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Hydrodynamic simulations of shock-driven chemistry in polyimide JEFFREY PETERSON, JOSHUA COE, Los Alamos National Laboratory — While the behavior of energetic materials has been extensively studied, the shock-driven chemistry of soft materials is still poorly understood. Analysis of recovered material from shock experiments has conclusively shown that soft materials undergo an irreversible transformation when shocked to high pressures, but only recently have in situ measurements of wave profiles [1] been able reveal the complex wave structures that result. In this presentation, we present hydrodynamic simulations that help connect observed wave behavior to interactions between thermodynamics, reaction kinetics, and hydrodynamics. As a prototypical example, we will present recent work with polyimide starting with a brief discussion of the equations of state created for both polyimide and its reaction products. The transition between reactants and products is achieved within the hydrodynamic simulation by utilizing a kinetic rate model whose parameters are informed through both historical shock data and more modern velocimetry measurements. Finally, we will discuss future directions for this work in the attempt to better reproduce experimental results.

[1] Dattelbaum and Sheffield. AIP Conference Proceedings 1426, 627 (2012)

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