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The impact of flow rheology on both density and size segregations SIYING LIU, JOSEPH MCCARTHY, University of Pittsburgh, Chemical Engineering Department — Shear induced segregation is a problem of considerable import both industrially and academically. As a granular material is sheared, the bed dilates and heavier (or smaller) particles typically move perpendicular to the mean flow. In the present work, we perform a computational study – based on the Discrete Element Method – of the flow in a simple boundary-driven planar shear cell. We show a direct connection between density/size segregation with granular rheology that has the potential to spur a substantial jump in our understanding of both fields and lead to a transformation in the way that particle flow research is conducted. Our results exhibit a behavior transition in segregation which mimics how the effective friction coefficient changes with changing flow rheology. Moreover, by recasting a segregation model in terms of rheologically-relevant dimensionless groups, we establish a novel expression which is able to collapse results for a wide range of conditions for both density and size segregation. Ultimately, these expressions can have a profound impact on both the study of granular flow/ mixing as well as industrial practice.

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