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X-ray diffuse scattering from thin polystyrene films MRINMAY K. MUKHOPADHYAY, ZHANG JIANG, SUNIL K. SINHA, University of California, San Diego, CA 92093, LAURENCE B. LURIO, JARETT STARK, Northern Illinois University, DeKalb, IL 60115, XUESONG JIAO, SURESH NARAYANAN, ALEC SANDY, Advanced Photon Source, Argonne, IL 60439 — Diffuse x-ray scattering from silicon supported polystyrene films has been measured as a function of thickness. An x-ray standing wave method was used to distinguish scattering from the surface and scattering from density fluctuations within the interior of the film. The former is a measure of surface roughness, while the latter yields the compressibility, κ_T. Films thicker than $h \sim$100 nm had bulk values for κ_T, while thinner films showed the empirical relation $\kappa_T(h) = \kappa_T^{bulk}\,(1 + \alpha/h)^{\delta}$ with $\alpha = 20$ ($\pm$1) nm and $\delta = 1.6$ ($\pm$1). The surface component of the scattering agreed with capillary wave theory for small q, but excess scattering appeared at larger q,which followed a power law, $S^* \sim q^{1/\upsilon}$. We attribute the excess scattering to static roughness from chain ends and loops near the surface.

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