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Ductile damage evolution assessment in high purity copper and stainless steel subjected to different shock-loading profiles using cohesive modeling ANDREW RUGGIERO, NICOLA BONORA, LUCA ESPOSITO, University of Cassino, GEORGE T. (RUSTY) GRAY III, Los Alamos National Laboratory — At continuum level, the triaxiality of the stress state has the major effect to reduce the ductility that the material can exhibit. As a result of this, ductile metals under uniaxial strain loading condition, such as that experienced in flyer plate impact experiment, should show a very limited ductility that is often in contrast with the energy dissipation estimated from the pull-back signal amplitude. In this paper, it is proposed that the developing of damage in form of voids causes a dramatic drop of the stress triaxiality giving the material the ability to sustain much larger deformation and consequent plastic work dissipation. Thus, a numerical model using cohesive elements has been developed to account for this dissipation in the energy balance. The model has been used to investigate the damage evolution and plastic strain accumulation in plate impact experiments with different loading profiles, for both high purity copper and stainless steel, in order to achieve a better comprehension of the processes related to spall fracture. Comparisons of numerical results with experimental data, available in term of both velocity profiles and optical metallography of soft-recovered samples, seem to confirm the capability of the proposed model to correctly capture distinctive features of spall event.

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