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Testing the paradigms of the glass transition in colloids via
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University — Upon cooling, molecular glass-formers undergo a glass transition during
which viscosity appears to diverge, and the material transitions from a liquid to an
amorphous solid. However, the new state is not an equilibrium phase: material
properties such as enthalpy continue to evolve in time. Rather, the material evolves
toward an intransient state, as measured by the Kovacs signature experiments, e.g.
the intrinsic isotherm, which reveals a paradoxical dependence of transition time on
quench depth, and suggests that whether the glass transition occurs at the begin-
nning or end of this transition is an open question. Colloidal glass formers provide a
natural way to model such behavior, owing to the disparity in time scales that allow
tracking of particle dynamics. We interrogate these ideas via dynamic simulation
of a hard-sphere colloidal glassy state induced by jumps in volume fraction. We
explore three methods to model the jump: evaporation, aspiration, and particle-size
jumps. During and following each jump, the positions, velocities, and particle-phase
stress are tracked and utilized to characterize relaxation time scales and structural
changes. Analogs for the intrinsic isotherms are developed. The results provide
insight into the existence of an ideal glass transition.

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