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Rice-Walsh equation of state for metals based on the shock Hugoniot data for porous samples KUNIHITO NAGAYAMA, Retired — The dimensionless material parameter R introduced by Wu and Jing into the Rice-Walsh equation of state (EOS) has been deduced from the published shock Hugoniot data for porous samples of ten metals. It was found that the parameter R/p decays smoothly with shock pressure p and displays small experimental scatter in the high pressure region. The parameter has only a weak temperature dependence and is well approximated by a function of pressure alone, and the Grüneisen parameter should be temperature dependent under compression. The thermodynamic formulation of the Rice-Walsh EOS for these metals was realized using the empirically determined function $R(p)$ and their known shock Hugoniot. It was then possible to reproduce porous shock Hugoniot for these metals, and agreement between the porous data and the calculated Hgoniots using the empirical function described was very good for most degrees of porosity. The Grüneisen parameters along full-density and porous Hugoniot curve were calculated using a thermodynamic identity connecting R and the Grüneisen parameter. Extended Rice-Walsh EOS was also formulated to explain anomalous Hugoniots with extremely high porosities.

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