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Effective bending rigidity of lipid membranes with coexisting gel and fluid domains ELIZABETH KELLEY, National Institute of Standards and Technology, RANA ASHKAR, Oak Ridge National Laboratory, ROBERT BRADBURY, PAUL BUTLER, MICHIHIRO NAGAO, National Institute of Standards and Technology — Lipid membranes undergo a wide array of dynamic transformations that are essential to cell function. These hierarchical dynamics span several decades in length and time scales, ranging from the rotation and diffusion of individual lipids to the undulation of micron-sized patches of the membrane. Formation of rigid domains in a fluid lipid matrix not only impacts the local lipid dynamics, but also is predicted to modulate the membrane mechanical properties that govern large-scale membrane deformations. Here we use neutron spin echo spectroscopy (NSE) to show that the effective bending modulus of lipid membranes with coexisting gel and fluid phases directly depends on the area fraction of the rigid gel domains. Our experimental results are in good agreement with theoretical predictions for heterogeneous lipid membranes and have important implications for understanding the effects of rigid inhomogeneities, such as transmembrane proteins or lipid domains, on the elasticity of biological membranes.

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