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Critical Hotspots and Flame Propagation in HMX-Based Explosives CAROLINE HANDLEY, AWE — Understanding reaction within hotspots (ignition) and its propagation into the bulk (growth) is key to the development of mesoscale models for shock initiation of heterogeneous explosives. An important concept is that of critical hotspots; a critical hotspot is just large and hot enough that it can itself react, and go on to spread reaction into the cooler surrounding explosive, before it is cooled by heat conduction. This paper will describe how previously-published hydrocode models for HMX and two binder materials were used to obtain critical hotspot criteria. The results compare well to those in the literature for HMX. In the simulations, which account for hydrodynamics, heat conduction and Arrhenius chemistry, reaction propagates outwards from hotspots via a flame driven by heat conduction. The flame propagation speed in the simulations has been compared to data for HMX from high- pressure diamond anvil cell experiments. Discrepancies between the hydrocode results and the data shed light on the mechanisms of reaction propagation in heterogeneous explosives.

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