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Cooperative Length Scale and Fragility of Polystyrene under Confinement CHUAN ZHANG, YUNLONG GUO, RODNEY PRIESTLEY, Princeton University — While thin films are an attractive model system to investigate the impact of confinement on glassy behavior, extending studies beyond thin films to geometries of higher dimensionalities is vital from both scientific and technological viewpoints. In this talk, we present the impact of confinement on the characteristic length at the glass transition as well as the fragility for confined polystyrene (PS) nanoparticles under isochoric conditions. We measure the glass transition temperature (T_g), fictive temperature (T_f) and isochoric heat capacity of silica-capped PS nanoparticles as a function of diameter via differential scanning calorimetry. From the measurement of T_f, we obtain the isochoric fragility, and via the fluctuation formula, the characteristic length at the glass transition. We illustrate that confinement under isochoric conditions for PS nanoparticles leads to a significant increase in the isochoric fragility while the characteristic length is reduced with size. At the minimum the results demonstrate a relationship between fragility and the characteristics length of isochorically-confined polymer that is not intuitive from the Adam-Gibbs theory.

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