Abstract Submitted
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**Modelling propagation of deflagration waves out of hot spots** YEHUDA PARTOM, Retired — It is widely accepted that shock initiation and detonation of heterogeneous explosives come about by a two-step process known as ignition and growth. In the first step a shock sweeping an explosive cell (control volume) creates hot spots that become ignition sites. In the second step deflagration waves (or burn waves) propagate out of those hot spots and transform the reactant in the cell into reaction products. The macroscopic (or average) reaction rate of the reactant in a cell depends on the speed of those deflagration waves and on the average distance between neighbouring hot spots. Here we simulate the propagation of deflagration waves out of hot spots on the mesoscale in axial symmetry using a 2D hydrocode, to which we add heat conduction and bulk reaction. The propagation speed of the deflagration wave depends on both pressure and temperature, where pressure dependence is dominant at low shock level, and temperature dependence is dominant at a higher shock level. From the simulation we obtain deflagration (or burn) fronts emanating out of the hot spots. For intermediate shock levels the deflagration waves consume the explosive between hot spots. For higher shock levels the deflagration waves strengthen to become detonation waves on the mesoscale. From the simulation results we extract average deflagration wave speeds and show how they depend on reaction rate and on other material parameters.

Yehuda Partom
Retired

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