

Abstract Submitted  
for the SHOCK09 Meeting of  
The American Physical Society

**Damage development in high purity copper under varying dynamic conditions and microstructural states using Continuum Damage Mechanics** NICOLA BONORA, ANDREW RUGGIERO, LUCA ESPOSITO, University of Cassino — The evolution of ductile damage processes in pure metals is strongly dependent on the material microstructure and purity level. Although damage modeling at the continuum scale (CDM) is very attractive, the role of microstructural features, such as grain size, grain boundary type, orientation, purity, etc., is usually not taken into account explicitly in the formulations. A possible simple extension of CDM model formulations can be done through the identification of the dependency of the damage model parameters from these microstructural features. In this work, the correlation of two typical damage parameters, common to several CDM formulations, that are the damage threshold strain,  $\varepsilon_{th}$ , at which the ductile damage processes are initiated, and the theoretical uniaxial strain at failure,  $\varepsilon_f$ , with material grain size and purity level, has been investigated. Annealed and half hardened pure copper with different grain sizes and different purity grades have been investigated. Successively, these information have been used to predict damage development under different dynamic loadings and stress triaxiality testing conditions such as Hopkinson pressure bar experiment on both smooth and round notched samples, Taylor and Flyer Plate impact tests and to extrapolate the response of different material metallurgical states.

Andrew Ruggiero  
University of Cassino

Date submitted: 20 Feb 2009

Electronic form version 1.4