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Local Glass Transition Temperature Gradients Near Polymer-Polymer Interfaces ROMAN BAGLAY, CONNIE ROTH, Department of Physics, Emory University — For decades the glass transition in confined systems has been studied with the hopes of uncovering the governing length scales that impact these dynamics. However, understanding length scales of local gradients in glass transition temperature (T_g) near a free surface have been hampered by limitations of how to treat the enhanced mobility at the free surface theoretically. We have previously reported on the local T_g in multilayer structures made from high molecular weight polystyrene (PS) and poly(n-butyl methacrylate) (PnBMA), a weakly immiscible system with a $\sim$ 7 nm interfacial width. Using ultrathin (10-15 nm) pyrene-labeled layers inserted into the multilayer structure at different positions (z) from the glassy-rubbery interface, we were able to map the local Tg(z) profile across this glassy-rubbery interface with temperature-dependent fluorescence intensity measurements. Our work revealed an asymmetric local mobility gradient propagating hundreds of nanometers away from the glassy-rubbery PS-PnBMA interface into the glassy PS and rubbery PnBMA sides before bulk Tgs were recovered far from the interface. Here we extend these measurements to investigate how the local T_g(z) profile in PS varies when in contact with a variety of immiscible polymers whose Tgs vary between +90 K to –80 K relative to the T_g of PS, so-called hard vs soft confinement.

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