Abstract Submitted
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Computational investigation of preshock desensitization of liquid nitromethane with air-filled cavities[1] XIAOCHENG MI, LOUISA MICHAEL, NIKOLAOS NIKIFORAKIS, University of Cambridge, ANDREW J. HIGGINS, McGill University — The phenomenon of preshock desensitization of heterogeneous explosives has been experimentally investigated for decades. Two governing mechanisms have been speculated: 1) Elimination of hot spots due to the removal of heterogeneities (e.g., a weak preshock closes the pores); 2) a smaller increase in temperature and entropy due to multiple input shock waves. To determine the dominant desensitization mechanism, two-dimensional, meso-resolved simulations are performed to capture the dynamics of double-shock initiation in mixtures of liquid nitromethane with air-filled cavities. Without invoking any phenomenological reaction models to account for the meso-scale effects, Arrhenius chemical kinetics and a statistically significant amount of heterogeneities are explicitly considered in these simulations. Uniformly random, random, and clustered distribution of cavities are considered in order to probe the response of heterogeneities to double shocks. Statistical analysis are performed on the simulation results to gain further insight into the mechanisms underlying shock desensitization.

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XiaoCheng Mi
University of Cambridge

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