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Modeling the shock-induced multiple reactions in a random bed of metallic granules in an energetic material JACK YOH, Seoul National University, BOHOON KIM, Caltech, SANGHUN CHOI, Seoul National University, EXTREME ENERGY LABORATORY TEAM — An investigation on the shock-particle interaction in condensed phase reactive flow has been carried out via the Eulerian hydrodynamic simulations. The analysis focused on the meso- to macro-scale numerical modeling of a granular metalized explosive containing randomly distributed metal particles intended to enhance its blast effect. The reactive flow model is used for the cyclotrimethylene-trinitramine (RDX) component, while thermally induced deflagration kinetics describes the aerobic reaction of the metal particles. The complex interfacial algorithm, which uses aligned level sets to track collapsing bubbles in water, is first validated against theory as well as experimental measurements. Then, the shock-induced collapse of metal particles embedded in the condensed phase domain of a high explosive is simulated. Both aluminized and copperized RDX are shown to detonate with a shock wave followed by the burning of the metal particles. The energy release and the afterburning behavior behind the detonating shock wave successfully identified the precursor that gave rise to the development of deflagration of the metal particles.

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