Equation-of-state model for rocks as mixtures of minerals at high pressures and temperatures

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In this paper, a model of the equation of state for a multicomponent system as a mixture of individual substances over a wide range of pressures and temperatures is presented. The model assumes that the thermodynamic equilibrium is achieved in the mixture—equality of pressures and temperatures of the components [1]. Knowing the equations of state for the components and their mass fractions, the equation of state for the mixture is determined. This model is used to calculate the thermodynamic properties of minerals and rocks. For example, such rocks as forsterite (Mg_2SiO_4) and enstatite ($MgSiO_3$) are presented within the model as mixtures of silicon dioxide (SiO_2) and magnesium oxide (MgO) with corresponding mass fractions of the components. The equations of state for the components (in particular, SiO_2 and MgO) of the studied mixtures are presented. The shock adiabats for the components and mixtures are calculated using the proposed equations of state. The results of these calculations are compared with available experimental data on shock compression at high pressures and temperatures.

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