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Blast Wave Mitigation in Granular Materials QUENTIN PONTALIER, MAXIME LHOUMEAU, DAVID FROST, McGill University — A common technique to mitigate the blast wave from a high explosive is to surround the explosive with a layer of inert particles or liquid. In the case of a powder layer in spherical geometry, the spherically expanding shock wave that propagates first within the porous powder bed has a complex structure and induces the formation of force chains through particles in contact, shock propagation in the interstitial gas, and leads to shock compaction and deformation of the particle bed. Overall, the shock accelerates the particles and heats the gas in the pores and the partition of the total energy between kinetic and internal energy is primarily a function of the layer porosity and mass ratio of material to explosive. This energy partition is explored computationally with a multiphase hydrocode as a function of the bed parameters and compared with the case of a homogeneous liquid. The results are compared with experiments which track the strength of the blast wave emerging from the material layer as well as the material velocity using high-speed photography. For a given mass ratio, the strength of the blast wave transmitted into the air and the material velocity are significantly lower for particle beds than liquid layers due to energy dissipation during compaction of the bed.

David Frost
McGill University

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