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Local Glass Transition Temperature Tg(z) Profiles of Polystyrene Next to End-Grafted Substrates XINRU HUANG, CONNIE ROTH, Emory University — Modifying polymer-substrate or polymer-nanoparticle interactions using grafted chains is frequently investigated as a possible means of altering and reinforcing the neighboring polymer matrix. The mechanism by which this occurs and how it can be optimized is not well understood because there are numerous parameters, such as grafting density, chain length, surface coverage, grafting strength, and matrix interpenetration, that are all interdependent factors controlling the behavior. Studies of such grafted-polymer-substrate effects in thin films are frequently complicated by the additional presence of a free surface. Here, we end-graft polystyrene (PS) to silica substrates and measured the local glass transition temperature Tg(z) as a function of distance z from the substrate interface. We observe local Tg(z) increases next to the chain-grafted substrate in excess of 45 K depending on grafting density. The length-scale over which this Tg(z) perturbation persists from the interface is large, z 80 nm before bulk Tg is recovered. Comparing with our groups recent work on polymer-polymer interfaces, this length scale is slightly smaller, but comparable to that observed for PS next to a higher-Tg polymer such as polysulfone (another form of so-called hard confinement).

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