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Predicting non-spherical particle segregation in dense granular flows[1] RYAN P JONES, JULIO M OTTINO, PAUL B UMBANHOWAR, RICHARD M LUEPTOW, Northwestern University — Segregation, or demixing, of sheared size-disperse mixtures of non-cohesive spherical particles is well-characterized. However, most particles in industry and geophysics are non-spherical. Here, using discrete element method simulations of gravity-driven free-surface granular flows, we characterize the segregation of bidisperse mixtures of non-cohesive, mm-sized particles that vary widely in their size and shape (disks, rods, and spheres). The segregation velocity for non-spherical particles depends on the local shear rate and the species concentration, as is the case for spherical particles. The propensity to segregate, measured in terms of a segregation length scale that characterizes the segregation velocity of the two species, can be predicted based on only the volume ratio between the two particle species, regardless of particle shape. The segregation length scale increases linearly with the log of the volume ratio for volume ratios varying from 0.1 to 10 in the same way as it does for bidisperse mixtures of spherical particles.

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