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Structural Recovery for a Single Polystyrene Ultrathin Film Using Flash DSC YUNG P. KOH, SIYANG GAO, SINDEE L. SIMON, Texas Tech University — The kinetic features of the glass transition under nanoconfinement of ultrathin films are studied using nanocalorimetry, with a particular focus on the cooling rate dependence of the glass transition temperature (Tg) and on the time-dependent structural recovery behavior of a 20 nm-thick polystyrene film. Measurements are performed using a commercial rapid-scanning chip calorimeter, the Mettler Toledo Flash differential scanning calorimeter (DSC). The Tg depression of the 20 nm-thick film is found to be a function of cooling rate, decreasing with increasing cooling rate; at high enough cooling rates (e.g., 1000 K/s), Tg is the same as the bulk within the error of the measurements. Structural recovery is performed as a function of aging time and temperature, and the evolution of the fictive temperature is followed. The advantages of the Flash DSC include sufficient sensitivity to measure enthalpy recovery for a single 20 nm-thick film, as well as extension of the measurements to aging temperatures as high as 15 K above nominal Tg and to aging times as short as 0.01 s. The aging behavior will be compared to that for bulk-like single thin films measured by Flash DSC, as well as to the results for stacked ultrathin films measured using conventional DSC.

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