Abstract Submitted
for the SHOCK15 Meeting of
The American Physical Society

Cell Length Independent PBRB Model for Simulations of HE Reaction Initiation, Growth, and Detonation[1] SUNIL DWIVEDI, School of Materials Science Engg., Georgia Institute of Technology, Atlanta, GA 30332, YASUYUKI HORIE, (Retired) Air Force Research Laboratory, Eglin AFB, FL 32547
— It has been our focus to use the Physics Based Reaction Burn (PBRB) model to simulate reaction initiation, growth, and detonation of HE composites at the mesoscale. The idealization of hot spots as planar surfaces reduces the 3D model to a 1D hot spot cell (1DHSC) model. The idealization also renders the model dependent on the 1DHSC length and mesh size. New developments are presented making the PBRB model 1DHSC length independent. First, the accurate prediction of the gas-solid interface temperature and thermal gradient are essential, achieved through a finite difference scheme with 500-2000 thermal grid points. Second, keeping the burn mass constant while varying the 1DHSC length is essential, achieved by varying the hot spot specific surface area. 1D and 2D simulation results are presented for shock response of RDX at 1 km/s and 2 km/s impact velocities. The 5, 10, and 50 micro meters 1DHSC lengths yield near identical run-to-detonation, time-to-detonation, and detonation velocity in agreement with experimental data. It is concluded that the new developments make the PBRB model well suited as a generic EOS model for HE composites. – Dr. John Brennan, ARL is acknowledged for his interactions and support.

[1]This work is supported in part by ARL Grant W911NF-12-2-0053 and DTRA Grant HDTRA1-12-1-0004.

Sunil Dwivedi
Georgia Institute of Technology

Date submitted: 29 Jan 2015 Electronic form version 1.4