UNIVERSITY OF TWENTE.

msm

B.Sc. Thesis Project

Segregation in cohesive multi-components dry granular systems

Multiscale Mechanics (Utwente)

Background: Mixing and blending of granular material is important in several processes such as concrete preparation, chemical formulation, nuclear and pharmaceutical engineering. However, major problem encountered in those processes is that, under the presence of shear, granular materials often have a tendency to segregate and even separate owing to differences in particle properties such as the size and density. This can critically degrade the quality of the final product, leading to huge economic losses.

Using Discrete Elements Methods (DEM) simulations, we will investigate the ability of cohesion to mitigate segregation of dry particulate systems in a rotating drum. Specifically, we want to measure and compare the segregation index of non-cohesive particles mixed with cohesive particles under different cohesive strengths and particle sizes.

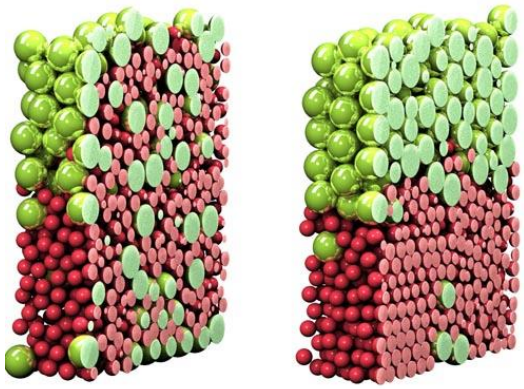

Figure 1. Segregation of particles. Mixed (left) and segregated (right). Picture adapted from Vaart et al. (2015).

Main Goal: Examine the segregation of flowing cohesive and non-cohesive particles in a rotating drum using numerical simulations.

Method: The first step of the BSc project is the setup of the DEM simulations and the contact mechanics models in a rotating drum geometry using the same input parameters as those already performed in a separate experimental project. The second step is to perform DEM simulations of the particles mixtures by varying particle cohesiveness and size. Finally, relevant parameters such as the segregation index will be computed and the simulations results will be compared to available data from experiments. This study will allow the development of a phase diagram and correlations, which can be useful in predicting segregation based on initial particulate properties.

Contact people:

Ahmed Jarray (MultiScale Mechanics, University of Twente): a.jarray@utwente.nl
Stefan Luding (MultiScale Mechanics, University of Twente): s.luding@utwente.nl