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Confinement Effects on Glassy-State Polymer Behavior in Thin Films, Nanocomposites, Tethered Nanoparticles, and Nanostructured Systems JOHN TORKELSON, PERLA RITTIGSTEIN, SOYOUNG KIM, RODNEY PRIESTLEY, CONNIE ROTH, MANISH MUNDRA, Northwestern University — Confinement of polymers at the nanoscale and even the microscale can lead to significant deviations in glass transition temperature, physical aging rate, and alpha-relaxation dynamics from bulk polymer behavior. Here we illustrate how model experiments involving several techniques applied to simple, thin polymer films help us to understand and predict qualitatively or semi-quantitatively the glassy-state response of more complex, confined systems, including nanocomposites, tethered nanospheres, nanostructured homopolymer films, and nanostructured systems consisting of more than one polymer component. We shall illustrate how the glass transition temperature can be altered by as much as 60 K and how physical aging can be nearly totally suppressed via confinement. The discovery of new confinement effects and implications for new applications of confined polymeric systems will be discussed.

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