Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Predicting Granular Segregation of Species with Overlapping Size Distributions SONG GAO, JULIO OTTINO , PAUL UMBANHOWAR , RICHARD LUEPTOW, Northwestern University — Segregation of two size-polydisperse particle species with overlapping size distributions can occur in practical systems. A continuum approach can be extended to model segregation of two species with overlapping size distributions that matches discrete element method simulation results. Since size dispersity of the two species does not affect the degree of species segregation significantly, the local species concentration can be accurately modeled as a mixture of two size-monodisperse species using a simpler bidisperse model, even with substantial overlap of the two species distributions. However, for broad size distributions the local average particle size can be influenced by size dispersity in some regions of the flow. The segregation length scale characterizing the tendency for the two species to segregate, which can be measured for mixtures of two polydisperse species, closely follows the value associated with the mean diameters of the two species. While based on quasi-two-dimensional bounded heap flow, our findings should also directly apply to a wide range of other dense granular flow geometries, including rotating tumblers, conical chutes, wedge-shaped heaps, confined shear, and more complicated geometries such as hoppers.

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Date submitted: 03 Aug 2020 Electronic form version 1.4