Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Sensitivity Characterization of Pressed Energetic Materials using Flyer Plate Mesoscale Simulations. NIRMAL RAI, H.S. UDAYKUMAR, Univ of Iowa — Heterogeneous energetic materials like pressed explosives have complicated microstructure and contain various forms of heterogeneities such as pores, micro-cracks, energetic crystals etc. It is widely accepted that the presence of these heterogeneities can affect the sensitivity of these materials under shock load. The interaction of shock load with the microstructural heterogeneities may leads to the formation of local heated regions known as "hot spots". Chemical reaction may trigger at the hot spot regions depending on the hot spot temperature and the duration over which the temperature can be maintained before phenomenon like heat conduction, rarefaction waves withdraws energy from it. There are different mechanisms which can lead to the formation of hot spots including void collapse. The current work is focused towards the sensitivity characterization of two HMX based pressed energetic materials using flyer plate mesoscale simulations. The aim of the current work is to develop mesoscale numerical framework which can perform simulations by replicating the laboratory based flyer plate experiments. The current numerical framework uses an image processing approach to represent the microstructural heterogeneities incorporated in a massively parallel Eulerian code SCIMITAR3D. The chemical decomposition of HMX is modeled using Henson-Smilowitz reaction mechanism. The sensitivity characterization is aimed towards obtaining James initiation threshold curve and comparing it with the experimental results.

Nirmal Rai
Univ of Iowa

Date submitted: 06 Nov 2015 Electronic form version 1.4