Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

The viscoelastic properties of ultrathin polymer films as measured with a novel nanobubble inflation technique. PAUL OCONNELL, GREGORY MCKENNA, Texas Tech University — Using a nano-bubble inflation technique developed within our laboratory, we have measured the absolute biaxial compliance of polymer films as thin as 11.3 nm. Previous results have shown that the degree of reduction in Tg with film thickness is not universal viz., PVAc shows no reduction even for the thinnest films while the PS shows a significant reduction at a thickness below approximately 80nm. In addition the rubbery plateau region for both materials shows dramatic stiffening as the thickness is reduced (>300 times) and scales as approximately the square of film thickness. We have extended the analysis of the data to directly determine the creep compliance function from the measured data rather than the minimization routine used previously. Creep compliance master curves constructed from data at varying thicknesses show that time-temperature superposition is valid even at the thinnest film thickness. The time-temperature shift factors are consistent with a WLF-type dependence and indicate a reduction in Tg for PS at 11.3nm of 53K while no significant reduction (< 3K) is seen for PVAc.

Paul OConnell
Texas Tech University

Date submitted: 20 Nov 2007 Electronic form version 1.4