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Size segregation theory for binary granular mixtures based on forces on a single large particle[1] ANURAG TRIPATHI, Indian Institute of Technology Kanpur, ALOK KUMAR, ITC Ltd., Pune, India, MOHIT NEMA, Wells Fargo EGS India, Bengaluru, India, DEVANG KHAKHAR, Indian Institute of Technology Bombay — The segregation force acting on a few large size intruder particles in a flowing granular medium is measured using DEM simulations without any restriction on the motion of the intruder particle. Accurate measurement of the net upward force causing the segregation of large particles of same density is done by accounting for the drag force on the large size intruder particles. This net upward force, measured for dilute concentrations of the large intruder particles, is corrected for higher concentrations of the large particles. This theoretical formulation yields a segregation flux which is similar to empirical size segregation flux based approaches used in literature. Specifically, we find a cubic dependence on the large particle concentration and a linear dependence on shear rate. The theory also suggests dependency on other flow variables which are not captured in the currently used empirical approaches. The predictions of the concentration and the velocity field using this approach for steady, fully developed chute flow of binary mixtures for a wide range of compositions and inclinations match very well with the DEM simulations for the two different size ratios considered in this study.

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Anurag Tripathi
Indian Institute of Technology Kanpur

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