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**Material failure modelling in metals at high strain rates** VILI PANOV, Cranfield University, CISM Group, RADE VIGNJEVIC, NEIL BOURNE — Plate impact tests have been conducted on the OFHC Cu using single-stage gas gun. Using stress gauges, which were supported with PMMA blocks on the back of the target plates, stress-time histories have been recorded. After testing, micro structural observations of the softly recovered OFHC Cu spalled specimen were carried out and evolution of damage has been examined. To account for the physical mechanisms of failure, the concept that thermal activation in material separation during fracture processes has been adopted as basic mechanism for this material failure model development. With this basic assumption, the proposed model is compatible with the Mechanical Threshold Stress model and therefore in this development it was incorporated into the MTS material model in DYNA3D. In order to analyse proposed criterion a series of FE simulations have been performed for OFHC Cu. The numerical analysis results clearly demonstrate the ability of the model to predict the spall process and experimentally observed tensile damage and failure. It is possible to simulate high strain rate deformation processes and dynamic failure in tension for wide range of temperature. The proposed cumulative criterion, introduced in the DYNA3D code, is able to reproduce the "pull-back" stresses of the free surface caused by creation of the internal spalling, and enables one to analyse numerically the spalling over a wide range of impact velocities.

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