

Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Self-assembly models for lipid mixtures DIVYA SINGH, Johns Hopkins University, LIONEL PORCAR, NIST Center for Neutron Research, PAUL BUTLER, NIST Center for Neutron Research, URSULA PEREZ-SALAS, UC, Irvine — Solutions of mixed long and short (detergent-like) phospholipids referred to as “bicelle” mixtures in the literature, are known to form a variety of different morphologies based on their total lipid composition and temperature in a complex phase diagram. Some of these morphologies have been found to orient in a magnetic field, and consequently bicelle mixtures are widely used to study the structure of soluble as well as membrane embedded proteins using NMR. In this work, we report on the low temperature phase of the DMPC and DHPC bicelle mixture, where there is agreement on the discoid structures but where molecular packing models are still being contested. The most widely accepted packing arrangement, first proposed by Vold and Prosser had the lipids completely segregated in the disk: DHPC in the rim and DMPC in the disk. Using data from small angle neutron scattering (SANS) experiments, we show how radius of the planar domain of the disks is governed by the effective molar ratio q_{eff} of lipids in aggregate and not the molar ratio q ($q = [DMPC]/[DHPC]$) as has been understood previously. We propose a new quantitative (packing) model and show that in this self assembly scheme, q_{eff} is the real determinant of disk sizes. Based on q_{eff} , a master equation can then scale the radii of disks from mixtures with varying q and total lipid concentration.

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Date submitted: 30 Nov 2005

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