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Plastic Flow of Polymer Chains below T_g Induced by Jamming Transition[1] CHAO TENG, Peking University, Shenzhen Graduate School, GI XUE, Nanjing University — Polymer chains begin to flow when they are heated above T_g. Other glassy systems, such as colloidal suspensions and granular materials, begin to flow when subjected to sufficiently large stresses. The equivalence of these two routes to flow is a basic tenet of jamming theory. However, a full understanding of jamming transition for polymer chains remains elusive. In this work, we adjust the polymer chain packing density by spry-drying and some other methods, and then apply shear stress at temperature far below its T_g. The resulting pellet shows very similar features as the hot processed or solution casting samples, which strongly indicates that the plastic flow of polymer chains ever happened below T_g. We found that the packing density and shear stress play important roles during the plastic flow process at low temperature, which is according with the jamming theory. This kind of plastic flow at low temperature shows its advantages when processing materials with bioactivity, which will be deactivated at high temperature. Furthermore, these findings also suggested an approach to understand the high mobility of surface layer of polymer thin film and nanoparticles.

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