

Abstract Submitted
for the SHOCK17 Meeting of
The American Physical Society

Multiscale Deformation behavior of polymer bonded explosives subjected to intermediate velocity impact¹ SURAJ RAVINDRAN, PETER MALCHOW, ADDIS TESSEMA, ADDIS KIDANE, University of South Carolina — We present a multiscale experimental investigation of polymer bonded sugar (PBS), a mechanical simulant of PBX, subjected to impact loading. The experiments are conducted by shooting a projectile onto the PBS specimen at an impact velocity of 56m/s using modified split Hopkinson bar apparatus. Images at two different scales are captured for macroscale (continuum) and mesoscale (local) deformation measurement during the loading at a rate of 2 million frames/second. The local deformation measurement is conducted using a newly developed high speed-high spatial resolution image based diagnostic technique. Based on the macroscale full-field information, the compaction wave velocity and the compaction wave thickness are calculated. Further the stress in front and behind the compaction front is calculated. It is observed that the compaction wave width is not constant, instead, increases as it propagates towards the other end. The change in compaction width could be due to energy dissipation during deformation. The meso-scale measurement provided insight into what might have happened during wave propagation. Deformation such as grain fracture, plastic deformation, and relative sliding of crystal have been observed and could have contributed to the energy dissipation.

¹The financial support of Air Force Office of Scientific Research (AFOSR) under Grant No. FA9550-14-1-0209 is gratefully acknowledged

Suraj Ravindran
University of South Carolina

Date submitted: 24 Feb 2017

Electronic form version 1.4