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# Understanding Powder Compaction with Single Particle Measurements

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## ABSTRACT

Powder compaction is the process of transforming granular media into a solid body with a high relative density (low porosity) and a unique anisotropic microstructure. It is critical to understand the physical mechanisms of the compaction process in order to identify powder properties and optimal process parameters for achieving desired properties of the final product. Tools that can simulate particle rearrangement and deformation during the compaction process are usually developed to guide such fundamental understanding. This study aims at understanding powder compaction using particle mechanics approach. Specifically, it employs the nonlocal contact formulation to predict the contact behavior of a single elastic particle within a confined granular system. As the result of the study, we present a new version of the nanoHUB Powder Compaction simulation tool. This version includes additional modeling features, such as a curvature correction, simulation of the contact radius evolution with particle deformation, and mechanical property extraction from an experimental dataset provided by the user.

## KEYWORDS

Powder compaction, nonlocal contact formulation, single-particle compression testing, plastic deformation, elastic deformation, nanoHUB Powder Compaction simulation tool