

Abstract Submitted  
for the SHOCK11 Meeting of  
The American Physical Society

**Modeling high strain rate viscoplastic deformations combined with phase changes** GILLES ROY, CEA Valduc, France, FRANK MONTHEILLET, EMSE (SMS Center), CNRS UMR 5146, Saint Etienne, France, CEA VALDUC - EMSE COLLABORATION — Metallic materials submitted to high strain rates upon dynamic loading can undergo phase changes induced by strains, stresses, and/or temperature increase associated with self-heating. Various mechanical and metallurgical assumptions have been proposed and implemented in numerical codes to deal with such complex interactions. In order to assess their respective influences, a simple nearly analytical model was developed and applied to the classical sphere expansion test carried out on a two-phase strain hardening, strain rate and temperature sensitive material. In this paper, classical homogenization assumptions are compared for deriving the overall material flow stress. Strain hardening transfer upon phase transformation is accounted for. Finally, the respective weights of the various contributions to the work rate, associated with stored energy, self-heating, and phase change, are analyzed.

Gilles Roy  
CEA Valduc

Date submitted: 18 Feb 2011

Electronic form version 1.4