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Heterogeneous activation in 2D colloidal glass-forming liquids classified by machine learning[1] XIAOGUANG MA, Department of Physics, University of Pennsylvania; Complex Assemblies of Soft Matter, CNRS-Solvay-UPenn, ZOEY DAVIDSON, TIM STILL, ROBERT IVANCIC, SAM S. SCHOENHOLZ, DANIEL M. SUSSMAN, A. J. LIU, A. G. YODH, Department of Physics, University of Pennsylvania — The trajectories of particles in colloidal glass-forming liquids are often characterized by long periods of "in-cage" fluctuations and rapid "cage-breaking" rearrangements. We study the rate of such rearrangements and its connection with local cage structures in a 2D binary mixture of poly(N-isopropyl acrylamide) spheres. We use the hopping function, $P_{\mathrm{hop(t)}}$, to identify rearrangements within particle trajectories. Then we obtain distributions of the residence time t_R between consecutive rearrangements. The mean residence time $\bar{t}_R(S)$ is found to correlate with the local configurations for the rearranging particles, characterized by 70 radial structural features and softness S [PRL 114, 108001 (2015)], which ranks the structural similarities with respect to rearranging particles. Furthermore, $\bar{t}_R(S)$ for particles with similar softness decays monotonically with increasing softness, indicating correlation between rearrangement rates and softness S. Finally we find that the conditional and full probability distribution functions, $P(t_R|S)$ and $P(t_R)$, are well explained by a thermal activation model.

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