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Numerical simulations for hot spot formation under shock loading in plastic-bonded explosives with three-dimensional discrete element methe FENG ZHAO, HAILING SHANG, WENQIANG WANG, HUA FU — Three-dimensional discrete element code, the combined discrete/finite element code and three-dimensional calculation model for explosive have been established for the simulation of hot spot formation in granular HMX, HMX based PBX, HMX crystalline with a void inside under shock loading. The simulation results indicate that in the case of PBX explosives hot spots mostly locate near the interface between HMX granules and binder, the temperature rise of HMX granules is lower than the binder, and the surrounding parts of HMX granules have higher temperature rise than the inner parts. In contrast to HMX granular explosive, since the binder can act as a cushion to the explosive, HMX in PBX has much lower temperature rise. Temperature of hot spot generated by void collapse is significantly influenced by the size and shape of the void. Finally, simple chemical reaction process has been simulated using the Arrhenius reactive rate law and the HOM equation of state for solid explosive and gas production.

Feng Zhao

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