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ASYMMETRIC COMPLEX PLASMAS PRESSURE IN THE FRAMEWORK OF THE AVERAGE WIGNER-SEITZ CELL APPROXIMATION WITH REGARD TO NONLINEAR SCREENING EFFECT *)

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The authors consider a two-component equilibrium electroneutral system of classical macroions of finite sizes with charges $Z >> 1$ and point oppositely charged microions with unit charges. We take into account a macroions nonlinear screening effect and obtain system pressure in two ways in the Wigner–Seitz average spherical cell model within the framework of the Poisson–Boltzmann approximation [1]. The first way is general. According to it, pressure is obtained by calculating the non-ideal part of the all particles interaction energy and the non-ideal part of the Helmholtz free energy. The second way can be applied to systems considered in the Wigner-Seitz average spherical cell approximation. The work presents analytical dependences that approximate the obtained curves for pressure depending on the macroions concentration, the macroion charge Z and system temperature [1]. It is shown that the obtained pressure and isothermal compressibility are positive over the entire range of macroion concentrations [1] in comparison with [2,3] where the nonlinear screening effect in not taken into account.

References

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