

Abstract Submitted  
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**Decoupling between Diffusivity and Effective Viscosity in Poly(isobutyl methacrylate) Films with a Thickness-Independent Glass Transition**<sup>1</sup> KUN GEN<sup>1</sup>, Boston University Physics Department, REIKA KATSUMATA, University of Texas at Austin, McKetta Department of Chemical Engineering, XUANJI YU, Boston University Division of Materials Science and Engineering, HEONJOO HA, AUSTIN R. DULANEY, CHRISTOPHER J. ELLISON, University of Texas at Austin, McKetta Department of Chemical Engineering, OPHELIA K.C. TSUI, Boston University Physics Department, Division of Materials Science and Engineering — We report measurements of self-diffusion ( $D$ ) and effective viscosity ( $\eta_{\text{eff}}$ ) on silica-supported poly(isobutyl methacrylate) (PiBMA) thin films. These films had been found to exhibit thickness ( $h_0$ ) independence in the glass transition temperature,  $T_g$  ( $= 58$  °C). At  $T = 106$  °C,  $D$  was independent of  $h_0$ , consistent with  $T_g$ . On the other hand,  $\eta_{\text{eff}}$  decreased with decreasing  $h_0$ , indicating decoupling between  $D$  and  $\eta_{\text{eff}}$ . We contemplate that the decoupling is caused by dynamic heterogeneity in the film and that  $D$  and  $\eta_{\text{eff}}$  are different dynamic averages. Specifically, by using a layer model, where the film is divided into sub-layers with thickness  $h_i$  and local viscosity  $\eta_i$ , and assuming that  $D \sim k_B T / \langle \eta_i \rangle$  and  $\eta_{\text{eff}} \sim \langle h_i^3 / (3\eta_i) \rangle$ , we are able to account for all the measurements.

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