Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Phase Segregation and Patterning in Two Dimensional Systems: Competition Between Van der Waals and Electrostatic interactions
SHARON LOVERDE, Department of Materials Science and Engineering, Northwestern University, FRANCISCO SOLIS, Department of Biophysics, Arizona State University, MONICA OLVERA DE LA CRUZ, Department of Materials Science and Engineering, Northwestern University — The formation of heterogeneities on surfaces, such as microdomains found in synthetic and natural lipid membranes, has not yet been yet fully explored from a theoretical point of view. It has been proposed, for example, that lipid rafts arise in membranes due to lipid-lipid and/or lipid-protein interactions. We consider a coarse-grained model of a mixture of charged lipids interacting within a monolayer. We analyze this model both analytically and with molecular dynamics simulations, and find a rich phase diagram. The complex phase behavior is generated by the competition between the short range van der Waals interactions and long range electrostatic interactions. In particular, we observe phase coexistence between an "ionic gas" phase with a dense patterned solid phase. We have examined the phase diagram of the system as a function of net charge density and charge asymmetry.

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Date submitted: 05 Dec 2005 Electronic form version 1.4