Equations of state of liquid phases of sodium and potassium at high pressures and temperatures

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Sodium, potassium and their mixtures are of interest because they can be used as liquid metal coolants for nuclear power plants. In this regard, it is necessary to know their properties in the entire region of liquid states, including near the evaporation region. This work discusses the thermodynamic properties of liquid phases of sodium and potassium at high pressures and temperatures. Simple equations of state with a small number of parameters are constructed for these metals near the region of the liquid–vapor phase transition. Based on the obtained equations of state, the boundaries of the evaporation region of pure metals and their mixtures are calculated. The dependence of the speed of sound on temperature at atmospheric pressure and the thermodynamic parameters characterizing the shock compression of the liquid phases of sodium and potassium are also considered. Based on a comparison of the calculation results with experimental data, the applicability regions of the developed equations of state are established. The results obtained can be used for numerical modeling of physical processes at high pressures and temperatures.