

Mesoscopic Theory for Highly Charged Colloids in Pure Water

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A mesoscopic theory for the primitive model of ionic systems is developed for arbitrary size and charge ratios between the two kinds of ions. Our theory is an extension of the theory we developed earlier for the restricted primitive model. The case of extreme asymmetries is studied in some detail in a mean-field approximation. We find a coexistence between a very dilute 'gas' phase and a crystalline phase in which the macroions form a bcc structure with the lattice constant ~ 3.6 times the particle diameter. Such coexistence was observed experimentally in deionized aqueous solutions of highly charged colloidal particles.