

Thermodynamic properties of nickel in a wide range of specific volumes and specific internal energies under shock compression of solid and porous samples

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Some equation-of-state models used to describe the thermodynamic properties of a material in the region of high energy densities are considered in this work. These models differ in the form of the dependence of the Grüneisen coefficient on the specific volume and specific internal energy. Within the framework of these models, equations of state were constructed for the transition metal nickel, and calculations of thermodynamic characteristics were carried out in a wide range of changes in volumes and internal energies (for a unit mass of the substance), which is accessible for study in shock-wave experiments. Based upon a comparison of the results of calculations of shock adiabats for nickel samples of different initial densities with the available experimental data, the boundaries of the applicability region of each model are established. The constructed equations of state for nickel can be used to solve problems of hydrodynamic modeling of processes in this metal under high dynamic pressures. This work is financially supported by the Russian Science Foundation (grant No. 25-19-00944, <https://rscf.ru/project/25-19-00944/>).