Simulation of Micro-sized Granular Particle Packing
using Discrete Element Method

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ABSTRACT

Granular packing of micro-sized particles with different size distributions and contact force models is studied using Discrete Element Method (DEM). Three kinds of size distributions, mono-sized, uniform and Gaussian, with mean diameter of 50, 60 and 70 μm are studied. Two aspects of micro-scale particle packing issues are addressed: one is the importance of van der Waals force when the particle size approaching to micro scale, the other one is the structure variation caused by different contact force models. The results indicate that compared with contact force, the van der Waals force contributes very insignificantly to the final packing structure. The packing structures obtained using two different force models are similar to each other. The effects of particle size and its distribution on the packing structure are more significant than the force model.

The further work is done in the frame work of LIGGGHTS. The results indicate that size distributions contribute more to the packing density for particles packing under cohesive effect: particles with Gaussian distribution have the largest packing density, while particles with mono-sized distribution is the secondary and the particles with uniform distribution have the lowest packing density. It is also found that cohesive effect to the system does not significantly affect the coordination number that mainly depends on the particle size. Unlike the pattern found in the normal particle packing, particle packing under cohesive effects does not provide a regular pattern as particles' radius changed.