Equations of state for mixtures of cesium iodide, cesium bromide and water at high energy densities in strong shock waves

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The theoretical understanding of processes occurring in matter under high energy concentrations is of basic interest, since conducting experimental research in this region can be difficult. In numerical simulations of the dynamics of such processes, equations of state for substances are used to close the system of equations of motion.
In this work, the thermodynamic properties of plasmas of mixtures CsI–H_2O and CsBr–H_2O at high pressures and high temperatures in shock waves are investigated theoretically. Equations of state for H_2O, CsI and CsBr are constructed using a model based on the Helmholtz free energy as a function of specific volume and temperature. Thermal and mechanical equilibrium in the mixture components is supposed. Within the framework of this approach, the thermodynamic parameters of the mixtures are calculated for given mass fractions and equations of state for the components. Using the developed equations of state, shock adiabats were calculated for H_2O, CsI, and CsBr, and their mixtures at high energy densities in shock waves. The results of these calculations are in good agreement with available shock-wave data. The proposed equations of state can be used in numerical simulations of various physical processes at high energy densities.
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