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Effect of Crystalline Anisotropy on Shock Propagation in Sapphire. W.J. NELLIS, Harvard U., G.I. KANEL, S.V. RAZORENOV, A.S. SAVINYKH, Russian Academy of Sciences, A.M. RAJENDRAN, U.S. Army Research Office — The major impediment to measuring reshock temperatures is opacity induced in anvil/windows by shock. We report measured shock profiles of c-, d-, and r-cut single crystals and comparison of these mechanical responses with optical snapshots measured by Hare et al. Profiles were measured at three peak stresses and two sample thicknesses. Particle velocity histories were recorded for sapphire/LiF interfaces. VISAR waveforms are noisy as a result of heterogeneous inelastic deformation and noise depends on crystal orientation and stress amplitude. Heterogeneity is least for r-cut and most for c-cut, which correlates with observed optical heterogeneity. At 2.4 mm thickness r-cut has a three-wave structure that might indicate several elastic-wave speeds off an axis of symmetry. The small signal of the third wave might also indicate a phase transition in the small volume of the sample at higher temperatures. The Hugoniot elastic limit of c-sapphire scatters from shot to shot; scatter in the HEL of r- and d-cut are smaller. Radial pre-stressing of c-sapphire resulted in some increase of the rise time of the second wave; no significant effect of pre-stressing was observed for d- and r- samples.

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