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Dense dry granular material under pure shear and shear reversal[1]

JIE ZHANG, Duke University, Department of Physics

We have performed 2D granular experiments under pure shear using bidisperse photo-elastic disks. Starting from a stress free state, a square box filled with granular particles is subject to shear with the area fixed. The forward shears involved various number of steps, leading to maximum strains between 0.1 and 0.3. Reverse shear was then applied. Depending on the packing fraction and the strain, the force chain network built prior to the shear reversal may be destroyed completely or partially destroyed. If the reverse shear is continuously applied, there is a force chain strengthening. Following each change of the system, contact forces of individual disks were measured. We also kept track of the displacement and rotation of every particle. I will present the results for the structure failure and reconstruction during shear reversals. I will also present results from a physical experiment and a DEM simulation. Particular attention is paid to the deformation and dissipation within a class of particle clusters found to be confined to the shear band, each comprising of a buckled force chain segment and its laterally supporting neighbors. The predominant mode of contact failure in a force chain undergoing buckling, and in the contacts with and within its laterally supporting neighbors, is frictional rolling.

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