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Simulating the dynamic response of magnesium alloys JEFFREY LLOYD, RICHARD BECKER, US Army Research Laboratory — Unlike several conventional metals, the mechanical response of magnesium is severely anisotropic for quasistatic and dynamic loading conditions. In this work we present a crystal-based strength model that is the same order of magnitude in computational cost as rate-dependent isotropic strength models, yet is able to capture essential features exhibited by textured magnesium polycrystals. The model demarcates plastic deformation into contributions from basal slip, extension twinning, and non-basal slip mechanisms. Comparisons are made between model predictions and experiments for two magnesium alloys with differing processing histories. The model is then used to explore and quantify the dependence of metallurgical and processing variations for several dynamic experiments that probe propensity for localization and failure under complex loading conditions.

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