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Frictional Jammed Packings: Classification, Protocol Dependence and the Phase Diagram STEFANOS PAPANIKOLAOU, COREY O' HERN, Departments of Mechanical Engineering & Materials Science and Physics, Yale University, New Haven, Connecticut 06520, MARK D. SHATTUCK, Benjamin Levich Institute and Physics Department, The City College of the City University of New York, New York, New York 10031 — We probe the nature of the jamming transition in systems of frictional disks, where static friction is modeled geometrically using "bumpy-particles" with uniform circular asperities on the disks' surface. First, we enumerate and classify the mechanically stable (MS) packings in small systems using exhaustive numerical simulations. We explicitly show that finite friction stabilizes packings that are unstable for frictionless particles, which causes the number of MS packings to increase strongly with the friction coefficient. MS packings for frictional particles are organized into low-dimensional geometric families in configuration space. We then calculate the critical behavior of the structural and mechanical properties near the jamming transition for frictional particles and as a function of protocol and show that friction drastically alters the nature of the transition.

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