Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Tension induced phase transitions in biomimetic fluid membranes
MARC SHAPIRO, PETIA VLAHOVSKA, Brown University — Membranes in eukaryotic cells are mixtures of hundreds of lipid species. The lipid diversity enables membranes to phase separate and form domains, called rafts, which play a critical role in cell functions such as signaling and trafficking. The phase transitions underlying raft formation have been extensively studied as a function of temperature and composition. However, the third dimension of the phase diagram, i.e., the tension (2D pressure), is still unexplored because membrane tension is difficult to control and quantify. To overcome this challenge, we develop two approaches, capillary micromechanics and electrodeformation, in which the tension is regulated by the area dilation accompanying deformation of a vesicle (a closed membrane). The first technique consists of forcing an initially quasi-spherical vesicle through a tapered glass microcapillary, while the second method utilizes uniform electric fields to deform the vesicle into an ellipsoid. Domains are visualized using a fluorescent dye, which preferentially partitions in one of the phases. The experimental results suggest that the miscibility temperature (at which domains form in an initially homogeneous membrane) increases with applied tension. Domain motions and coarsening are also investigated.

Petia Vlahovska
Brown University

Date submitted: 12 Aug 2012 Electronic form version 1.4