9-3.O

THE EQUATION OF STATE IN THE SUPERCRITICAL REGION AND THE WIDOM LINE OF A FLUID MODEL

O.A. Dobush, M.P. Kozlovskii, I.V. Pylyuk
Institute for Condensed Matter Physics, National Academy of Sciences of Ukraine
Lviv, Ukraine

We propose the analytic method for the derivation of the state equation of a fluid model [1] in the region above the critical temperature ($T>T_c$), which is elaborated using the renormalization group transformation in the collective variables set in the framework of the grand canonical ensemble. The constituents of the system interact via the Morse potential. Mathematical description with allowance for non-Gaussian fluctuations of the order parameter is performed in the vicinity of the critical point on the basis of the quartic measure density (the ρ^4-model). The recurrence relations between the coefficients of effective non-Gaussian measures of density, the solutions of these relations and the equation for a phase transition temperature are derived. The total expression of the thermodynamic potential in case of temperatures $T>T_c$ is obtained as a compilation of terms derived for each fluctuation regime. The equation of state with fluctuational effects taken into account is derived for the cases of $T>T_c$ and $T=T_c$. The proposed method of calculation of the grand partition function allows deriving the critical temperature, the critical indexes of the correlation length, the isothermal compressibility. This method also enables deducing the expression for plotting the Widom line [2] directly from the equation of state.

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9-4.O

LANDAU-GINSBURG KINETICS OF GRANULAR FLUID COMPACTION

Oleg I. Gerasymov[1]*, Andrii Ya. Spivak[1]
[1]*Odesa State Environmental University, L'vivs'ka Str.15, Odesa, 65016, Ukraine*
* Corresponding author e-mail: gerasymovoleg@gmail.com

Granular fluid is a subject of intensive studies in the soft matter physics [1]. Structurization in form of formation of specific domains which has an individual symmetries are known either from experiments [2] or from theoretical modeling [3-7]. It has been shown that granular fluids can be characterized by non-trivial differential equation of state which in general takes a form of Abelian equation [3].
In the present paper Landau-Ginsburg formalism has been applied to study the kinetics of structural transformation in externally perturbed granular fluids. The relevant relaxation law for selected order parameter was investigated in the close vicinity of crystallic ordered phase (which is observed experimentally [2]). It is shown that of these mechanical process has a characters of first-order phase transitions.
Landau-Ginsburg kinetic equation describing the relaxation of compaction to the asymptotic quasistationary state has been formulated. We obtain analytical solutions, which describe relaxation of the relevant order parameter field in a sequential piecewise set of intervals of the values of packing parameter. The obtained results agreed with the data of measurements concerned the compaction in granular materials subjected to external perturbation field.

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