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A New Look at Polymer Films and the Glass Transition JANE LIPSON, Dartmouth College, SCOTT MILNER, ExxonMobil — The effect on the glass transition (Tg) of a polymer in going from bulk to film is still not well understood. Among the outstanding issues is the influence of a free surface relative to that of a hydrogen bonding substrate. We have developed a model able to capture the shift in Tg as a function of distance from two interfaces, accounting for the potentially different impacts of air and of a silicon oxide surface. While most of the literature reports Tg as a function of total film thickness, in ongoing work the Torkelson group has used labeling methods to probe the Tg of slices of controlled thickness within a polystyrene (PS) film.[1] In separate studies they have changed the thickness of a labeled surface layer with the underlayer held constant, the thickness of the underlayer with that of the surface layer held constant, and the thickness of the whole (labeled) film. Polystyrene is unusual in having relatively weak interactions with the substrate. Here we both apply our model to the PS film data and investigate the impact of changing from PS to a polymer able to hydrogen bond to the silicon oxide surface. [1] Ellison, CJ; Torkelson, JM Nature Mat. 2, 695 (2003).

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