M.Sc. Thesis Project

Segregation in cohesive multi-component dry granular system

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.

In this project, we will investigate the ability of cohesion to mitigate segregation in dry multi-component systems. 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.

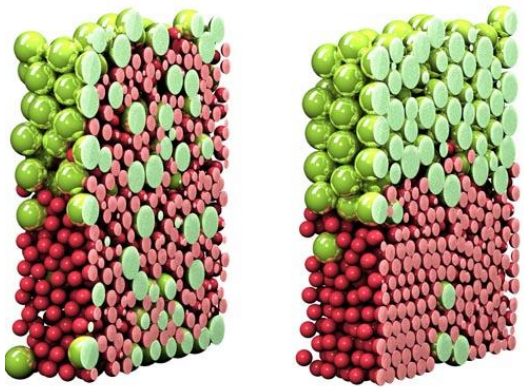

Figure 1. Segregation of particles. Mixed (left) and segregated (right). Picture adapted from Vaart et al. (2015).

Main Goal: Analyze the segregation of flowing multi-component cohesive and non-cohesive particles.

Method: The first step of the M.Sc. project is the development (or selection and improvement) of a robust image post-processing code for particles segregation index measurement. The second step is to study the segregation and mixing of the multi-component cohesive particulate systems. The particles are made cohesive via chemical silanization and the data to be analyzed are already available from previous project. This study will ultimately allow the development of a phase diagram, which can be useful in predicting segregation based on initial particulate properties.

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