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Using High Energy Diffraction Microscopy to Assess a Model for Microstructural Sensitivity in Spall Response[1] NATHAN BARTON, JOEL BERNIER, MOON RHEE, SHIU FAI LI, MUKUL KUMAR, Lawrence Livermore National Laboratory, JOHN BINGERT, Los Alamos National Laboratory, JONATHAN LIND, Carnegie Mellon University — We present results from a model validation effort that employs detailed non-destructive three-dimensional microstructure data obtained from High Energy Diffraction Microscopy (HEDM) experiments. By focusing validation efforts on models that connect directly to experimentally measurable features of the microstructure, we can then build confidence in use of the models for components prepared under different processing routes, with different impurity distributions, or subjected to different loading conditions. The computational model makes use of a crystal mechanics based constitutive model that includes porosity evolution. The formulation includes nucleation behavior that is fully integrated into a robust numerical procedure, enhancing capabilities for modeling small length scales at which nucleation site potency and volume fraction are more variable. Three-dimensional experimental data are available both pre-shot and post-shot from the same volume of impact-loaded copper. Crystal lattice orientation and porosity data are obtained, respectively, from near-field HEDM and tomography techniques. Starting from the as-measured initial microstructure, simulation results will be compared to post-shot experimental results as a function of modeling assumptions.

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