Shear Jamming in Frictionless Particulate Media\textsuperscript{1} THIBAULT BERTRAND, COREY S. O’HERN, Yale University, R.P. BEHRINGER, Duke University, BULBUL CHAKRABORTY, Brandeis University, MARK D. SHAT-TUCK, City College of the City University of New York — We numerically study two-dimensional packings of frictionless bidisperse disks created using compressive 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 \( \phi \). As a result, during compression the system may reach a \( \phi \) above the minimum value before jamming. If this unjammed packing is then sheared by a strain \( \gamma \), it can jam. Using a combination of compression and shearing, we can define jamming protocols as trajectories in the \((\phi, \gamma)\) plane that yield jammed packings. In this plane, we can reach a particular point \((\phi_n, \gamma_n)\) in many ways. We will focus on two protocols: (1) shearing to \( \gamma_n \) at \( \phi = 0 \) followed by compression to \( \phi_n \) at \( \gamma = \text{gamma}_n \) and (2) compression to \( \phi_n \) at \( \gamma = 0 \) followed by shearing to \( \gamma_n \) at \( \phi = \phi_n \). For protocol 1, we find that the probability of finding a jammed packing at \( \phi \) and \( \gamma \), \( P(\phi, \gamma) = Q(\phi) \) is independent of \( \gamma \). For protocol 2, we use a simple theory to deduce \( P(\phi, \gamma) \) from \( Q(\phi) \).

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