

Abstract Submitted
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Measurement of the Response of an Elastomer at Pressures Up to 9GPa and Strain Rates of $10^5 - 10^6 s^{-1}$ TONG JIAO, RODNEY CLIFTON, Brown University — Pressure-shear plate impact (PSPI) experiments have been conducted to study the mechanical response of an elastomer at high pressures and high strain rates. The previously determined isentrope has been extended to 9 GPa. At this pressure, the high-strain-rate shearing resistance of polyurea is approximately 500MPa- comparable to, or greater than, that of high strength steels and at much lower weight. It was also found that polyurea exhibits remarkable “recoil” during unloading from these high pressures. A new symmetric pressure-shear plate impact (SPSPI) configuration has been developed in order to enable the direct measurement of the thickness-averaged nominal strain rates of the sample - as well as the tractions on both of its interfaces with linear elastic plates. This enhancement is made possible by using a symmetric configuration for which the velocity of the mid-plane of the sample is known from symmetry to be one-half of the impact velocity. One-dimensional elastic wave theory is used to obtain tractions and particle velocities at the sample/anvil interface from the measured rear-surface velocities. In this way, nominal strain-rate histories are obtained for both longitudinal and shear strains.

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