

Abstract Submitted
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Direct Observation of Heterogeneous Translational Motion at T_g

STEPHEN SWALLEN, MARK EDIGER, University of Wisconsin-Madison — Recent experiments have provided direct evidence of heterogeneous translational motion in a supercooled small molecule organic liquid, tris-naphthylbenzene. The early stages of diffusion were measured using neutron reflectivity, and indicate that translational motion near the glass transition temperature T_g is qualitatively different than diffusion in “normal” liquids. The diffusion coefficient was found to be wave-vector dependent, $D(q) \propto q^{-2}$, with a crossover to a q -independent value, $D(q \rightarrow 0)$, at a length scale of ~ 22 nm at T_g . These results demonstrate that translational motion on the nanometer length scale can be extremely heterogeneous in a single component system near T_g , giving rise to large jumps of roughly 20 molecular diameters. This observation explains the unusually fast diffusion coefficients found in many materials near T_g , and also the unusually rapid crystallization of supercooled liquids.

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