Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Molecular simulations of capillary adhesion[1] SHENGFENG CHENG, MARK ROBBINS, Johns Hopkins University — Adhesion due to capillary condensation is ubiquitous in nature, and dominates the adhesion force between particles in many experiments. Traditional models are based on continuum theory and may not describe nanoscale capillaries in microelectromechanical systems (MEMs) or at an atomic force microscope (AFM) tip. We employ molecular dynamics simulations to investigate the capillary adhesion between a nominally spherical tip and a flat substrate with a liquid bridge of fixed volume. The atomic scale roughness on the tip, contact angle and volume are varied. The adhesive force-distance curve and the separate contributions from Laplace pressure and surface tension are compared to continuum theory using independently measured parameters. Continuum theory provides a good description down to separations of a few molecular diameters. Atomic scale roughness affects the contact angle that enters the continuum theory and alters the adhesive force.

[1]Work supported by Grants CTS-0320907-DLMS and NIRT-0709187.

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Date submitted: 27 Nov 2007 Electronic form version 1.4