Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Effect of friction on shear jamming[1] DONG WANG, JIE REN, JOSHUA DIJKSMAN, ROBERT BEHRINGER, Duke University — Shear Jamming of granular materials was first found for systems of frictional disks, with a static friction coefficients $\mu_s \simeq 0.6$. Jamming by shear is obtained by starting from a zero-stress state with a packing fraction $\phi_S \leq \phi \leq \phi_J$ between ϕ_J (isotropic jamming) and a lowest ϕ_S for shear jamming. This phenomenon is associated with strong anisotropy in stress and the contact network in the form of "force chains," which are stabilized and/or enhanced by the presence of friction. We address experimentally how reducing friction affects shear jamming by using either teflon disks of teflon wrapped photoelastic particles. The teflon disks were placed in a wall driven 2D shear apparatus, in which we can probe shear stresses mechanically. Teflon-wrapped disks were placed in a bottom driven 2D shear apparatus (Ren et al., PRL 2013). Both apparatuses provide uniform simple shear. In all low-μ experiments, the shear jamming occurred, as observed through stress increases on the packing. However, the low-μ differences observed for $\phi_J - \phi_S$ were smaller than for higher friction particles. Ongoing work is studying systems using hydrogel disks, which have a lower friction coefficient than teflon.

[1]We acknowledge support from NSF Grant No. DMR12-06351, ARO Grant No. W911NF-1-11-0110, and NASA Grant No. NNX10AU01G

Dong Wang
Duke University

Date submitted: 15 Nov 2013 Electronic form version 1.4