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Calibration and validation of the PTW dynamic strength model for Cu using novel feedthrough hydrodynamic instability experiments[1]
SUDRISHTI GAUTAM, SAUL OPIE, ELIZABETH FORTIN, JENNA LYNCH, Arizona State University, ERIC LOOMIS, Los Alamos National Laboratory, PEDRO PERALTA, Arizona State University — Hydrodynamic instabilities, e.g., the Rayleigh-Taylor can be used to deduce dynamic material strength at very high pressures and strain rates. The Ritchmyer-Meshkov Instability (RMI) can also be used, since it allows using precise diagnostics such as Transient Imaging Displacement Interferometry due to its slower linear growth rate. Experiments at Los Alamos National Laboratory used RMI to measure strength in polycrystalline copper with a novel approach, whereby the shock is applied directly on the perturbed surface using laser ablation and producing a perturbed shock that propagates through the sample thickness. The Preston-Tonks-Wallace (PTW) model, which is a proven material strength model at very high pressures and strain rates is used along with numerical simulations, to study the effects of initial amplitude and wavelength of the perturbations, dynamic strength of material, stability of the shock front, dynamic evolution of the amplitudes, and velocities of the perturbation imprinted on the back surface by the perturbed shock front. Simulation results obtained from using the PTW models were then compared and validated with experimental results for copper samples tested at pressures $\geq$ 8 GPa.

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