Numerical and experimental study of a mixing process in dry and saturated conditions

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Abstract

Mixing process is widely used in industry to handle granular materials. The complex granular dynamics in the mixing process has attracted great interests from a broad spectrum of research communities, such as statistical physics, pharmaceutical engineering and geotechnical engineering. Recently, due to the soaring demands of mineral resources, a mixing process has been proposed to prepare the soils which contain valuable minerals being extracted from seabed [1,2]. Previous studies showed that numerical simulations based on large scale discrete element method (DEM) are capable of studying the mixing process in dry and in saturated situations [1,2]. Among other factors that influence the macroscopic responses of the mixing process, it is found out that the rolling friction parameter is the most influential factor that affects the macroscopic torque response for the underwater mixing [3]. In literature, rolling friction parameter is often used to mimic the particle shape effect and cannot be measured directly. It is a parameter that requires to be calibrated indirectly by actual experiments. For this purpose, we design and conduct a series of physical and numerical mixing experiments in dry and saturated conditions to investigate the calibration of this parameter and the applicability of the calibrated parameters. The results from this study is expected to contribute to the understanding the role of rolling in granular materials.

Keywords: mixing; rolling friction; large scale DEM simulation

References

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