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Jetting Formation of Explosive Dispersal of Hybrid Particles KUN XUE, State Key Laboratory of Explosion Science and Technology, Beijing Institute of Technology, Beijing, 100081, China — The explosive dispersal of granular matter is characterized by persistent ballistic conical jets with billowing wakes. This particle clustering or jet structures influence but only their dynamic trajectories but also the particle-fluid mixing and subsequent energy release if the particles are reactive. The explosive dispersal of hybrid sand with a range of saturation were observed to exhibit a postponed jetting onset and a significantly finer and more uniformed jet structure with increasing saturation. In order to predict the particle jetting formation, we proposed an instability criterion involving the opposing forces of stabilizing inertial pressures and destabilizing viscous resistance. Thus a kinetic breakup model was established. The predicted instability onsets of expanding sand shells agreed reasonably well with the experimental observations. The incorporation of a modified granular compaction model taking into account the lubrication effect of interstitial fluids in hybrid sand enables the breakup model to quantitatively describe the dependence of jetting onset on the saturation. A close inspection of dynamic fragmentation of sand subject to explosive loadings via a multi-material hydrodynamic modeling revealed a multiple necking mechanism underlying the jetting formation opposed to the surface instability mechanisms, such as Rayleigh-Taylor (RT), Richtmyer-Meshkov instabilities (RM).

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