

Abstract Submitted  
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**Enhanced Molecular Dynamics in the Near-Surface Region of Polystyrene Thin Films Observed with  $\beta$ -NMR** IAIN MCKENZIE, TRIUMF and Simon Fraser University, CHAD R. DALEY, University of Waterloo, ROBERT F. KIEFL, TRIMUF and University of British Columbia, C.D. PHIL LEVY, TRIUMF, W. ANDREW MACFARLANE, University of British Columbia, GERALD D. MORRIS, MATT R. PEARSON, TRIUMF, DONG WANG, University of British Columbia, JAMES A. FORREST, University of Waterloo — Beta-detected nuclear spin relaxation of  $^8\text{Li}^+$  has been used to probe the depth dependent molecular dynamics in high- and low-molecular-weight deuterated polystyrene (PS-d8). In both samples, the average nuclear spin-lattice relaxation rate,  $1/T_1^{\text{avg}}$ , is depth independent below  $\sim 200$  K. However, above this temperature  $1/T_1^{\text{avg}}$  increases above the bulk value within several nanometers of the surface. These results provide the most direct evidence for enhanced molecular-level mobility near the free surface of glassy polymers and suggest the polymer fluctuation rate decreases approximately exponentially with distance from the free surface, returning to bulk behavior for depths greater than  $\sim 10$  nm.

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