Rheology and segregation of granular mixtures in dense flow

Anurag Tripathi and Devang Khakhar

*Department of Chemical Engineering, IIT Bombay, India**

We investigate the rheology of granular mixtures, comprising particles of different size and density, in a flow on a rough inclined plane by means of Discrete Element Method (DEM) based simulations. Steady flows at relative high particle volume fractions (ϕ ¿ 0.5) are considered for different density ratios, size ratios and inclination angles. A new model based on the viscoplastic model of Jop et al. (Nature, **441**, 727, 2006) is shown to describe the rheology of the mixtures quite well. Segregation of particles is analyzed by considering the sedimentation of single particles in the flow. We find that modified versions of Stokes Law and Archimedes principle may be used to obtain the drag force and buoyancy experienced by a sedimenting particle. A continuum model is developed to predict the equilibrium segregation in the flow and compared to simulation results.

*Electronic address: khakhar@iitb.ac.in