Abstract Submitted
for the SHOCK17 Meeting of
The American Physical Society

Three-dimensional Mesoscale Simulations of Detonation Initiation in Energetic Materials with Density-based Kinetics THOMAS JACKSON, Univ of Florida - Gainesville, A.M. JOST, JU ZHANG, Florida Institute of Technology, P. SRIDHARAN, Univ of Florida - Gainesville, G. AMADIO, University of Illinois — In this work we present three-dimensional mesoscale simulations of detonation initiation in energetic materials. We solve the reactive Euler equations, with the energy equation augmented by a power deposition term. The reaction rate at the mesoscale is modelled using a density-based kinetics scheme, adapted from standard Ignition and Growth models. The deposition term is based on previous results of simulations of pore collapse at the microscale, modelled at the mesoscale as hot-spots. We carry out three-dimensional mesoscale simulations of random packs of HMX crystals in a binder, and show that the transition between no-detonation and detonation depends on the number density of the hot-spots, the initial radius of the hot-spot, the post-shock pressure of an imposed shock, and the amplitude of the power deposition term. The trends of transition at lower pressure of the imposed shock for larger number density of pore observed in experiments is reproduced. Initial attempts to improve the agreement between the simulation and experiments through calibration of various parameters will also be made.

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Date submitted: 23 Feb 2017 Electronic form version 1.4