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Ignition of pressed granular explosives due to short-duration pulse loading[1] CHRISTOPHER MILLER, SEOKPUM KIM, MIN ZHOU, Georgia Inst of Tech — We report the results of micromechanical simulations of a series of experiments on the ignition of pressed granular HMX under loading due to impact by thin flyers. The conditions analyzed concern loading pulses on the order of 50 nanoseconds to 1 microsecond and impact velocities on the order of 200-1600 m/s. The materials studied have average grain sizes of 50-200 microns. The model provides phenomenological account of defects in the forms of microcracks, voids, interfacial debonding, and constituent property variations and material attributes including constituent shock and non-shock responses, fracture, internal contact, frictional heating, and heat conduction. The analysis focuses on the development of hotspots under different material settings and loading conditions. In particular, a hotspot-based ignition criterion developed recently [Barua et al., Ignition criterion for heterogeneous energetic materials based on hotspot size-temperature threshold, J. Applied Physics; 113, 064906 (2013)] is employed to determine the probability of ignition of each material design under combinations of impact velocity and load duration. The results of parametric studies are compared with experimental observations reported in the literature.

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