Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

Jamming of granular materials under shear[1] JIE ZHANG, ROBERT BEHRINGER, Duke University — We probe the transition of a disordered system between an unstable (e.g. fluid-like) state and a stable (e.g. solid-like or jammed) state. Examples of relevant systems include glasses, foams, colloids and granular materials. Liu and Nagle proposed a jamming diagram with axes of inverse density, temperature and shear stress, and a region near the origin was proposed to encompass the jammed states. Point J on the diagram, (isotropic jamming) was thought to be the lowest possible jammed density, and for denser systems, shear stress was thought to lead to unjamming. Recent work has focusd on isotropic jamming. Here, we explore the effect of shear on jamming. We have carried out experiments using quasi-2D systems of photoelastic disks subject to pure shear. We obtain interparticle contact forces as well as other key information. From this data we compute stresses, densities, etc. Contrary to the above picture, we find that the application of shear to densities lower than that at point J can lead to jammed states. Shear applied to isotropic jammed states does not lead to unjamming, but rather to an increase in all stresses. These data, which obviously pertain to frictional particles, suggest a jamming diagram given by shear stress, pressure and inverse density.

[1]Work supported by NSF grant DMR0906908, ARO grant W911NF-07-1-0131-00, and BSF grant 2004391.

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Date submitted: 06 Aug 2009 Electronic form version 1.4