SIMPLE EQUATIONS OF STATE FOR METALS NEAR THE LIQUID–VAPOR PHASE TRANSITION

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In the present work, the equations of state of the liquid phase of refractory metals (tungsten, molybdenum) are obtained on the basis of three simple thermodynamic models. The first considered model is based on the van der Waals equation. The second model leads to the equation of state obtained by considering the model problem of charged hard spheres from [1]. The third model defines the equation of state for a system of interacting point centers [2]. To obtain the parameters of the equations of state, experimental data on the isobaric expansion of metals in the liquid phase were used. These parameters varied over a wide range, and for each set, the pressure isobar corresponding to the experimental conditions was calculated. After that, for each set of parameters, the average square of the deviation from the experimental data was calculated. As the optimal set of parameters, the one that corresponded to the smallest value of this squared deviation was chosen. The shock adiabats for metal samples with different initial densities and expansion isentropes of shock-compressed samples (initially porous) were calculated using the obtained equations of state. The results of these calculations are presented in comparison with the available data of shock-wave experiments. The study was supported by a grant from the Russian Science Foundation (No. 19-19-00713, https://rscf.ru/project/19-19-00713/).

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