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The Onset of Axial Segregation in Rotating Tumblers PENGFEI CHEN, JULIO M. OTTINO, RICHARD M. LUEPTOW, Northwestern University
— The onset of axial segregation of binary mixtures having different size particles in rotating tumblers is numerically investigated using the discrete element method. Results confirm the existence of axial flows between bands, which is the basis for most theoretical models of the phenomenon. We consider the distribution of axial fluxes of the two types of particles in transverse planes and their variance along the length of the tumbler. The onset of axial segregation occurs when the ratio of the axial flux of the two kinds of particles differs in the upstream and downstream part of the flowing layer. This difference is likely to be generated from the transverse segregation occurring in the flowing layer. Based on this, a phenomenological model with a negative diffusion coefficient can account for the onset of axial segregation qualitatively. The criterion for the onset of axial segregation and the roles of endwalls and tumbler parameters are also discussed.

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