Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Mapping potential energy landscapes of templated substrates using diffusing colloidal particles PRADIPKUMAR BAHUKUDUMBI, Texas A&M University, Mechanical Engineering, MICHAEL BEVAN, Texas A&M University, Chemical Engineering, ALI BESKOK, Texas A&M University, Mechanical Engineering — Manipulating self and directed colloidal assembly on templated substrates requires the ability to measure and reversibly tune interactions on the order of kT. Accurate measurements of small energy differences in particle-substrate interactions are necessary to control the equilibrium self assembly processes. In this work, we report measurements of colloidal particle interactions and assembly dynamics at patterned substrate interfaces using optical microscopy techniques. Standard photolithography techniques were used to fabricate arrays of different size physical features on an Indium-Tin-Oxide (ITO) electrode surface. Electric fields were used in conjunction with gravitational effects to control inherent competitive transport mechanisms to produce ordered colloidal structures. A novel method to map potential energy surfaces that utilizes a diffusing colloidal particle as a sensitive "probe" to measure kT interactions will also be described. The 2D diffusion of the colloidal probe was monitored using Video microscopy (VM), and the x, y center coordinates and the particle trajectories were tracked using standard image processing algorithms. Consequently, the potential energy landscape probed by the particle can be obtained by inverting the 2D histogram of particle positions using Boltzmann's equation.

Ali Beskok
Texas A&M University, Mechanical Engineering

Date submitted: 03 Aug 2005 Electronic form version 1.4