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Predicting the Agglomeration of Cohesive Particles in a Gas-Solid Flow and its Effect on the Solids Flow[1] KEVIN KELLOGG, PEIYUAN LIU, CASEY LAMARCHE, CHRISTINE HRENYA, University of Colorado at Boulder — In flows of cohesive particles, agglomerates will readily form and break. These agglomerates are expected to complicate how particles interact with the surrounding fluid in multiphase flows, and consequently how the solids flow. In this work, a dilute flow of particles driven by gas against gravity is studied. A continuum framework, composed of a population balance to predict the formation of agglomerates, and kinetic-theory-based balances, is used to predict the flow of particles. The closures utilized for the birth and death rates due to aggregation and breakage in the population balance take into account how the impact velocity (the granular temperature) affects the outcome of a collision as aggregation, rebound, or breakage. The agglomerate size distribution and solids velocity predicted by the continuum framework are compared to discrete element method (DEM) simulations, as well to experimental results of particles being entrained from the riser of a fluidized bed.

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