Kinetic Heterogeneities at Dynamical Crossovers

THOMAS HAXTON, ANDREA LIU, Department of Physics and Astronomy, University of Pennsylvania — We perform molecular dynamics simulations of a model glass-forming liquid to measure the spatial and temporal extent of kinetic heterogeneities as functions of distance $a$ and time $t$. We locate local maxima $\chi^*$ of the dynamic susceptibility $\chi_{ss}(a,t)$ at distances $a^*$ and times $t^*$. We find two types of maxima, both correlated with crossovers in the dynamical behavior: a smaller, early-time maximum corresponding to the crossover from ballistic to sub-diffusive motion, and a larger, late-time maximum corresponding to the crossover from sub-diffusive to diffusive motion. Our results indicate that dynamic heterogeneities are not necessarily signatures of an impending glass or jamming transition. To quantify the lifetime of heterogeneities, we measure the decay of the time correlation function of the overlap parameter. We find that the ratio of the lifetime to the relaxation time increases as temperature is decreased towards the glass transition.

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