DETERMINATION OF DMPC SURFACE AREA AND BILAYER THICKNESS FROM SANS ON UNILAMELLAR VESICLES.

The bilayer thickness and the lipid surface area is studied in various model membrane systems using mainly SAXS [1] and SANS [2, 3] methods. The SANS is preferable for a high contrast between the bilayer and D_2O solutions.

Though the scattering theory is very well known, it is necessary to assume different approximations in the evaluation of experimental data. The most frequently used constraint is a homogenous coherent neutron scattering length density, $\rho(\vec{r})$, and no water molecules intercalated within bilayer [2, 3]. In the present work, we have performed SANS experiment on unilamellar DMPC vesicles and interpreted these data using a 5-strip function model of $\rho(\vec{r})$. In the polar region, the value of $\rho(\vec{r})$ increases linearly due to water molecules located therein. Using the DMPC component volumes and fixing the polar region thickness to 9 Å, we have obtained the bilayer thickness d_L=45.9±0.3 Å, the DMPC surface area A_L=55.7±0.6 Å^2, and the number of water molecules located in the bilayer polar region N_L=6.0±0.2 per one DMPC molecule at 30°C. In the fluid DMPC bilayers, the value of d_L decreases and the values of N_L and A_L increase non-linearly with the temperature in the range 25-40°C. These results are used to discriminate among various models of precritical behaviour on the high temperature side of the DMPC gel-fluid phase transition.

1. Nagle,J.F. and S.T.Nagle. 2000. BBA 1469:159-195
2. Balgavý,P., M.Dubničková et al. 2001. BBA 1512:40-52
3. Pencer,J. and F.R.Hallett. 2000. Phys. Rev. E 61:3003-3008

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