Abstract Submitted
for the SHOCK05 Meeting of
The American Physical Society

High Strain Rate Response of an Elastomer[1] TONG JIAO, RODNEY J. CLIFTON, Brown University — Pressure-shear plate impact experiments are used to study the nonlinear dynamic response of an elastomer at shearing rates of 10^5 - 10^6 s^{-1}. Samples with thicknesses in the range $100\mu m$ - $400\mu m$ are cast between two hard steel plates. Because of the comparatively low impedance of the elastomer, longitudinal waves reverberating through the thickness of the sample – and recorded with a laser interferometer – can be used to determine the isentrope of the material under uniaxial strain compression. Once the sample is fully compressed the shear wave arrives and imposes a simple shearing deformation. From the transverse velocity, measured interferometrically at the rear surface of the sandwich target, the shear stress and the transverse velocity at the rear surface of the sample are determined. These measurements provide an indication of the shearing resistance of the material under pressure. When the longitudinal unloading wave arrives from the rear surface of the target, these same measurements provide an indication of the shearing resistance of the material at zero pressure. Because the sample adheres to the bounding plates the reflection of unloading waves from both the rear surface of the flyer and the rear surface of the target allows the sample to be strained in uniaxial extension. Thus, from a single experiment, one obtains the response of the elastomer in uniaxial strain compression, simple shear and uniaxial strain extension.

[1]Supported by ONR at Brown University

Tong Jiao
Brown University

Date submitted: 21 Jan 2005 Electronic form version 1.4