MAR05-2004-001858

Abstract for an Invited Paper
for the MAR05 Meeting of
the American Physical Society

Soft modes and the onset of jamming

MATTHIEU WYART, Service de l'Etat condense, CEA Saclay

Glasses have a large excess of low-frequency vibrational modes in comparison with crystalline solids. We show that such a feature is a necessary consequence of the geometry generic to a *marginally* connected solid. In particular, we analyze the density of states of a recently simulated system comprised of weakly compressed spheres at zero temperature. We account for the observed a) constancy of the density of modes with frequency, b) appearance of a low-frequency cutoff ω^*, and c) power-law increase of ω^* with compression. We predict a length scale l^* below which the boundary conditions strongly affect the system. l^* diverges at the jamming transition when the system becomes isostatic.