Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

How does Tg reduction affect the chain mobility in confined PS films? BULENT AKGUN, Department of Materials Science and Engineering, University of Maryland, MICHAEL DIMITRIOU, SUSHIL K. SATIJA, NIST Center for Neutron Research — It is well established that the glass transition temperature (Tg) of supported polystyrene (PS) thin films decrease with decreasing film thickness. This Tg reduction due to the free surface effect is associated with enhanced mobility. However, the correlation between the enhanced mobility and Tg reduction has not been studied yet. To understand the effect of Tg reduction on the vertical mobility of PS chains across the interfaces we have investigated the interdiffusion between PS and deuterated PS (dPS) films in bilayer and trilayer geometries using neutron reflectivity (NR). Bilayer films of 42 nm thick dPS bottom layer and 20 nm thick PS top layer are created in such a way to mimic the films where large Tg reductions has been demonstrated by recent fluorescence measurements. Trilayer films were created using the same bottom layer but floating a 10 nm thick PS middle layer and 10 nm thick dPS top layer to compare the mobilities at the interfaces between the top/middle and middle/bottom layers. NR results showed that there is almost no mixing between the layers up to 90-95 C for both bilayer and trilayer films which is not consistent with large Tg reductions observed in the literature. Our results also indicate no difference in the mobility of PS chains at the top/middle and middle/bottom interfaces in the trilayer film which argues against the enhanced mobility reported in the literature for the top 10 nm of PS thin films. Diffusion of PS chains across the interface gets faster as the MW decreases.

Bulent Akgun
Department of Materials Science and Engineering, University of Maryland

Date submitted: 09 Nov 2012 Electronic form version 1.4