Abstract Submitted
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A study of reactant interfaces in Ni+Al particle systems during shock wave propagation RYAN A. AUSTIN, DAVID L. MCDOWELL, Georgia Institute of Technology, YASUYUKI HORIE, Air Force Research Laboratory, DAVID J. BENSON, University of California, San Diego — Macro-scale responses of energetic materials during shock compression are influenced strongly by thermo-mechano-chemical processes occurring at the level of the microstructure. For example, it is believed that the propagation of chemical reactions in reactive particle systems is intimately linked to conditions at reactant interfaces such as surface temperature, phase changes, defect density, and mass mixing due to inelastic deformation. To provide explicit resolution of such interfacial conditions, numerical models are constructed. The finite element method is used to numerically solve the differential equations that govern the coupled thermomechanical response of micron-size particle mixtures of Ni and Al during shock wave propagation (interface chemistry is not yet modeled). The size and temperature distributions of contiguous reactant contact surfaces are quantified for a range of shock strengths. A parametric study of mixture attributes is undertaken to assess the sensitivity of the aforementioned distributions to variations of the microstructure.

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