MAR07-2006-001249

Abstract for an Invited Paper
for the MAR07 Meeting of
the American Physical Society

Molecular dynamics studies of rigidity in solids

MICHAEL PLISCHKE, Simon Fraser University

We have used molecular dynamics (MD) to study the elastic properties of systems of particles randomly and permanently crosslinked to each other as function of crosslink density p. At zero temperature, such systems generically lose the ability to withstand shear at a rigidity percolation point, p_r, that is (at least for particles interacting through central forces) different from the geometric percolation point p_c. At finite temperatures there is an entropy-generated component of the shear modulus $G(p,T)$ that remains finite for all $p > p_c$ and which vanishes with a characteristic power law $G(p,T) \sim (p - p_c)^t$. Our simulations in both two and three dimensions seem to indicate that t is model-independent and, within our error bars, the same as the exponent that describes the behavior of a disordered network of conductors near its percolation point.