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Probing In-Plane Diffusion of Nano-Confined Polymers in Ultra-thin Films JOSHUA KATZENSTEIN, University of Texas at Austin - Department of Chemical Engineering, JUSTIN CHANDLER, University of Texas at Austin, HALEY HOCKER, CHRISTOPHER ELLISON, University of Texas at Austin - Department of Chemical Engineering — In-plane (parallel to the substrate) polymer diffusion at and near interfaces has significant implications for polymeric surfactants used in tertiary oil recovery, exfoliation of clay sheets in polymer nano-composites, and several other high technology applications. Here, we report a study on the in-plane diffusion of whole polymer chains confined between interfaces using fluorescence recovery after photobleaching. Adapted from quantitative biology, FRAP provides a platform to independently study the effect of temperature, molecular weight, and film thickness on in-plane diffusion of polymers confined between interfaces. Fluorescently labeled polymers were synthesized, spin coated onto quartz substrates and the self-diffusion coefficient was measured by irreversibly photobleaching fluorophores in a pre-defined pattern and monitoring recovery of fluorescence over time. Preliminary results indicate that for thick films the diffusion coefficient is consistent with bulk values.

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