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Rate-Independent Material Model to Describe the Shock and Ramp Wave Loading Response of 6061-T6 Aluminum to 22 GPa J.M. WINEY, W. MAMUN, Y.M. GUPTA, Wash. State Univ. — A rate-independent phenomenological material model has been developed to describe the response of 6061-T6 aluminum for shock loading to 22 GPa and ramp wave loading to 4 GPa. To describe the mean stress response of the material, existing isothermal pressure-volume data from hydrostatic compression experiments were utilized. The elastic shear response was modeled by assuming that Poisson's ratio is constant. Material strength was described using a von Mises yield surface, together with nonlinear strain-hardening. Simulations using this material model were performed to compare with experimental wave profile data for shock and ramp wave loading. Our simulations show better agreement with the experimental results compared to previous materials models. In particular, experimental features such as the speed of the plastic wave, the ramping behavior between the elastic and plastic waves, and the speed of the release wave from the shocked state are described well by our model. Work supported by DOE.

Michael Winey
Washington State University

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