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Shear-Induced Diffusion in a Dense Frictional Disk Packing JOSHUA DIJKSMAN, JIE REN, ROBERT BEHRINGER, Duke University — We study shear-induced diffusion in a dense disordered packings of frictional photoelastic disks. We induce diffusion by subjecting the packing to uniform oscillatory shear cycles. We can track both displacement and rotational motion, and measure interparticle forces obtained from the photoelastic response of the disks. The shear deformation is volume conserving, so each experiment corresponds to a well defined density. We then vary the density to probe its impact on diffusion; we also study the influence of the shear amplitude. Surprisingly, we find that both rotational and translational diffusion increases with density for all but the highest densities – clearly steric hindrance only becomes relevant at the highest packing fractions. At the onset of mechanical stability, as indicated by an increase in the total pressure in the system, we also find profound changes in both the amplitude, time dependence and directionality of the particle diffusion.

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