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Van-der-Waals equation of state, second virial coefficient, interaction potential and the minimum condition of free energy

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Abstract

The modified Van-der-Waals equation of state is obtained using the minimum condition of the free energy. It is shown that the Van-der-Waals equation of state can describe the properties of substance near line where the factor of compressibility is equal two number one. It is shown that the parameter of the Van-der-Waals equation of state that is usually considered as parameter of attractive forces can actually include the part of repulsive forces. The integral equations for the interaction potential are obtained using condition of minimum of free energy that is a function of one of two related with each other parameters of the Van-der-Waals equation of state. One- and two-temperature expansions with coefficients that are defined via interaction potential are theoretically obtained for the second virial coefficient.