P44 Formation of a Reactive Particle Jet with an Explosive Multiphase Lens

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Abstract:

The conventional method for forming a narrow high-speed jet of material is with the use of a hollow shaped charge to accelerate a conical liner. A larger jet of particles may be formed by replacing the liner with an explosive layer and filling the hollow conical volume with particles. If the particles are then saturated with a liquid explosive, the resulting explosive lens increases the particle jet velocity by an order of magnitude due to the detonation propagation in the liquid-particle mixture. In the present paper, the latter configuration is investigated experimentally and computationally with a multi-material hydrocode for the case of light, reactive particles (aluminum) as well as heavy, inert particles (steel). With the liquid explosive saturating steel particles, the jet velocity is higher than for a dry particle bed, but coherency of the jet is reduced. For reactive aluminum particles, the liquid explosive increases the jet velocity by an order of magnitude compared to a dry particle bed and enhances the reaction of the particles. By varying the dilution of the liquid explosive, and hence the detonation velocity, the wave dynamics within the explosive lens may be modified to increase the subsequent velocity of the particle jet formed.

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