

Equation of state for europium in a wide range of variation of specific volume and internal energy

Khishchenko K.V.^{1,®}

¹ Joint Institute for High Temperatures of the Russian Academy of Sciences, Izhorskaya 13 Bldg 2, Moscow, 125412, Russia

® konst@ihed.ras.ru

Equations of state for different substances are required for numerical simulations of hydrodynamic processes in various media interacting with high-density energy flows. The thermodynamic parameters of the achieved states of matter can vary in a wide region. The equation of state primarily determines the correspondence of the simulation results to existing theoretical concepts and available experimental data on the behavior of the medium under the conditions in question. In particular, europium is used in nuclear power as a neutron absorber. The equation of state of this material is necessary when designing nuclear equipment components operating under conditions of intense mechanical and thermal loads.

In this work, the equation of state for dense europium plasma is constructed based on a function that expresses the relationship between entropy, specific volume, and internal energy. Within the framework of this model, calculations of the thermodynamic characteristics of europium plasma at high pressures and densities were carried out. The proposed equation of state is in good agreement with the available data from shock-wave experiments and can be effectively used in numerical simulations of processes of intense pulsed action upon matter.

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