Abstract Submitted
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Anisotropic shock response of single-crystalline β-phase tin ROBERT SCHARFF, Nevada National Security Site, New Mexico Operations, Los Alamos, New Mexico 87544, GERALD STEVENS, BRANDON LA LONE, WILLIAM TURLEY, Nevada National Security Site, Special Technologies Laboratory, Santa Barbara, California 93111, SARYU FENSIN, DARBY LUSCHER, Los Alamos National Laboratory, Los Alamos, New Mexico 87545 — Mesoscale simulations of the dynamic response of polycrystalline metals to shockwave compression can provide unique insight in to the nature of the various physical mechanisms responsible for material failure. This approach requires a constitutive description for individual grains and boundaries, including defects such as dislocations, within an explicit representation of the microstructure geometry and evolving deformation fields. Computational models of the single-crystal constituents cannot be unambiguously constrained by traditional measurements of the shock or stress-strain response of polycrystalline metals. Instead, these models require comprehensive measurements of the anisotropic shock response of single crystals for their calibration and validation. We present a coordinated experimental and simulation campaign on the shock response of single-crystalline β-phase tin demonstrating a remarkable anisotropic elastic-plastic response of the metal. This anisotropy will be explained with the help of molecular dynamics simulations that show preferred twinning in one orientation.

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