MAR05-2004-000556

Abstract for an Invited Paper
for the MAR05 Meeting of
the American Physical Society

Random close packing revisited: How many ways can we pack smooth, spherical grains?

COREY O'HERN, NING XU, JERZY BLAWZDZIEWICZ, Department of Mechanical Engineering, Yale University

We create jammed packings of smooth, spherical particles using an algorithm in which we successively compress or expand soft particles and minimize the total energy of the system at each step until the particles are just at contact. We focus on small systems and thus are able to find (nearly) all of the jammed states. We decompose the probability for obtaining a jammed state at a particular volume fraction into two composite functions: 1) the density of jammed states, which only depends on geometry and 2) the basin of attraction for each jammed state, which depends on the protocol used to create them. By studying the density of states and basins of attraction separately, we are able to show why it is relatively easy to create random close-packed states in 3D monodisperse and 2D bidisperse systems but not in 2D monodisperse systems.

Co-authors are Ning Xu and Jerzy Blawzdziewicz, Department of Mechanical Engineering, Yale University.