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Effect of Interfaces on Self-diffusion and Glass Transition Temperature of Poly(isobutyl methacrylate) Thin Films REIKA KATSUMATA, AUSTIN DULANEY, CHRISTOPHER ELLISON, University of Texas at Austin - McKetta Department of Chemical Engineering — In thin films, physical properties such as the glass transition temperature (T_g), modulus, and viscosity, are different compared to that in thick films due to higher interfacial area to volume ratio. However, the effects of film thickness and associated interfaces on self-diffusion are not well understood, partly because only a few techniques are available for such studies. In this study, we employed fluorescence recovery after patterned photobleaching to evaluate the self-diffusion coefficient (D) of fluorescently labeled poly(isobutyl methacrylate) (PiBMA, $M_n = 11$ kg/mol, $PDI = 1.2$). Films 16 - 300 nm in thickness were spin coated onto two substrates then D and T_g were examined: one set of films possessing attractive polymer/substrate interactions on silica substrates, and the other set possessing repulsive polymer/substrate interactions using poly(cyclohexylethylene) substrates. D was measured in the melt state ($T_g + 48$ K) and the D of thick films were identical to the bulk value regardless of the substrate type. The D of a ~ 19 nm thick film on a repulsive substrate was four times larger than its bulk value while T_g was increased by about 10-15 K. In contrast, attractive substrates typically do not affect D or T_g of PiBMA.

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