EQUATIONS OF STATE OF ALLOYS BASED ON REFRACTORY METALS AT HIGH PRESSURES AND TEMPERATURES OF SHOCK COMPRESSION

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Interest in studying the states of matter under the influence of powerful shock waves arises in various problems of plasma physics at high energy concentrations [1]. To numerically simulate the phenomena that arise in this case, it is necessary to know the equation of state of the substance under consideration [2].

In this paper, equations of state for alloys of refractory metals over a wide range of pressures and temperatures are presented. The equation-of-state model for alloys is specified in the form of sums of specific volumes and internal energies, which are determined by the equations of state of the components:

$$V_{1N}(P,T) = \sum_{i=1}^{N} \alpha_i V_i(P,T), \quad E_{1N}(P,T) = \sum_{i=1}^{N} \alpha_i E_i(P,T),$$

where V_{1N} and E_{1N} are the specific volume and specific internal energy of the alloy; V_i, E_i and α_i are the specific volume, specific internal energy and mass fraction of the i-th component; N is the number of components.

Based on the presented model, calculations of the shock compressibility of various alloys containing zirconium, hafnium and other refractory metals were carried out. The results of these calculations are presented in comparison with the available data from shock wave experiments at high pressures and temperatures [3]. The results of estimating the plasma non-ideality parameter in the states under consideration are also presented.

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