

ASYMMETRIC COMPLEX PLASMA PRESSURE AND ISOTHERMAL COMPRESSIBILITY IN THE FRAMEWORK OF THE POISSON–BOLTZMANN PLUS HOLE APPROXIMATION

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We consider an equilibrium two-component complex plasma of finite-size macroions with charges Z and point oppositely charged microions with unit charges. The considered plasma is asymmetric ($Z \gg 1$). System pressure is calculated within the framework of the Poisson–Boltzmann plus hole approximation by obtaining the Coulomb non-ideal parts of interaction energy and Helmholtz free energy. It is shown that both the pressure and plasma isothermal compressibility are positive over the entire range of macroion concentrations [1]. The obtained pressure and isothermal compressibility are similar to the those obtained in the Wigner–Seitz cell in the framework of the Poisson–Boltzmann approximation [2]. Also, we demonstrated a significant difference in pressure and isothermal compressibility with the same quantities calculated with the use of the equations of state [3, 4] in the linearized Debye approximation.

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