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Cooperative Particle Dynamics in the Manhattan Model PRASANTA PAL, Department of Applied Physics, Yale University, COREY O'HERN, JERZY BLAWZDZIEWICZ, Department of Mechanical Engineering, Yale University, O'HERN GROUP TEAM, BLAWZDZIEWICZ GROUP TEAM — We study Brownian dynamics of hard rods in a Manhattan-like traffic grid, in which a series of narrow one-dimensional horizontal and vertical channels intersect at right angles, and particles are forbidden from turning at the intersections. We measure the intermediate scattering function (ISF) and mean-square displacement (msd) as a function of packing fraction ϕ and determine ϕ_g at which dynamical arrest occurs as a function of the system size, number of intersections, and topology of the grid. As a particular example, we explicitly characterize the cooperative particle dynamics required for structural relaxation for symmetric systems in which all lobes between junctions contain the same number of particles. In these systems, we predict the scaling behavior of the structural relaxation time and self-diffusion coefficient versus $\phi_g - \phi$. We will also quantify the extent to which these systems age and determine whether there is a characteristic number of junctions above which glassy dynamics occurs.

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