Given that the scattering length densities (SLD) of perfluorinated and hydrocarbon surfactant tails differ largely for both neutron and x-ray scattering, SANS and SWAXS are very sensitive to the composition as well as the internal structure of the bilayer [5].

Using contrast-variation SANS (KWS-1, FRM II), we were recently able to show that the composition of our SUVs differs significantly from the sample composition even for a nearly symmetric mixture (mole fraction $x_{\text{TDMAO}} = 0.43$).

We are currently improving our structural model based on this finding in order to fully exploit the detailed structural information contained in our stopped-flow SAXS/WAXS data (ID02, ESRF) [6]. These results then are correlated with a thermodynamic analysis of the system.

References:

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