Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Dynamics of bound polymer layers in CO2[1] NAISHENG JIANG, LEVENT SENDOGDULAR, MANI SEN, MAYA K. ENDOH, TADANORI KOGA, Department of Materials Science and Engineering, Stony Brook University, Stony Brook, NY 11794-2275, BULENT AKGUN, MICHAEL DIMITRIOU, SUSHIL SATIJA, Center for Neutron Research, National Institute of Standards and Technology, Gaithersburg, MD 20899 — Recently, there has been growing interest in bound polymer layers (BPLs) on planar solids due to their strong influence on the physical and mechanical properties of confined polymeric materials. It is known that BPLs are immobile (in air) even at temperature far above the bulk glass transition temperature. Here, we used CO_2 as a plasticizer for polystyrene (PS) bound layers ($\sim$10 nm in thickness) formed on planar silicon (Si) substrates. By using high pressure neutron reflectivity, we studied the swelling behavior of the BPL and the interdiffusion process for bilayers of the bottom BPL and an deuterated PS overlayer (about 50 nm-thick) in CO_2 at T = 36°C. The results have clearly shown that CO_2 swells the BPL and induces the interdiffusion of polymer chains across the BPL/overlayer interface. We further studied the interdiffusion processes as a function of molecular weights of the overlayer, allowing us to highlight the unique interdiffusion process relative to the bulk.

[1] We acknowledge the financial support from NSF Grant No. CMMI-084626.

Naisheng Jiang
Department of Materials Science and Engineering,
Stony Brook University, Stony Brook, NY 11794-2275

Date submitted: 14 Nov 2013 Electronic form version 1.4