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Two-Phase Equation of State for Cerium and Specificity of its Dynamic Compression VYACHESLAV ELKIN, EVGENII KOZLOV, ELENA KAKSHINA, Y. MOREVA, RFNC-VNIITF — The unusual thermodynamic properties of cerium result from specificities in the narrow 4f-zone whose electrons are subdivided into localized and delocalized subsystems. In this paper the model of pseudo-binary solid solutions allowing for two different electronic states is applied to construct the thermodynamically complete two-phase equation of state for cerium. The free energy of phases is written as a sum of the terms describing potential curve, lattice vibrations, and the contribution from thermally excited electrons. The parameters of the model were fitted to describe the thermodynamic data obtained in the static experiments with high-purity cerium. This equation of state was used to analyze wave structures realizing under dynamic compression with the regard for the equilibrium phase (γ–α)–transition. The Hugoniot in the (P,T)-plane shows that due to temperature jump on the line of the (γ–α)–transition the Hugoniot does not cross the complicated area of metastable $\alpha\prime$–, $\alpha\prime\prime$–, and ε – phases. This allows assumption that possible (α–ε)–transitions of cerium in the shock wave won't be concealed by the lower–temperature (α–$\alpha\prime$)– and ($\alpha\prime$–$\alpha\prime\prime$)–transtions.

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