Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Microsphere Wetting, Meniscus Structure, and Capillary Interactions on a Curved Liquid Interface PAUL KIM, ANTHONY DINSMORE, DAVID HOAGLAND, THOMAS RUSSELL, Univ of Mass - Amherst — A small spherical microparticle on a cylindrically curved liquid interface locally induces a quadrupolar interface deformation to maintain a constant contact angle about its wetted periphery. Measured by optical profilometry, this deformation was compared to a recent theoretical expression, and good agreement was noted for contact line shape, particle vertical position, and deformation vs. (distance, angle, particle size, interfacial curvature). Interface quadrupoles lead to particle capillary interactions in analogy to 2D electrostatic quadrupoles, and as one consequence, spheres on a cylindrical interface assemble tetragonally, i.e., into a square lattice. This assembly was monitored in the optical microscope, with particles interacting as predicted, into a square lattice aligned with the underlying cylindrical axis. These particles and assemblies were driven to the middle of the curved interface by capillary interaction with pinned liquid contact lines on each side of the liquid cylindrical section used in the experiments. These phenomena can inform the directed interfacial assembly of micro-sized spherical objects, with potential application in fabrication of functional devices and materials, encapsulation, and emulsification.

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Date submitted: 12 Nov 2016 Electronic form version 1.4