

Abstract Submitted
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DEM simulation of flow of dumbbells on a rough inclined plane

SANDIP MANDAL, DEVANG KHAKHAR, Department of Chemical Engineering, Indian Institute of Technology Bombay, Powai, Mumbai 400076, India — The rheology of non-spherical granular materials such as food grains, sugar cubes, sand, pharmaceutical pills, among others, is not understood well. We study the flow of non-spherical dumbbells of different aspect ratios on a rough inclined plane by using soft sphere DEM simulations. The dumbbells are generated by fusing two spheres together and a linear spring dashpot model along with Coulombic friction is employed to calculate inter-particle forces. At steady state, a uni-directional shear flow is obtained which allows for a detailed study of the rheology. The effect of aspect ratio and inclination angle on mean velocity, volume fraction, shear rate, shear stress, pressure and viscosity profiles is examined. The effect of aspect ratio on probability distribution of angles, made by the major axes of the dumbbells with the flow direction, average angle and order parameter is analyzed. The dense flow rheology is well explained by Bagnold's law and the constitutive laws of JFP model [Jop et. al., Nature 441, 727 (2006)]. The dependencies of first and second normal stress differences on aspect ratio are studied. The probability distributions of translational and rotational velocity are analyzed.

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