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Study of void sizes and loading configurations effects on shock initiation due to void collapse in heterogeneous energetic materials SIDHARTHA ROY, NIRMAL RAI, H.S. UDAYKUMAR, Univ of Iowa — In heterogeneous energetic materials, presence of porosity has been seen to increase its sensitivity towards shock initiation and ignition. Under the application of shock load, the viscoplastic deformation of voids and its collapse leads to the formation of local high temperature regions known as hot spots. The chemical reaction triggers at the hot spot depending on the local temperature and grows eventually leading to ignition and formation of detonation waves in the material. The temperature of the hot spot depends on various factors such as shock strength, void size, void arrangements, loading configuration etc. Hence, to gain deeper understanding on shock initiation and ignition study due to void collapse, a parametric study involving various factors which can affect the hot spot temperature is desired. In the current work, effects of void sizes, shock strength and loading configurations has been studied for shock initiation in HMX using massively parallel Eulerian code, SCIMITAR3D. The chemical reaction and decomposition for HMX has been modeled using Henson-Smilowitz multi step mechanism. The effect of heat conduction has also been taken into consideration. Ignition threshold criterion has been established for various factors as mentioned. The critical hot spot temperature and its size which can lead to ignition has been obtained from numerical experiments.

Nirmal Rai
Univ of Iowa

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