Computational and Theoretical Studies of Jamming in Soft Materials

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We use a combination of molecular dynamics simulations and theoretical methods to understand jamming and glass transitions in simple models of soft materials, for example, granular materials, colloids, and foams. Several interesting topics that we have investigated recently are: 1) How do these systems respond to an applied shear stress? Is there a discontinuity in the shear rate at the onset of shear flow? When are shear flows spatially uniform or instead highly localized? and 2) How do glassy systems 'break' when subjected to thermal fluctuations? Are there large-scale collective relaxations that cost relatively little energy? Can we explain slow relaxations in glasses and other jammed systems by understanding these collective relaxations? In this talk, I will highlight the progress that we have made in answering these important questions.

Keywords: jamming, molecular dynamics, glasses