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Molecular weight dependence of surface flow near the bulk glass transition temperature YU CHAI, University of Waterloo, THOMAS SALEZ, MICHAEL BENZAQUEN, ELIE RAPHAEL, ESPCI, JAMES A. FORREST, University of Waterloo — We present the study on molecular weight dependent sub-T_g surface dynamics of polymer thin films by using the Nano-step experiment [McGraw et al. Soft Matter 7, 7832 (2011)]. By varying the molecular weight, we are able to probe the surface dynamics of the free surface below T_g with the polymer size comparable to the surface depth. In particular, we define and use a correlation function to compare measured and calculated profiles to analyze the transition from the bulk flow to flow restricted to the surface region. Surprisingly, even for the polymers with M_w =22,000 surface flow is still observed below the bulk T_g value. A numerical simulation of random walk is used to find the fraction of polymer of which all of the polymer segments are located in the free surface region. The simulation results indicate that there are still a significant fraction of polymer molecules where all segments are in the near free surface region. These molecules can undergo flow consistent with the experimental results.

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