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Response of magnesium single crystals to shock-wave loading at normal and elevated temperatures G. GARKUSHIN, Institute of Problems of Chemical Physics of RAS, Chernogolovka, 142432 Russia, G. KANEL, Joint Institute for High Temperatures of RAS, Moscow, 125412 Russia, A. SAVINYKH, S. RAZORENOV, Institute of Problems of Chemical Physics of RAS, Chernogolovka, 142432 Russia, D. JONES, W. PROUD, Institute of Shock Physics, Imperial College London, London, SW7 2AZ, United Kingdom — Magnesium single crystals, 0.2 mm to 3 mm thick, were shock loaded along the two axes, a, c and the direction at 45 degrees to the c-axis. At the room temperature the response is very similar to that observed by Pope and Johnson for beryllium single crystals (1974). Shock compression along the c-axis causes inelastic deformation by means of pyramidal slip and twinning and is associated with the largest HEL. The easiest basal slip was activated by shock loading along the inclined, off-axis direction and is associated with smallest HEL value. For all orientations, we observed elastic precursor decay and growth of the HEL values with increasing temperature. However, for the c-orientation the growth is caused by decrease of elastic constants and not with an increase of resolved shear stress along the pyramidal slip planes. In the other orientations the resolved shear stresses in slip planes at the HEL increased with temperature. At inclined shock compression we found two plastic shock waves for which the stress behind the first depends on the peak stress associated with the second plastic wave. The crystals demonstrate the largest spall strength at shock loading along the a-axis and smallest one at shock loading in off-axis direction.

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