

replacing SHOCK17-2017-000115.; Moved to poster by APS
Abstract Submitted
for the SHOCK17 Meeting of
The American Physical Society

Experimental Investigation of the Shearing Resistance of Soda-Lime Glass at Pressures up to 9 GPa and Strain Rate of $10^6 s^{-1}$ ¹
TONG JIAO, Brown University, CHRISTIAN KETTENBEIL, GURUSWAMI RAVICHANDRAN, California Institute of Technology, RODNEY CLIFTON, Brown University, DIVISION OF ENGINEERING AND APPLIED SCIENCE, CALIFORNIA INSTITUTE OF TECHNOLOGY TEAM, SCHOOL OF ENGINEERING, BROWN UNIVERSITY TEAM — Pressure-Shear Plate Impact (PSPI) experiments were conducted to measure the high-rate shearing resistance of soda-lime glass at pressures up to 9 GPa and at shearing rates of approximately $10^6 s^{-1}$. Samples of soda lime glass, 5 μm thick, were sandwiched between pure tungsten carbide (WC) plates and impacted by pure WC flyers. Normal stress and shearing resistance of the sample were calculated from measured free surface velocities using 1D elastic wave theory. The experimental results show that, at a pressure of 9 GPa, the shear stress increases almost linearly up to 1 GPa and then falls quickly to approximately 0.3 GPa — after which it decreases slowly to approximately 0.17GPa. Comparisons with results of previous experiments on nominally identical samples, impacted to generate lower peak pressures, showed the peak shearing resistance to be proportionately higher at the higher pressures; however, the sharp fall in shearing resistance occurs at comparable shear strains (1.5-2). These pilot experiments are part of a larger collaborative effort to investigate shearing resistance and phase transformations in soda-lime glass at much higher pressures, say greater than 50 GPa.

¹This work is supported by Office of Naval Research

Tong Jiao
Brown University

Date submitted: 02 Mar 2017

Electronic form version 1.4