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Influence of Shock Prestraining and Grain Size on the Dynamic Tensile Extrusion Response of Copper: Experiments, Modeling and Simulation[1] GEORGE GRAY III, Los Alamos National Laboratory, PAUL MAUDLIN, MICHAEL BURKETT, ELLEN CERRETA, CLARRISA YABLINSKY, BENJAMIN HENRIE, CARL TRUJILLO, MIKE LOPEZ, LOS ALAMOS NATIONAL LABORATORY COLLABORATION — The mechanical behavior and damage evolution response of high-purity Cu are influenced by strain rate, temperature, stress state, grain size, and shock prestraining. The effects of grain size on the mechanical response of high-purity Cu have been probed and are correlated with the substructural evolution during deformation. The dynamic extrusion response of shock prestrained Cu demonstrates the significant influence of grain size on the large-strain dynamic tensile ductility of high-purity copper. Eulerian hydrocode simulations utilizing the Mechanical Threshold Stress flow stress model were performed to provide insight into the dynamic extrusion process. Quantitative comparisons-between the predicted and measured deformation topologies and extrusion rate will be presented. Predictions of the texture evolution (based upon the deformation rate history and the rigid body rotations experienced by the Cu during the extrusion process) are compared with texture measurements.

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