Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

The Measurement of Surface Rheological and Surface Adhesive Properties using Nanosphere Embedment STEPHEN HUTCHESON, GREGORY MCKENNA, Department of Chemical Engineering - Texas Tech University — In previous work, we determined the actual rheological behavior at the surface of a polystyrene film with nanometer scale resolution by applying a viscoelastic contact mechanics model to experimental data in the literature. The goal of our current research is to build upon this analysis and use nanosphere embedment experiments to probe the nanorheological behavior of polymer surfaces near the glass transition, in the melt state and in the solid rubbery state. An atomic force microscope (AFM) is used to measure the embedment depth as nanoparticles are pulled into the surface by the thermodynamic work of adhesion. The results show that, with properly designed experiments, both the surface adhesion properties and the surface rheological properties can be extracted from nanosphere embedment rates. We include work on a phase separated copolymer and a commercially available polydimethylsiloxane (PDMS) rubber.

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Date submitted: 22 Nov 2007 Electronic form version 1.4