JET FORMATION DURING EXPLOSIVE PARTICLE DISPERSAL

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Experimental studies have shown that when solid particles are explosively dispersed, the particles often develop a nonuniform spatial distribution. This may take the form of clusters of particles or coherent jet-like particle structures which may persist for some distance during the dispersal process. Particle clustering influences the particle aerodynamics, particle-gas mixing and burning, and blast wave propagation and is a ubiquitous feature of enhanced blast metalized explosives. A series of exploratory experiments has been carried out to investigate the influence of particle diameter and density and explosive mass on the development of instabilities at the front of an expanding particle cloud. A conical arrangement was used, in which a bed of dry particles was placed above a spherical explosive charge at the apex of the cone. The experiments show that the spatial uniformity of the expanding particle cloud depends strongly on the particle size, density and velocity. In general, small, light particles that are strongly accelerated are most susceptible to the formation of particle jets. Calculations with a multiphase model have also been carried out to explore the variety of mechanisms that have been proposed to account for particle clustering, including entrainment into vortical structures induced by Rayleigh-Taylor or Richtmyer-Meshkov instabilities, non-elastic particle collisions, and non-uniform particle drag.