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Axial Segregation in Rotating Drum - Extension of the Basic Axial Diffusion Model

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Abstract :

In the last two decades, two mechanisms for describing axial segregation in granular mixtures have emerged in the context of binary mixtures. While the transient travelling wave picture has been well established, it lacks the physical connection to the well known friction hypothesis: Granular material composed of different frictional properties diffuse(into axial bands) due to concentration fluctuations in the free surface layer caused by friction-limited mobility. In this paper we present an extension to the frictional mechanism based on free surface flow by extending the axial gradient operator to second order in a binomial expansion. Moreover, we have replaced the idealised Newtonian shear stress with a more realistic Bagnoldian-type that is well known to describe inertially dominated flows like that observed (via Positron Emission Particle Tracking experiments) in the free surface layer. The validity of the new model is illustrated in the successful reproduction of axial segregation and banding, and the subsequent coarsening that is experimentally observed with time evolution.

Award :

Yes

Level :

PhD

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Paper :

Yes

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