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Anomalous Swelling of Lipid Bilayer Stacks Is Caused By Softening of the Bending Modulus

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Analysis of diffuse x-ray scattering data from oriented stacks of lipid bilayers provides the bending modulus K_C and the bulk modulus B separately. We report results for the lipid DMPC that exhibits anomalous swelling as the temperature decreases towards the main transition within the fluid L_α phase. The measured bending modulus K_C decreases by almost a factor of two in the same temperature range (24-27°C) as the anomalous swelling occurs. Monte Carlo simulations show that the anomalous swelling can be accounted for by the measured decrease in K_C with no changes required in the van der Waals or hydration forces. This research was supported by NIH grant GM44976.

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