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Sub-Jamming Transition in Jammed Binary Sphere Mixtures ISHAN PRASAD, CHRISTIAN SANTANGELO, GREGORY GRASON, University of Massachusetts Amherst — We study influence of bi-dispersity on structural evolution of jammed binary sphere mixtures with increasing small-sphere composition, f_s. In binary spheres, maximally dense, random packing is achieved at infinite size ratio and unique composition ($f_s = 0.2659$) where small spheres jam within interstitial volume of jammed large spheres, leading to a kink in total volume fraction, ϕ, vs. f_s. Using simulations of athermally jammed packings, we explore how this critical feature influences the evolution of random binary sphere packings at finite size ratio, α, ranging from 1 to 10. We report a clear distinction between large and small α behavior, separated by a critical value of $\alpha_c = 5.8$. For $\alpha < \alpha_c$ structural properties –such as total volume fraction, rattler fraction and contact statistics– are found to crossover smoothly from small to large f_s, while above a critical size asymmetry these properties indicate an abrupt, first-order like transition. We correlate this sharp transition with a "sub-jamming" transition of small-spheres occurring at finite values of f_s, which becomes cooperative only for sufficiently asymmetric mixtures. We propose a heuristic geometric and mechanical argument to understand what determines α_c.

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