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Ignition Behavior of an aluminum-bonded explosive (ABX) MIN ZHOU, D. BARRETT HARDIN, Georgia Institute of Technology, YASUYUKI HORIE, Retired — We report the results of a study on the ignition behavior of a novel concept and design of heterogeneous energetic material system called ABX, or aluminum-bonded explosives. The idea is to replace the polymeric binder in polymer-bonded explosives (PBX) with aluminum. The motivation of this study is that a new design may have several desirable attributes, including, among others, electrical conductivity, higher mechanical strength, enhanced integrity, higher energy content, and enhanced thermal stability at elevated temperatures. The analysis carried out concern the replacement of the Estane binder in a HMX/Estane PBX by aluminum. The HMX volume fraction in the PBX and HMX is on the order of 81%. 2D mesoscale simulations are carried out, accounting for elasticity, viscoelasticity, elasto-viscoplasticity, fracture, internal friction, and thermal conduction. Results show that, relative to the PBX, the aluminum bonded explosives (ABX) show significantly less heating and lower ignition sensitivity under the same loading condition. The findings appear to confirm the expected promise of ABX as a next-generation heterogeneous energetic material system with more desirable attributes.

D. Barrett Hardin
Georgia Institute of Technology

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