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Ignition Prediction of Pressed HMX based on Hotspot Analysis Under Shock Pulse Loading SEOKPUM KIM, CHRISTOPHER MILLER, Georgia Institute of Technology, YASUYUKI HORIE, (ret.) Air Force Research Lab, CHRISTOPHER MOLEK, ERIC WELLE, Air Force Research Lab, MIN ZHOU, Georgia Institute of Technology — The ignition behavior of pressed HMX under shock pulse loading with a flyer is analyzed using a cohesive finite element method (CFEM) which accounts for large deformation, microcracking, frictional heating, and thermal conduction. The simulations account for the controlled loading of thin-flyer shock experiments with flyer velocities between 1.7 and 4.0 km/s. The study focuses on the computational prediction of ignition threshold using James criterion which involves loading intensity and energy imparted to the material. The predicted thresholds are in good agreement with measurements from shock experiments. In particular, it is found that grain size significantly affects the ignition sensitivity of the materials, with smaller sizes leading to lower energy thresholds required for ignition. In addition, significant stress attenuation is observed in high intensity pulse loading as compared to low intensity pulse loading, which affects density of hotspot distribution. The microstructure-performance relations obtained can be used to design explosives with tailored attributes and safety envelopes.

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