

Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Modeling segregation of bidisperse granular materials: Model development¹ YI FAN, CONOR SCHLICK, PAUL UMBANHOWAR, JULIO OTTINO, RICHARD LUEPTOW, Northwestern University — Predicting segregation of size bidisperse granular materials is a challenging problem. In this talk, we present a theoretical model that captures the interplay between advection, segregation, and diffusion. The fluxes associated with these three driving factors depend on the underlying kinematics, whose characteristics play key roles in determining final particle segregation configurations. Unlike previous models of segregation, our model uses parameters based on kinematic measures instead of arbitrarily adjustable fitting parameters. This permits the theoretical prediction of species concentration within the entire flowing layer as particles segregate in the depth direction while they flow downhill. The model achieves quantitative agreement with both experimental and DEM simulation results when applied to quasi-two-dimensional bounded heaps, and can be readily adapted to other flow geometries.

¹Y.F. was funded by The Dow Chemical Company. C.P.S. was supported by NSF Grant CMMI-1000469.

Yi Fan
Northwestern University

Date submitted: 24 Jul 2013

Electronic form version 1.4