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Shear-induced dynamical phase-transitions in a granular system JIE ZHANG, YINGQIAO WANG, HONGYANG TANG, Shanghai Jiaotong University — In this study, we investigate the granular materials in a 2D Couette cell under shear using photo-elastic disks. For initial packing fractions ϕ smaller than $\phi_c = 82\%$, an initially stress-free state can be first shear jammed and then gradually relaxes to a steady state with strong stress fluctuations. Such a steady state will then make a stochastic transition to an unjammed state under the continuous shear. For packing fractions ϕ larger than ϕ_c, we observe no such transitions. The characteristic strain of the transition diverges as a function of $|\phi - \phi_c|^{-2}$ which resembles a second-order dynamical phase transition. We interpret some portion of the results of such phase transitions using a mean-field model that was originally proposed to explain the discontinuous shear thickening and the shear jamming of the frictional granular materials. We are currently still investigating such an intriguing phenomenon in order to understand the detailed dynamics of the transition.

Jie Zhang
Shanghai Jiaotong University

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