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Polymer Diffusion in Confined Thin Films via Fluorescence Recovery after Photobleaching LAURA A. G. GRAY, CLIFFORD P. BRANGWYNNE, RODNEY D. PRIESTLEY, Princeton Univ, Dept. of Chemical and Biological Engineering — Over the past twenty years many studies have shown a reduction in the glass transition temperature (Tg) of thin polymer films confined to the nanoscale when supported on non-attractive substrates or in the free-standing film geometry. The depth dependence of Tg has been measured using thin layers of fluorescently tagged polymer to localize the dye within a larger polymer film stack, revealing a decrease in local Tg tens of nanometers into the film. These results have been explained by the propagation of enhanced mobility from the free-surface into the polymer film. Fewer direct measurements of molecular mobility have been made in confined polymer systems. Here, we present the results of fluorescence recovery after photobleaching (FRAP) experiments investigating the mobility of fluorescently labeled methacrylate-based polymers confined in thin film geometries. By quantifying the percentage of mobile fluorophores, FRAP allows us to probe entanglement density as a function of confinement.

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