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Compressive fracture of brittle materials under divergent impact loading A.S. SAVINYKH, Institute of Problems of Chemical Physics of Russian Academy of Sciences, G.I. KANEL, Institute for High Energy Densities of Russian Academy of Sciences, S.V. RAZORENOV, Institute of Problems of Chemical Physics of Russian Academy of Sciences, A. RAJENDRAN, U.S. Army Research Office, ZHEN CHEN, University of Missouri-Columbia — Since the stress/strain states in impact and penetration problems are multiaxial, measurements from conventional planar shock wave experiments offer limited utilization and validation for these problems. This paper reports results from a novel shock-wave experiment in which divergent loading is generated in alumina and boron carbide ceramic plates through the use of an explosively driven convex copper flyer plate. The free surface particle velocity a 2.6 mm thick copper witness plate was measured using a VISAR. The experimental measurements clearly revealed, in addition to the longitudinal waves, the presence of shear waves. The results of measurements outlined the range of stressed states which are below the failure criterion. The experimental results were analyzed through one dimensional computer simulations. Compressive fracture was modeled by employing a simplistic damage model in the simulations of spherical shock wave propagation. The calculated wave profiles showed distinct signatures of the compressive fractures.

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