

Erratum

Interaction between charged colloids in a low dielectric constant solvent

E. ALLAHYAROV^{1,2}, E. ZACCARELLI³, F. SCIORTINO³, P. TARTAGLIA⁴ and H. LÖWEN¹

¹ *Institut für Theoretische Physik, Heinrich-Heine-Universität Düsseldorf - D-40225 Düsseldorf, Germany*

² *Institute for High Temperatures, Russian Academy of Sciences - Izhorskaya 13/19, 117419 Moscow, Russia*

³ *Dipartimento di Fisica and CNR-INFM-SOFT, Università di Roma La Sapienza - P.le A. Moro 2, I-00185 Roma, Italy*

⁴ *Dipartimento di Fisica and CNR-INFM-SMC, Università di Roma La Sapienza - P.le A. Moro 2, I-00185 Roma, Italy*

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Due to insufficient sampling during the molecular dynamics computer simulations, the results at low salt concentration are erroneous. Therefore, we repeated our simulations for considerably higher salt concentration and smaller macroion diameter and charge. The new set of system parameters is: microion diameter $\sigma_c = 10 \text{ \AA}$, macroion diameter $\sigma = 20\sigma_c$, system size $L = 200\sigma_c$, system temperature $T = 300 \text{ K}$, dielectric constant of the solvent $\epsilon = 8$ (which implies a Bjerrum length $\lambda_B = 6.97\sigma_c$), macroion charge $Z = -5e$, the salt ions and counterions are monovalent. The salt concentration is varied from $n_s = 1.03 \times 10^{-4} \text{ mol/l}$ to $n_s = 1.3 \times 10^{-2} \text{ mol/l}$.

As a consequence, figs. 2, 3 and 5 are not correct and we present here their amended version as figs. 1, 2 and 3, respectively.

The concentration of ion pairs n_p , given in fig. 2 as a function of the bulk salt concentration n_s , is now corrected in fig. 1. The number of ion pairs is defined by the number of oppositely charged pairs which are closer than $3\sigma_c$. The relative fraction n_p/n_s increases with increasing salt concentration.

The total number density of ions around one single macroion, given in fig. 3 as a function of their distance to the macroion, is now corrected in fig. 2. The range of salt depletion is comparable with the mean distance $n_s^{-1/3}$ between ions in the electrolyte confirming the depletion picture of Bjerrum pairs. The attraction between two macroions induced by a depletion of Bjerrum pairs (fig. 5) is valid as shown by the corrected data in fig. 3.

In conclusion, the mechanism of effective attraction due to a depletion of Bjerrum pairs which was proposed in the paper, stays stable for low dielectric constant solvents albeit in a different parameter region as listed above.

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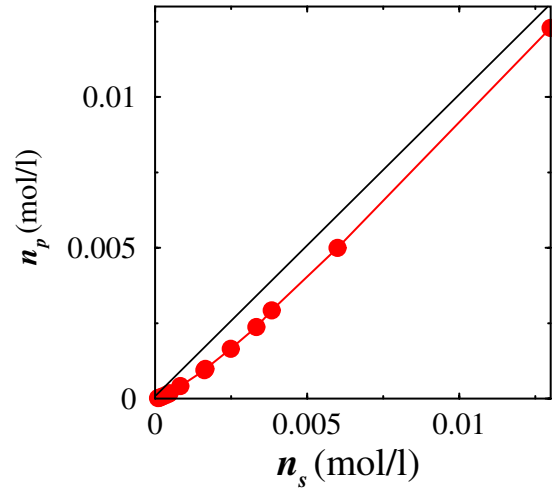


Fig. 1: Concentration of associated ion pairs n_p against the bulk salt concentration n_s .

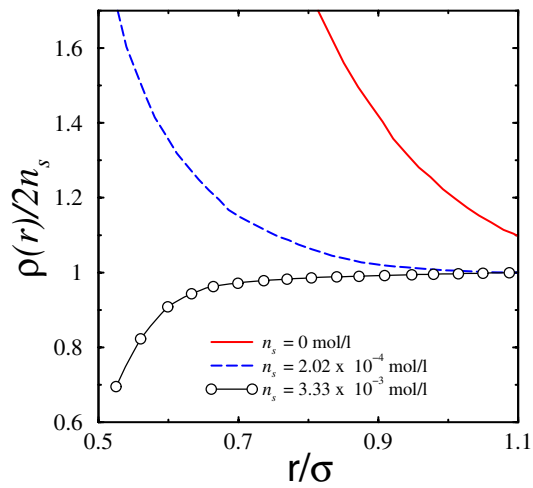


Fig. 2: Total ion number density around the macroion for different added salt concentration. The data are scaled on the bulk total number density $2n_s$. Note that at higher salt densities there is a depletion zone close to the macroion surface.

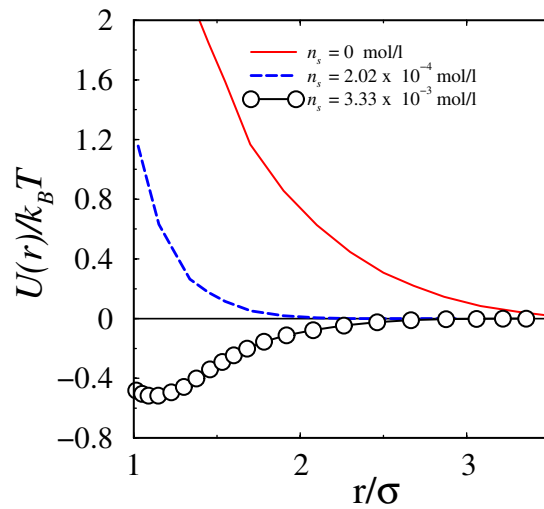


Fig. 3: Distance-resolved effective macroion-macroion interaction potential for different salt concentrations.