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Shear Jamming in Frictionless Particulate Media[1] THIBAULT BERTRAND, COREY S. O'HERN, Yale University, R.P. BEHRINGER, Duke University, BULBUL CHAKRABORTY, Brandeis University, MARK D. SHATTUCK, City College of the City University of New York — We numerically study two-dimensional packings of frictionless bidisperse disks created using compresive and simple shearing protocols. To create jammed packings by compression, we start N particles from random positions and grow their diameters followed by relaxation of particle overlaps using energy minimization. These compressed packings exist over a range of packing fractions ϕ. As a result, during compression the system may reach a ϕ above the minimum value before jamming. If this unjammed packing is then sheared by a strain γ, it can jam. Using a combination of compression and shearing, we can define jamming protocols as trajectories in the (ϕ, γ) plane that yield jammed packings. In this plane, we can reach a particular point (ϕ_n, γ_n) in many ways. We will focus on two protocols: (1) shearing to γ_n at $\phi = 0$ followed by compression to ϕ_n at $\gamma = gamma_n$ and (2) compression to ϕ_n at $\gamma = 0$ followed by shearing to γ_n at $\phi = \phi_n$. For protocol 1, we find that the probability of finding a jammed packing at ϕ and γ, $P(\phi, \gamma) = Q(\phi)$ is indepependent of γ. For protocol 2, we use a simple theory to deduce $P(\phi, \gamma)$ from $Q(\phi)$.

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