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Effect of Friction on Shear Jamming[1] DONG WANG, Duke University, JIE REN, Merck & Co., JOSHUA DIJKSMAN, Wageningen University and Research Centre, JONATHAN BARES, ROBERT BEHRINGER, Duke University
— Shear jamming of granular materials was first found for systems of frictional disks, with a static friction coefficient $\mu \approx 0.6$ (Bi et al. Nature (2011)). Jamming by shear is obtained by starting from a zero-stress state with a packing fraction ϕ 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. Whether shear jamming occurs for frictionless particles is under debate. The issue we address experimentally is how reducing friction affects shear jamming. We put the Teflon-wrapped photoelastic disks, lowering the friction substantially from previous experiments, in a well-studied 2D shear apparatus (Ren et al. PRL (2013)), which provides a uniform simple shear. Shear jamming is still observed; however, the difference $\phi_J - \phi_S$ is smaller with lower friction. We also observe larger anisotropies in fragile states compared to experiments with higher friction particles at the same density. In ongoing work we are studying systems using photoelastic disks with fine gears on the edge to generate very large effective friction.

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Dong Wang
Duke University

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