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When do jammed sphere packings have a valid linear regime?

CARL GOODRICH, ANDREA LIU, Univ of Philadelphia, SIDNEY NAGEL, Univ of Chicago — The physics of jamming can be studied in its purest form in packings of soft spheres at zero temperature. One of the successes of this approach is that bulk material properties, such as the elastic moduli or density of normal modes, can be predicted solely from the distance of the system to the jamming transition. Such properties are both defined and measured in the linear-response regime. It is thus tacitly assumed that the harmonic approximation to the local energy landscape can capture the meaningful physics, and it is therefore essential to delineate when this assumption is valid. We will examine the regime of validity of the harmonic approximation in jammed sphere packings as a function of system size and density. We will also discuss the crossover from linear response of the zero-temperature jammed solid to thermal behavior at nonzero temperatures.

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