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Abstract for an Invited Paper
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Exploring Rapid Initiation of Intermixing, Phase Formation, and Combustion in Reactive Materials[1]

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Reactive materials are being developed and commercialized for a variety of applications ranging from local heat sources for bonding to controlled burning for chemical time delays to dispersed heat sources for bioagent and target defeat. In all cases the reactive materials are fabricated into an unstable state from which large amounts of energy can be released. This is true for materials that enable formation reactions, reduction-oxidation reactions, and simple combustion reactions. In this presentation we consider a number of the factors that control the initiation of reactions as well as the rate of heat release in the full reaction. The initiation of formation and reduction-oxidation reactions will be explored following pulses of thermal, electrical and mechanical energy, and the impact of reactant chemistry and microstructure on ignition will be identified. In the final part of the presentation we will review the impact of chemistry and geometry on the combustion of reactive foils and particles in air. Results from novel in situ studies will be presented, along with numerical simulations and direct measurements of reaction temperatures, propagation rates, and heat production.

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