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**Prediction of Probabilistic Ignition Behavior of PBXs from Microstructural Stochasticity**[1] SEOKPUM KIM, ANANDA BARUA, Georgia Institute of Technology, YASUYUKI HORIE[2], Air Force Research Lab, Eglin AFB, FL, MIN ZHOU, Georgia Institute of Technology — A novel approach is developed to computationally predict and quantify the stochasticity of the ignition process in polymer-bonded explosives (PBXs) under impact loading. The method involves subjecting sets of statistically similar microstructure samples to identical overall loading and characterizing the statistical distribution of the ignition response of the samples. The focus of the analyses is exclusively on the influence of microstructure geometry variations on the critical time to ignition at given load intensity and the critical impact velocity below which no ignition occurs. Results show that the probability distribution of the time to criticality follows the Weibull distribution. The quantification of this probability distribution as a function of microstructural attributes including grain volume fraction, grain size and specific binder-grain interface area along with the stochastic variations of these attributes within each set of samples yields relations that reveal microstructural parameters that play dominant roles in determining the ignition behavior of the materials. In particular, it is found that the specific interfacial area directly influences the critical time to ignition and the critical impact velocity below which no ignition is observed.

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