

Abstract Submitted
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Confinement Effects on Molten Thin Cyclic Polystyrene Films¹

QIMING HE, Univ of Akron, SURESH NARAYANAN, Argonne National Laboratory, DAVID WU, Colorado School of Mines, MARK FOSTER, Univ of Akron — The surface fluctuations of melt film of 6k cyclic polystyrene (CPS) and its linear analog were measured using X-ray photon correlation spectroscopy (XPCS) for films of various thicknesses. The surface fluctuations of the 6k linear PS melt films 17 nm and thicker and the 6k cyclic melt films 28 nm and thicker can be described using a hydrodynamic continuum theory (HCT) that assumes the film is characterized only by the bulk viscosity. When a film of CPS is 24 nm or thinner, the behavior can no longer be captured using the HCT with bulk viscosity. The surface fluctuations behave as though the film has an effective viscosity higher than the bulk value. There is no evidence of an effective modulus in the very thin films of cyclic chains. The thickness at which confinement effects are seen for the 6k CPS chains is larger than that for the linear analogs.

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