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Towards the influence of compaction on the compressibility of a model bi-component mixture

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There are well-defined indications, following from experimental studies of compressibility (adiabatic compressibility is measured using sound speed measurements, and then isothermal compressibility is restored), to the existence of a dependence of the compressibility of simple bi-component mixtures not only on the molar fractions of the components [1]. It can be assumed that this parameter may be the compaction (packaging) parameter [2].
In this way, this work examines the question of the influence of the packing parameter on the compressibility of a model two-component mixture. For this purpose, it is proposed to use extensions of the model equations of state (for example, the van der Waals equation is chosen) for the case of a two-component mixture together with an equation for compressibility, following from the Carnahan-Starling-Mansoori theory [3], which operates precisely with the compactization factor.
Analytical expressions have been obtained to express the compressibility of a binary mixture through the molar fractions of the components and the compaction of the entire bi-component system. Using the obtained analytical expressions, three-dimensional phase diagrams have been constructed in the axes compressibility, the molar fraction of one of the components, and the compaction of the mixture, allowing one to track the joint influence of these parameters on the equation of state model bi-component system.
As a result of studying the obtained phase diagrams, it was established that the influence of internal parameters (molar composition, compaction) is carried out jointly and consistently (multi-parameter). Mole composition and compaction, for model systems (such as the hard ball model) are among the carefully controlled parameters and thus, the proposed model for describing compressibility is suitable for use to parameterize the results of empirical studies of the dependence of the compressibility of simple binary mixtures (liquid, or granular) to the theoretical description of which the concept of hard spheres is applicable.

REFERENCES

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