Multiphase Equations of State for Metals Over Wide Range of Temperatures and Pressures

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A theoretical description of the thermodynamic properties of matter in a broad region of the phase diagram is of fundamental as well as practical interest. Numerical simulations of hydrodynamic processes in condensed media under high-energy influences require equations of state for structural materials over a wide range of thermodynamic parameters from normal conditions to extremely high values of temperatures and pressures. Proper inclusion of phase transitions is important from the standpoint of modelling of those processes. In this work, a new semiempirical equation-of-state model, which takes into account polymorphic transformation, melting, evaporation, and ionisation effects, is proposed. Multiphase equations of state for some metals (beryllium, magnesium, titanium, iron, and tin) are constructed on the basis of model developed. Calculation results are compared with available experimental data at high temperatures and pressures. The most essential static and dynamic thermophysical experiments are described.