

Abstract Submitted  
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**Glass Transition Dynamics and Surface Layer Mobility in Unentangled Polystyrene Films** ZHAOHUI YANG, Boston University, YOSHIHISA FUJII, F.K. LEE, C.H. LAM, DONGDONG PENG, OPHELIA TSUI — Most polymers solidify into a glassy amorphous state, accompanied by a rapid increase in the viscosity when cooled below the glass transition temperature ( $T_g$ ). There has been an ongoing debate on whether the  $T_g$  changes with decreasing polymer film thickness and the origin of the changes. We measured the viscosity of unentangled, short-chain polystyrene (2.4kg/mol) films on silicon at different temperatures and found that the transition temperature for the viscosity decreases with decreasing films thickness, in agreement with the changes in the  $T_g$  of the films observed by thermal expansion measurements. By applying the hydrodynamics equations to the films, we are able to explain the data fully by assuming that a highly mobile layer is present within the top 2.3 nm thick region of the films and follows an Arrhenius dynamics while the remaining of the films is bulk-like.

Dongdong Peng  
Boston University

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