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Testing the paradigms of the glass transition in colloids ROSEANNA ZIA, Stanford University, JIALUN WANG, Cornell University, XI-AOGUANG PENG, QI LI, GREGORY MCKENNA, Texas Tech University — Many molecular liquids freeze upon fast enough cooling. This so-called glass state is path dependent and out of equilibrium, as measured by the Kovacs signature experiments, i.e. intrinsic isotherms, asymmetry of approach and memory effect. The reasons for this path- and time-dependence are not fully understood, due to fast molecular relaxations. Colloids provide a natural way to model such behavior, owing to disparity in colloidal versus solvent time scales that can slow dynamics. To shed light on the ambiguity of glass transition, we study via large-scale dynamic simulation of hard-sphere colloidal glass after volume-fraction jumps, where particle size increases at fixed system volume followed by protocols of the McKenna-Kovacs signature experiments. During and following each jump, the positions, velocities, and particle-phase stress are tracked and utilized to characterize relaxation time scales. The impact of both quench depth and quench rate on arrested dynamics and state variables is explored. In addition, we expand our view to various structural signatures, and rearrangement mechanism is proposed. The results provide insight into not only the existence of an ideal glass transition, but also the role of structure in such a dense amorphous system.

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