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Atomic Beam Scattering as a Probe of the Glass Transition of Polymer Thin Films MIRIAM FREEDMAN, AARON ROSENBAUM, STEVEN SIBENER, The James Franck Institute and Department of Chemistry, University of Chicago — We have investigated the thin film dynamics of poly(methyl methacrylate) (PMMA) using inelastic helium atom scattering. The glass transition in the surface region of a polymer film is thought to be at a lower temperature than the bulk, but it is unclear whether this reduction is due to the film surface or the near-surface layer. Because helium atom scattering is a surface sensitive, non-perturbative technique with which we can directly probe the surface dynamics, we hope to be able to clarify this debate. We obtain broad time of flight spectra, which are well fit by a semi-classical scattering model. From these fits, we note deviations near the bulk glass transition that could be due to changes in surface presentation or dynamics. At low beam energies and sample temperatures, we observe elastic scattering from which we calculate Debye-Waller factors that are similar to other organic thin films. This study has shown that helium atom scattering provides a unique means of exploring the glass transition of polymer thin films.

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