Abstract Submitted
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Meso-Scale Heterogeneity Effects on the Bulk Shock Response of Ti+Al+B Reactive Powder Mixtures[1] MANNY GONZALES, ASHOK GURUMURTHY, GREGORY KENNEDY, ARUN GOKHALE, NARESH THADHANI, Georgia Institute of Technology — Highly heterogeneous reactive powder mixtures including Ti+2B (Stoichiometric 1:2) and an Al-containing mixture (Ti+2B+50%Al by vol.) are studied to ascertain the shock compression response and potential reaction behavior. The transit time through the pressed powder mixture compacts is monitored using poly-vinylidene fluoride (PVDF) stress gauges and used to compute a wave speed through the compact. The stress states at the back of the powder (measuring the state of the compacted and potentially transformed powder) are compared with thermodynamic mixture theories as well as meso scale microstructure-based simulations to identify the onset of anomalous behavior which can be traced to highly exothermic reaction in this system. Shock compression experiments show highly dispersive wave fronts when measured from the back surface of the powder compact, which are compared with meso scale simulations considering varying starting mixture states. These simulations also provide microstructure evolution parameters during shock compression which are stereologically evaluated to establish the state of the material present under the experimental conditions. An analysis of the effects of starting mixture conditions on the stress at the back surface is also presented.

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