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Damage Quantification and Simulation of Flyer Plate Spallation and Round Notched Tensile Experiments

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(1) *MST-08: Structure-Property Relationships, G755*
(2) *X-7: Materials Modelling, F699*
(3) *T-3: Fluid Mechanics, B216*
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Dynamic and quasi-static failure and dynamic incipient failure tensile experiments were performed on a half-hard 10100 Cu material using several different specimen geometries, including uniaxial stress and several notches, as well as uniaxial strain flyer plate experiments designed to achieve incipient failure. The dynamic tensile tests were performed on a momentum trapped tensile split Hopkinson pressure bar. Damage quantification of the incipient failure specimens was performed and statistically reduced for comparison with continuum damage model predictions from explicit simulations of the experiments. The damage model contains both a nucleation and void growth components. The experimental data provides a wide parameter space of stress triaxiality, ranging from near 1/3 to about 5, with equivalent plasticity ranging from a couple of percent up to near 100 percent. This information is used to develop and calibrate a nucleation damage model component that results in simulation predictions that closely match a wide variety of diagnostic and post-mortem measurements of these experiments.

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