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Effect of Crystalline Anisotropy on Shock Propagation in Sapphire G.I. KANEL, Joint Institute for High Temperatures, Moscow, Russia, W.J. NELLIS, Department of Physics, Harvard University, Cambridge, MA 02138, A.S. SAVINYKH, S.V. RAZORENOV, Institute of Problems of Chemical Physics, Chernogolovka, Russia, A.M. RAJENDRAN, U.S. Army Research Office, RTP, NC 27709-2211 — The shock-wave response of sapphire of seven orientations (c, d , r, n, s, g, m) which correspond to the angles between the load direction and the c-axis varying from 0 to 90 degrees was investigated with the goal to find optimal conditions of its use as a window material. In the experiments at shock stresses in a range from 16 GPa up to 85 GPa the VISAR particle velocity histories were recorded using LiF windows. In most cases measured waveforms are noisy as a result of heterogeneity of deformation. The measured HEL values depend on peak shock stress and direction of shock compression. Highest HEL values reaching 24 GPa have been recorded at shock loading along c-axis and perpendicularly to it (c- and m-directions) whereas shock compression along the s-direction is accompanied with smallest heterogeneity of the deformation and smallest rise time in plastic shock wave. Results of experiments with varying transversal stresses admit to conclude that inelastic deformation of sapphire begins in ductile mode and leads to fracture and fragmentation as a result of interaction of shear bands or twins.

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