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The effect of tail-length mismatch in binary DMPC/DSPC lipid bilayers RANA ASHKAR, UMCP/NIST, MICHIHIRO NAGAO, PAUL BUTLER, NIST Center for Neutron Research — Bilayer heterogeneity has been long hypothesized to drive raft formation and promote complex functionality in lipid membranes. The highly dynamic nature of the membrane however is thought to play a critical role in this delicate balance between structure and performance. To probe the effect of lateral heterogeneity on membrane dynamics, we investigate the thermal response of unilamellar-vesicle systems of mixed dimyristoylphosphatidylcholine (DMPC) and distearoylphosphatidylcholine (DSPC) with DMPC/DSPC ratios of 50/50 and 70/30. Both lipids experience a transition from an ordered gel phase, with stiff stretched tails, to a melted fluid phase, with more coiled flexible tails, as they are heated through their melting temperature, T_m(DMPC) $\approx$ 21 °C and T_m(DSPC) $\approx$ 51 °C. The distinct T_m's of the two lipids provide a broad gel-fluid phase with a significant mismatch ($\approx$ 20 Å) between the tail-lengths of the DMPC and DSPC molecules. The structural properties of the vesicles were determined by small-angle neutron and x-ray scattering and the collective lipid dynamics in the bilayer were investigated by neutron spin-echo (NSE) spectroscopy on selectively deuterated samples. The NSE results indicate a slowdown of thickness fluctuations in the gel-fluid coexistence phase and an intriguingly strong enhancement in the thickness fluctuation amplitude for T $>T_m$(DSPC) compared to our previous work on single component vesicles.

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