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Dynamics of Large Intruder Particles in a Split Bottom Cell ZHEN SUN, Department of Mechanical Engineering, University of Minnesota, YI FAN, KIMBERLY HILL, St. Anthony Falls Laboratoy, Department of Civil Engineering, University of Minnesota — We have performed experimental studies on the behavior of a single intruder particle in an otherwise relatively uniform matrix of granular materials sheared in a split bottom cell. We study the effect of the size and density of the intruder particle relative to the particles in the matrix on the behavior of the intruder particle. When an intruder particle is sufficiently large relative to the size of the particles in the matrix, it will rise to the surface only when the ratio between the density of the intruder particle and that of the matrix particle density d_r is somewhat less than a critical value $d_{cr1} < 1$. Intruder particles of a higher density move to an equilibrium distance h from the bottom of the cell that varies with d_r. When d_r is greater than a second critical value d_{cr2} – where $d_{cr1} < d_{cr2} < 1$ – $h = 0$. We model the behavior of these large intruder particles considering effective buoyancy and volume fraction variations as well as drag forces in the shear flow.

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