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Ordered Packing Induced by Simultaneous Shear and Compaction[1] BRUNO HANCOCK, Pfizer USA, MEENAKSHI DUTT, University of Cambridge, CRAIG BENTHAM, Pfizer UK, JAMES ELLIOTT, University of Cambridge — We study a system of monodisperse frictional particles confined between two surfaces and being simultaneously sheared and unaxially compacted by the upper surface. The upper surface is made of particles identical to those in the bulk, arranged randomly, or in a square or triangular lattice. The particles between the surfaces are allowed to compact under gravity after being poured onto the bottom surface, followed by simultaneous constant strain compaction and shear by the upper surface. We focus on the evolution of the packing structure with interparticle friction, arrangements of the particles on the surfaces, initial height of the confined gravitationally compacted particles and the shear and compaction strain rates. We compute the coordination number, packing fraction, contact orientation, distribution of contacts and other relevant quantities to provide quantitative insight on the packing structure. We have found, for a 5 diameter layer of confined particles, the compaction speed has a greater effect on the packing structure of the particles in comparison to the shear speed. For a shearing surface formed of particles arranged in a square lattice, the packing structure of the confined particles evolves to interdigitating layers of 3D close-packed spheres. The numerical experiments have been performed via Discrete Element Method simulations (Dutt et al., 2004 to be published) using Microcrystalline Cellulose spheres.

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