Abstract Submitted
for the SHOCK13 Meeting of
The American Physical Society

Measurement of Strength at High Pressures Using Oblique Shock Waves VICTORIA STOLYAR, GURUSWAMI RAVICHANDRAN, California Institute of Technology, SCOTT ALEXANDER, Sandia National Laboratories — At high pressures and high strain rates, the measurement of strength is important to many implications including planetary impact and inertial confinement fusion. Understanding how strength depends on pressure allows for the characterization of materials and validation of constitutive models. Slotted barrel guns have traditionally been used in experiments, such as the pressure-shear plate impact technique, to generate longitudinal and shear waves through an oblique impact. A new methodology for measuring material strength using normal impact (1-2km/s) is described. In this configuration, a composite target is designed with an angled material of interest embedded into a driver material. This driver material is used to generate an oblique shock wave that is followed by a shear wave, due to the angled nature of the target material. Using shock polar analysis, the rear surface of the target is designed to be parallel to the transmitted shock wave in order to mitigate wave interactions at the rear surface. A window is used on the rear surface of the target to measure the in-situ particle velocities at the target-window interface. Using three VISAR measurements, the tangential and longitudinal particle velocities at the rear surface of the target are found from which the shear stress (strength) is inferred as a function of pressure. Results are presented for 6061-T6 Aluminum as well as Tantalum. Hydrocode simulations are used to predict the experimental results as well as characterize the wave interactions in the oblique wedge experiments.

Victoria Stolyar
None

Date submitted: 21 Feb 2013 Electronic form version 1.4