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Finite element code development for modeling detonation of HMX composites ADAM DURAN, VEERA SUNDARARAGHAVAN, Univ of Michigan - Ann Arbor — In this talk, we present a hydrodynamics code for modeling shock and detonation waves in HMX. A stable efficient solution strategy based on a Taylor-Galerkin finite element (FE) discretization was developed to solve the reactive Euler equations. In our code, well calibrated equations of state for the solid unreacted material and gaseous reaction products have been implemented, along with a chemical reaction scheme and a mixing rule to define the properties of partially reacted states. A linear Gruneisen equation of state was employed for the unreacted HMX calibrated from experiments. The JWL form was used to model the EOS of gaseous reaction products. It is assumed that the unreacted explosive and reaction products are in both pressure and temperature equilibrium. The overall specific volume and internal energy was computed using the rule of mixtures. Arrhenius kinetics scheme was integrated to model the chemical reactions. A locally controlled dissipation was introduced that induces a non-oscillatory stabilized scheme for the shock front. The FE model was validated using analytical solutions for sod shock and ZND strong detonation models and then used to perform 2D and 3D shock simulations. We will present benchmark problems for geometries in which a single HMX crystal is subjected to a shock condition. Our current progress towards developing microstructural models of HMX/binder composite will also be discussed.

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