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Probe of Dynamic Heterogeneity in Freeze-dried Polymer with similarities to thin film JIE XU, CHAO TENG, GI XUE, Department of Polymer Science and Engineering, Nanjing University — Understanding the dynamics of polymer chains in confined states is still crucial in the field of soft condensed matter. Dynamic heterogeneity is widespread in the confined system and could strongly alter the overall dynamics, such as in the experimental case of a free surface or a held fixed region. In this work, we show the dynamic heterogeneity in the freeze-dried polystyrene system through a combination of fluorescence nonradiative energy transfer (NRET) method, TMA, and PALS. The NRET data shows that the interchain distance could be altered by other the primitive solution concentration of the freeze-dried PS or the thickness of the free-standing film. Striking similarity of interchain packing density effect on the Tg is find the freeze-dried systems and free-standing films. The application of stress can also make a glass flow. We applied a uniaxial stress on the freeze-dried PS, a shear-induced flow is curried in the region with reduced interchain packing density. The polymer chains in this region show increased segmental mobility, which prompts the shear-induced solid-to-fluid transition to happen well below the bulk glass transition temperature.

Jie Xu
Department of Polymer Science and Engineering, Nanjing University

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