

Abstract Submitted  
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**Computational Prediction of Shock Ignition Thresholds and Ignition Probability of Polymer-Bonded Explosives**<sup>1</sup> YAACHI WEI, Georgia Institute of Technology, SEOKPUM KIM, Oak Ridge National Laboratory, YASUYUKI HORIE, (ret.) Air Force Research Lab, MIN ZHOU, Georgia Institute of Technology — A computational approach is developed to predict the probabilistic ignition thresholds of polymer-bonded explosives (PBXs). The simulations explicitly account for microstructure, constituent properties, and interfacial responses and capture processes responsible for the development of hotspots and damage. The specific damage mechanisms considered include viscoelasticity, viscoplasticity, fracture, post-fracture contact, frictional heating, and heat conduction. The probabilistic analysis uses sets of statistically similar microstructure samples to mimic relevant experiments for statistical variations of material behavior due to inherent material heterogeneities. The ignition thresholds and corresponding ignition probability maps are predicted for PBX 9404 and PBX 9501 for the impact loading regime of  $U_p = 200 - 1200$  m/s. James and Walker-Wasley relations are utilized to establish explicit analytical expressions for the ignition probability as a function of load intensities. The predicted results are in good agreement with available experimental measurements. The capability to computationally predict the macroscopic response out of material microstructures and basic constituent properties lends itself to the design of new materials and the analysis of existing materials.

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