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Physical Aging of Thin Polystyrene Films Quenched and Measured Free-Standing JUSTIN PYE, CONNIE ROTH, Dept of Physics, Emory University — High molecular weight (MW) free-standing polymer films exhibit unusual and yet unexplained nanoconfinement effects. We have recently demonstrated that such ultrathin, high MW free-standing polystyrene (PS) films show two reduced glass transition temperatures (Tgs) which can be separated by more than 60 K, indicating that two separate mechanisms act simultaneously to propagate enhanced mobility into the film from the free surface. These studies indicate that the majority of the film transitions to a glass at the upper Tg leaving only a small fraction of the material mobile to much lower temperatures. In an effort to gain insight into the properties of these films between the two reduced Tgs, we aim to measure the physical aging characteristics at temperatures both above and below the lower transition temperature. To this end, we have developed a method using ellipsometry to measure the physical aging rate of thin free-standing PS films that remain free-standing after being thermally quenched. Measurements on thicker free-standing films, greater than 500 nm, supported by rigid, circular sample holders show no thickness dependence to the aging rate, consistent with the thickness independent stress applied to these films by the thermal expansion mismatch between film and holder. Measurements on thinner films will also be presented.

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