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VALIDATION OF A NEW ALUMINUM HONEYCOMB CRUSH MODEL WITH DYNAMIC IMPACT TESTS*

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ABSTRACT

A new constitutive model for large deformation of aluminum honeycomb, called the Honeycomb Crush Model (HCM) has been developed. This model has 6 yield surfaces that are coupled to account for the orthotropic behavior of the cellular honeycomb being crushed on-axis and off-axis. The HCM has been implemented in the transient dynamic Presto finite element code for dynamic impact simulations. HCM constitutive parameters were identified based on Presto finite element models that were used to simulate uniaxial and biaxial crush tests of 38 lb/ft^3 aluminum honeycomb and reported in an earlier paper. This paper focuses on validating the HCM in the Presto code for application to impact situations that have honeycomb crush velocities up to 85 ft/sec. Rate sensitivity of the model compared to uniaxial test data will be given. A two-stage energy absorber with integrated aluminum honeycomb was used in dynamic impact validation experiments. The test and finite element model will be described along with the uncertainty quantification that was done and propagated through the model. Finally, correlation of model predictions and test results will be presented using an energy based validation metric.

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