MAR08-2007-004418

Abstract for an Invited Paper
for the MAR08 Meeting of
the American Physical Society

Are colloidal and molecular glass formation related?

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Understanding why and how a glass is formed on a microscopic level remains an outstanding problem in condensed matter physics. A molecular glass is normally formed by cooling of a liquid. Upon entering the supercooled state, the structural dynamics slows down dramatically and eventually the liquid enters the non- equilibrium glassy state. On route towards the glass, the behaviour shows a range of highly general, near universal characteristics, such as stretched exponential behaviour of dynamic correlation functions and cooperative dynamics. Such generalities exist even though molecular glasses can be formed from liquids encompassing a wide range of molecular structures and interactions. Glass formation also occurs in altogether very different systems. One of the most interesting, both from a fundamental and an applications point of view, is that of colloidal suspensions. The high degree of control that can be achieved regarding colloidal particle size, shape and interactions makes this a fantastic model system in learning about glass-formation. We know that a range of properties observed during dynamic arrest in molecular systems for decreasing temperature are indeed mirrored in the arrest of a colloidal suspension upon increase of particle volume fraction. However, the richness in phenomenology observed for liquids has generally not been observed for colloids. We will discuss to what extent colloidal glass formation can be viewed as equivalent to molecular glass formation and present recent experimental work that suggests a remarkably direct connection.