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Effect of CO₂ on a polystyrene adsorbed nanolayer¹ DEBORAH BARKLEY, NAISHENG JIANG, LEVENT SENDOGDULAR, XIAOYU DI, MANI SEN, MAYA K. ENDOH, TADANORI KOGA, Stony Brook University, Stony Brook, NY, BULENT AKGUN, Center for Neutron Research, National Institute of Standards and Technology and Bogazici University, Bebek, Istanbul, Turkey, MICHAEL DIMITRIOU, SUSHIL SATIJA, Center for Neutron Research, National Institute of Standards and Technology — We report the role of compressed carbon dioxide (CO₂) in a mobility gradient of polymer chains near a planar solid substrate. A series of bilayers of bottom hydrogenated polystyrene and top deuterated polystyrene layers were prepared on Si substrates, and high pressure neutron reflectivity (NR) was used to study diffusive motion at the polymer/polymer interface. The interdiffusion is hindered when the distance is less than 3R_g (R_g, radius of polymer gyration). This reduced chain diffusivity is attributed to CO₂-induced polymer adsorption on the substrate, transforming the 0.6R_g thick region from the substrate interface into an irreversibly adsorbed polymer layer. The cohesion strength is attributed to loops in the adsorbed chains with which the neighboring chains can entangle.

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