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Quantifying How Polymer Interfacial Diffusion Differs from Bulk

LIANG HONG, Materials Science and Engineering Department, University of Illinois at Urbana-Champaign, STEVE GRANICK, Department of Materials Science and Engineering, Chemistry, Physics, Chemical Engineering, University of Illinois at Urbana-Champaign — Whereas polymer adsorption-desorption kinetics are reasonably well explored, in-plane diffusion is not. This talk will describe the molecular weight (M) and surface coverage dependence of two polymers, polystyrene (PS) and polydimethylsiloxane (PDMS) adsorbed to quartz from organic solvent. The M scaling of surface diffusion is quantified, and a surprising dependence on surface coverage is described. Time permitting, additional studies will be described in which, for the first time, polymer self-diffusion has been studied within a surface forces apparatus designed for fluorescence spectroscopy. Using FRAP (fluorescence recovery after photobleaching) to study slow diffusion and FCS (fluorescence correlation spectroscopy) to study rapid diffusion, we quantify how the self-diffusion coefficient of PDMS oligomer melts slows with diminishing surface separation, when PDMS is confined between mica surfaces.

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