Can hydration forces induce lateral phase separations in lamellar phases?

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Abstract. Large repulsive forces measured between membranes of lamellar lipid phases at low hydration are attributed to hydration interactions which vary widely among lipid species. We include this interaction in a model of lamellar phases of two membrane components (two lipids or lipid and protein). The surface polarization of a mixture is taken as a linear combination of those of the components. The model predicts phase separation at low hydration. This may have important consequences for living cells which are dehydrated either by the osmotic effects of tissue freezing, or by desiccation in unsaturated atmospheres.

Key words: Lamellar phase, phase separation, hydration forces, membrane dehydration