Modelling the deformation behaviour of granular assemblies of non-spherical particles by the use of bonded Discrete Element Method

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ABSTRACT

Modelling the mechanical behaviour of granular assemblies under high load (e.g. calendaring battery electrodes or pressing tablets) with discrete element method (DEM) is a challenging task greatly influenced by the shape of the individual particles. Spherical particle representation is often not sufficient enough when it comes to real cases with non-spherical particles. However, the widespread agreement to have sophisticated particle shape representations has lead to approaches that allows for shape consideration within DEM. Currently available are approaches that include superquadrics and multi-sphere representations with or without bonds.

In our attempt the bonded multi-sphere approach has been adopted. Granular assembly is represented as collection of two types of representing non-spherical particles: Particles with intragranular bonds (for a pair of elements which belong to the same particle) and intergranular bonds (for a pair of elements which belong to two different particles). Main advantage of this approach is that by tuning bonds parameters our particles can behave not only as rigid but further as deformable bodies.

Different examples of uni-axial powder compaction like calendaring of electrodes and pressing tablets will be presented to show the ability of this approach to accurately provide the required deformation. Experimental results will be used in ordered to justify our findings.

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