Numerical Analysis of Segregation of Granular Materials in Sandpile Formation

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ABSTRACT

Particle mixtures with a wide range of sizes, shapes, and densities often experiences segregation during the handling and transport[1]. In the sandpile formation process, particles with different sizes and surface properties which might cause segregation are mostly studied by physical experiment. For instance, Fan et al. [2], Benito et al. [3] and Makse et al. [4] investigated the effect of parameters such as size ratio, free falling height, flow rate and angle of repose on segregation respectively. However, most of these studies are based on physical experiments and phenomenological models. Hence, the inner flow, force structures and the rolling torque towards the understanding of segregation mechanisms are still not fully analysed. Thus, in this work, DEM is used to examine the flow patterns of mixture with various angle of repose and different size ratios, and then the flow and force structures for both large and small particles are investigated to analyse the size segregation process. The results show when large particles have small angle of repose, segregation is most serious. On the contrary, small particles with small angle of repose, kink occurs and stratification is significant.

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