Abstract Submitted
for the SHOCK07 Meeting of
The American Physical Society

Failure and Penetration Response of Borosilicate Glass During Short-Rod Impact CHARLES E. ANDERSON, JR., Southwest Research Institute, DENNIS L. ORPHAL, International Research Associates, Inc., THILO BEHNER, VOLKER HOHLER, MATTHIAS WICKERT, Ernst-Mach-Institut, DOUGLAS W. TERMPLETON, RDECOM-TARDEC — The failure characterization of brittle materials like glass is of fundamental importance in describing the penetration resistance against impact of projectiles. A critical question is whether this failure front remains "steady" after the driving stress is removed. That is, does failure propagate similar to a wave propagating without a driving force, or is it failure kinetics-based with a slow down or a halt after the stress is removed? A test series with short gold rods (D = 1 mm, L/D 5 - 11) impacting borosilicate glass (D = 21mm, L = 60 mm) was carried out to investigate this fundamental question. For the experiments the reverse ballistic method was used and the impact and penetration process was observed simultaneously with five flash X-rays and a 16-picture high-speed optical camera. Very high measurement accuracy was established to ensure reliable results. Impact velocities from 1 km/s to 2 km/s were investigated. Results show that the failure front induced by rod impact and penetration does arrest (come to a standstill) after the rod is totally eroded inside the glass.

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Date submitted: 08 Mar 2007 Electronic form version 1.4