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Detonation Initiation with Thermal Deposition due to Pore Collapse in Energetic Materials - Towards the Coupling between Micro- and Macroscale JU ZHANG, Florida Institute of Technology, THOMAS JACKSON, University of Florida — Initiation of detonation through thermal power deposition due to pore collapse in energetic materials (such as HMX) is studied numerically by solving the reactive Euler equations. The thermal power deposition model is partially based on previous results of direct simulations of pore collapse. The thermal deposition time scales obtained from the pore collapse model are significantly longer than acoustic time scale. It is found here that a critical size of hot spots exists, and when hot spots exceed the critical size, direct initiation of detonation upon ignition seems independent of power input, and is achieved even with low power input. On the other hand, when hot spots are below the critical size, the ignition does not lead to detonation. However, if the thermal deposition time scale is decreased, a scenario different than pore collapse, such that it is on the acoustic time scale, detonation does arise, a scenario corresponding to the so-called "explosion in explosion". A time scale criterion for direct initiation of detonation is then proposed and demonstrated with numerical simulations. It is proposed that if the chemical reaction time scale is shorter than the acoustic time scale at ignition, the ignition will lead to a direct initiation of detonation.

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