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Understanding the Physical Aging Behavior of Glassy Polystyrene Layers in Close Contact with Rubbery Domains CONNIE ROTH, PHIL RAUSCHER, JUSTIN PYE, ROMAN BAGLAY, Department of Physics, Emory University, Atlanta, GA USA — Recent advances in synthesis strategies and processing methods have led to new nanostructured polymer blend and block-copolymer materials containing domain sizes less than 100 nm with glassy and rubbery domains in close proximity. Given the outsized role interfacial perturbations have played in causing large changes in the glass transition temperature Tg and physical aging of ultrathin single-layer films, we are interested in studying how the presence of glassy-rubbery interfaces between neighboring polymer domains may alter the local stability and physical aging of confined glassy layers. Using a polystyrene (PS) / poly(n-butyl methacrylate) (PnBMA) weakly immiscible system with 7 nm interfacial width, we demonstrate how ellipsometry can be used to isolate the physical aging rate of thin PS layers atop rubbery PnBMA layers. Despite a 25-30 K reduction in the average Tg of 84 nm thick PS layers atop PnBMA as measured by fluorescence, we observe no change in the PS aging rate relative to bulk. These results are in contrast with previous works on single-layer polymer films that have found the local aging rate to often be correlated with local Tg changes. This appears not to be the case for glassy PS layers atop rubbery PnBMA suggesting some additional factor is affecting the structural relaxation occurring near the glassy-rubbery interface.

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