Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Experimental Study of Particle Behavior on a Curved Polymer Interface[1] KATHLEEN MCENNIS, CHUAN ZENG, BENNY DAVIDOVITCH, ANTHONY D. DINSMORE, THOMAS P. RUSSELL, University of Massachusetts Amherst — A spherical particle bound to an anisotropically curved liquid interface, such as a cylinder or catenoid, cannot maintain a constant contact angle without deforming the interface. Theory predicts that because of this deformation, individual particles will experience a capillary force toward lower negative Gaussian curvature. To test this prediction, particles are deposited from suspension onto interfaces of non-uniform shape. Melted polystyrene (PS) confined on chemically patterned surfaces creates semi-cylinders a few hundred microns in diameter. Microscopic catenoids are created by placing a melted PS film in an electric field. After cooling, PS vitrifies and the particles are frozen in place. The location of particles is observed by optical, scanning electron, and scanning force microscopy (SFM). Particles are observed to migrate to the rims of the catenoids while particles on semi-cylinders cluster, but show no preference for location. At these size scales and particle concentrations, the predicted single-particle behavior is not observed. SFM is used to determine the validity of the assumed constant contact angle boundary condition at the particle's surface. The implication of these results on curvature induced particle assembly will be discussed.

[1]We acknowledge support from NSF-supported MRSEC on Polymers at UMass (DMR- 0820506), NSF CBET-0967620, and the U.S. DOE Office of Basic Energy Sciences (DE-FG02-96ER45612).

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Date submitted: 10 Nov 2011 Electronic form version 1.4