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Structural signature of jamming transition[1] NING XU, Department of Physics, University of Science and Technology of China — In thermal amorphous systems, the first peak of the pair correlation function $g(r)$ reaches the maximum height $g_1^{\max}$ at a crossover volume fraction ϕ_v when the volume fraction ϕ is varied. In the $T = 0$ limit, ϕ_v approaches ϕ_c, the critical volume fraction of the $T = 0$ jamming transition, accompanied by a diverging $g_1^{\max}$. The occurrence of $g_1^{\max}$ at $T > 0$ thus reminisces the $T = 0$ jamming transition. By measuring typical quantities such as the pressure, bulk modulus, shear modulus, and characteristic frequency of the boson peak, which all show power law scalings with $\phi - \phi_c$ in marginally jammed solids at $T = 0$, we observe that $\phi = \phi_v$ separates the thermal amorphous systems into two regimes with distinct material properties: these quantities show similar power law scalings with $\phi - \phi_c$ to marginally jammed solids when $\phi > \phi_v$, which break down when $\phi < \phi_v$. Therefore, the occurrence of $g_1^{\max}$ signifies the jamming transition at $T > 0$. Because the scalings are manipulated by ϕ_c, the $T = 0$ jamming transition should be the only critical point that controls the jamming transition and properties of jammed solids at $T > 0$.

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