# Properties of bilayer membranes in the phase transition or phase separation region

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Abstract

The increase in passive permeability of bilayer membranes near the phase transition temperature is usually explained as caused by either the increase in the amount of 'boundary lipid' present in the membrane, or by the increase in lateral compressibility of the membrane. Since both the amount of 'boundary lipid' and the lateral compressibility show a similar anomaly near the transition temperature, it is difficult to distinguish experimentally between the two proposed mechanisms.

We have examined some details of both of the proposed pictures. The fluid-solid boundary energy, neglected in previous work, has been computed as a function of the domain size. For a single component uncharged lipid bilayer, the results rule out the existence of even loosely defined solid domains in a fluid phase, or vice versa. Thermodynamic fluctuations, which are responsible for anomalous behaviour near the phase transition temperature, are not intense enough to approximate the formation of a domain of the opposite phase.

Turning next to lateral compressibility of bilayer membranes we have considered two-component mixtures in the phase separation region. We present the first calculation of lateral compressibility for such systems. The behaviour shows interesting anomalies, which should correlate with existing and future data on transport across membranes.

Author Keywords: Phase separation; Bilayer compressibility; Lipid domain; (Bilayer membrane)

Abbreviations: DPPC, dipalmitoyl phosphatidylcholine; DMPC, dimiristoyl phosphatidylcholine

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