Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Reduced Viscosity of Free Surface in Entangled Polymer Melt Films[1] TAD KOGA, C. LI, M. ENDOH, J. KOO, M. RAFAILOVICH, Stony Brook University, S. NARAYANAN, D. LEE, Argonne National Laboratory, L. LURIO, Northern Illinois University, S. SINHA, UC San Diego — The dynamics of polymer chains near the surface of a melt and within thin films remains a subject of inquiry along with the nature of the glass transition in these systems. By embedding "dilute" gold nanoparticles in single polystyrene thin films as "markers", we could probe the local viscosity of the free surface at temperatures far above the glass transition temperature (T_g). The technique used was X-ray photon correlation spectroscopy with resonance-enhanced X-ray scattering. The results clearly showed the viscosity was about 30 % lower than the rest of the film. We found that this reduction is strongly associated with chain entanglements at the free surface rather than the reduction in T_g.

[1]This work was supported by NSF CAREER Grant No. CMMI-0846267.

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Date submitted: 15 Nov 2009 Electronic form version 1.4