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Protocol Dependence in Jammed Particulate Media: Statistics of the Density Landscape[1]

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The density at which hard-sphere fluids jam into amorphous solids depends strongly on the compression protocol. Extremely fast quenching protocols bring each initial point in configuration space to the closest basin-maximum on the density landscape. In contrast, slower quench protocols allow the system to relax and explore configuration space. The protocol-dependence of the density, other structural quantities, and mechanical properties depends strongly on statistical features of the landscape. In this talk, I describe calculations of the the basin volumes associated with jammed hard sphere packings, and the critical quench rate Γ^* above which the probabilities for obtaining jammed packings are determined by their basin volumes. Basin volumes are exponentially distributed; thus, for $\Gamma > \Gamma^*$, so are jammed packing probabilities. We discuss the implications of this result on the statistical mechanics of jammed systems.

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