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Modeling the Shock Ignition of a Copper Oxide Aluminum Thermite[1] KIBAEK LEE, D. SCOTT STEWART, MICHAEL CLEMENSON, NICK GLUMAC, CHRISTOPHER MURZYN, University of Illinois, Urbana, IL
— An experimental "striker confinement" shock compression test was developed in the Glumac-group at the University of Illinois to study ignition and reaction in composite reactive materials. These include thermitic and intermetallic reactive powders. The test places a sample of materials such as a thermite mixture of copper oxide and aluminum powders that are initially compressed to about 80 percent full density. Two RP-80 detonators simultaneously push steel bars into reactive material and the resulting compression causes shock compaction of the material and rapid heating. At that point one observes significant reaction and propagation of fronts. But the fronts are peculiar in that they are comprised of reactive events that can be traced to the reaction/diffusion of the initially separated reactants of copper oxide and aluminum that react at their mutual interfaces that nominally make copper liquid and aluminum oxide products. We discuss our model of the shock ignition of the copper oxide aluminum thermite in the context of the striker experiment and how a Gibbs formulation model, that includes multi-components for liquid and solid phases of aluminum, copper oxide, copper and aluminum oxide can predict the events observed at the particle scale in the experiments.

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