Abstract Submitted
for the SHOCK17 Meeting of
The American Physical Society

Shock temperature determination for metals satisfying Rice-Walsh equation of state KUNIHITO NAGAYAMA, Retired — It is shown that the Rice-Walsh equation of state (EOS) can be used to describe shock compression of metals with the dimensionless material parameter R introduced by Wu and Jing as a function of pressure alone. In this paper, two independent procedures of estimating shock temperature were proposed, which are; (i) the generalised function of specific heat at constant pressure as a function of $T/\Theta(p)$ is first derived from the measured temperature dependence of C_p and it can be used to calculate shock temperature together with $R(p)$ function. Where $\Theta(p)$ is a function of $R(p)$. Alternative method is, (ii) residual volume isentropically released from shocked state is first calculated, and the residual temperature corresponding to this volume is calculated using temperature dependence of thermal expansion coefficient at zero-pressure. Shock temperature can then be calculated by the isentropic relationship to residual temperature. Estimated shock temperature by using two methods are compared. The results are also compared with the Grüneisen EOS with $\rho\gamma = const$ plus Debye model. It is shown that the Grüneisen EOS calculation was found to have apparent incompatibility with thermodynamic data at zero-pressure.

Kunihito Nagayama
Retired

Date submitted: 12 Feb 2017 Electronic form version 1.4