Failure Wave in DEDF and Soda-Lime Glass During Rod Impact
DENNIS ORPHAL, International Research Assoc., THILO BEHNER, VOLKER HOHLER, Ernst-Mach-Insitut, CHARLES ANDERSON, Southwest Research Institute, DOUGLAS TEMPLETON, US Army TARDEC — Investigations of glass by planar, and classical and symmetric Taylor impact experiments reveal that failure wave velocity $U_F$ depends on impact velocity, geometry, and the type of glass. $U_F$ typically increases with impact velocity to between $\sim 1.4\ C_S$ and $C_L$ (shear and longitudinal wave velocities, respectively). This paper reports the results of direct high-speed photographic measurements of the failure wave for gold rod impact from 1.2 and 2.0 km/s on DEDF glass ($C_S = 2.0, C_L = 3.5$ km/s). The average rod penetration velocity, $u$, was measured using flash X-rays. Gold rods eliminated penetrator strength effects. $U_F$ for gold rod impact on DEDF is $\sim 1.0-1.2$ km/s, which is considerably less than $C_S$. The increase of $u$ with impact velocity is greater than that of $U_F$. These results are confirmed by soda-lime glass impact on a gold rod at an impact velocity of 1300 m/s. Similar results are found in “edge-on-impact” tests; $U_F$ values of 1.4 km/s and 2.4-2.6 km/s in soda-lime glass are reported for W-alloy rod impact, considerably less than $C_S$ (3.2 km/s) [1,2]. [1] Bless, et. al.(1990) AIP Proc. Shock Comp. Cond. Matter—1989, pp. 939-942 (1990) [2] E. L. Zilberbrand, et. al. (1999) Int. J. Impact Engng., 23, 995-1001 (1999).