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Shock Compression of Molybdenum Single Crystals to High Stresses TOMOYUKI ONIYAMA, Division of Engineering and Applied Science, California Institute of Technology, YOGENDRA GUPTA, Institute for Shock Physics, Washington State University, GURUSWAMI RAVICHANDRAN, Division of Engineering and Applied Science, California Institute of Technology — To investigate the effect of crystal anisotropy and to elucidate the role of slip systems in BCC crystals, Molybdenum(Mo) single crystals were subjected to shock compression along [100], [111] and [110] directions to various impact stresses up to 190 GPa. The set of impact stresses in this work covers the stress range that is significantly higher than previously studied (12.5GPa). Particle velocity histories and the shock wave velocities were measured using laser interferometry. Along [100] and [111] directions, a two-wave structure, an elastic wave followed by a plastic wave, was observed up to 110 GPa impact stress. Along [110] direction, the two-wave structure was observed only up to 90 GPa impact stress. For all three directions, the elastic amplitude exhibited dependence on the impact stress. The dependence on impact stress was comparable along [100] and [110] directions, and larger along [111] direction. In contrast, at higher impact stresses, only overdriven waves were measured for all orientations. In addition to the experiments, molecular dynamics simulations were carried out to gain insight into the deformation mechanisms. The results of the 90GPa impact simulation revealed the activation of slip systems. This work was supported by DOE/NNSA.

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