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Modeling Detonation of Heterogeneous Explosives with Embedded Inert Particles Using Detonation Shock Dynamics: Normal and Divergent Propagation in Regular and Simplified Microstructure SCOTT STEWART, University of Illinois at Urbana-Champaign — We use a detonation shock propagation model, Detonation Shock Dynamics(DSD) to compute the interaction of a detonation shock wave that passes over a series of inert spherical particles embedded in a high explosive material. DSD provides an efficient means to study the dynamics of lead shock waves without the necessity of simulating the entire multi-material, reactive flow field. We derive partial differential equations for the motion of a detonation shock that obeys a linear shock normal velocity-curvature relation in a cylindrical coordinate system and in a moving, shock-attached coordinate system. The shock dynamics equations are solved numerically, in a unit-cell configuration. We describe the short-term and long-term behavior of the shock wave as it passes over the particles. We describe both the averages and character of the stochastic behavior that affects long-term average properties for microstructure in which the inert particles are periodically and randomly spaced.

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