

Abstract Submitted
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Ordered and disordered granular sphere packings obtained by epitaxial growth ANDREEA PANAITESCU, ARSHAD KUDROLLI, Clark University — We study granular packings obtained by depositing spheres on a substrate under the influence of gravity. By exploiting the direct particle tracking enabled by X-ray tomography, the nature of the order and disorder is investigated using statistical measures including density pair correlation function, and the orientational order parameter. We find that by using a low deposition rate, impinging particles with sufficient energy can overcome friction and come to rest in a potential minimum of a periodic substrate, giving rise to ordered face-centered cubic structures. However, impinging particles with large kinetic energy can dislodge particles in the substrate leading to disorder as mobile particles cooperatively form arches while they come to rest. Thus, a wide range of volume fractions and packing structures is accessed by simply controlling the nature of the substrate and deposition rate and energy, along with the shape of the impinging particles. We contrast the ordered and disordered phases observed as a function of packing fraction with our previous study with cyclically sheared packings. In that study, compaction, nucleation and growth of face centered cubic and hexagonal close packed crystalline order was observed after hundreds of thousands of shear cycles.

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