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Continuum model and simulation of segregating rods RICHARD M. LUEPTOW, Northwestern University, YONGZHI ZHAO, Zhejiang University, PAUL B. UMBANHOWAR, Northwestern University — Most studies of segregation of flowing granular materials focus on spherical particles, even though particles are often non-spherical in practical granular systems. Here we focus on the segregation of rod-like (cylindrical) particles of the same diameter but different lengths using continuum theory and DEM simulations based on super-ellipsoids. In the flowing layer of a bounded heap flow, a bidisperse mixture of long and short rods segregates such that the shorter rods percolate toward the lower portion of the flowing layer while longer rods rise toward the upper portion of the flowing layer, much like smaller spherical particles segregate from larger spherical particles. The rods tend to deposit on the underlying bed of particles in the heap such that they are aligned with the flow with the smaller rods deposited upstream of the larger rods due to segregation. The percolation velocities related to segregation for long and short rods depend on the local shear rate and the concentration of the other particle species, just as is the case for small and large spherical particles. Using this percolation velocity and an appropriate value for collisional diffusion, the advection-diffusion-segregation continuum model successfully predicts the segregation of rod-like particles.

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