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Numerical investigation of the density effect in modeling detonation propagation in high explosives CARLOS CHIQUETE, CHAD D. MEYER, MARK SHORT, Los Alamos National Laboratory — Detonation Shock Dynamics (DSD) is an asymptotically-derived detonation propagation model used in engineering models of high explosive (HE) performance. The method is based on the limit where the detonation reaction zone length and time scales are small in relation to the much larger geometry in which the HE is embedded. The intrinsic DSD propagation law (functionally relating the surface normal velocity and curvature) for each HE is typically calibrated to simplified geometry tests where steady-state front velocities and shapes are measured. This relationship is necessarily a function of the experimental conditions and is thus limited in scope. For HEs with variable pressing or casting density, a particular need exists for calibrations sensitive to this variability. However, there is little constraint on how the density effect is specifically incorporated into the fitting procedure. To investigate this issue, shock-attached calculations in simple slab or cylindrical geometries are performed for varying initial density for a numerical explosive model with a realistic equation of state. The steady-state detonation velocities, front shapes and the resulting DSD calibration of this generated data are analyzed as function of the applied HE density.

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