The interaction between like-charged colloids mediated by multivalent, stiff polyelectrolytes

K. Bohinc[1], L. Lue[2]

[1]Faculty of Health Sciences, University of Ljubljana, Slovenia

[2]Department of Chemical and Process Engineering, University of Strathclyde, UK

Interactions between charged objects in aqueous solutions are of fundamental importance in many technological and biological systems. These interactions can be altered by the presence of multivalent ions that possess a spatially distributed internal charge. In this presentation, we examine the influence of stiff, multivalent polymers on the interaction between charged surfaces [1-4]. Mean field theory is not able to describe these systems when the surfaces are highly charged. We extend and employ a self-consistent field theory that is accurate from the weak to the intermediate through to the strong coupling regimes [3]. The results show that close to the charged surface, the counterions are oriented parallel to the surface, whereas at distances greater than half of the ion length, they are randomly oriented. Due to the restriction of the orientations of the rod-like counterions at the surfaces, the ion density at the charged surface decreases to zero. We also calculate pressure between the surfaces [1]. For large surface charge densities, the interaction between like charged surfaces becomes attractive due to charge correlations, while the interaction is repulsive at low surface charge densities. Zwitterionic counterion systems are also examined. For large surface charge densities, the force between like charged surfaces becomes attractive, as a result of charge correlations. The theoretical results are found to agree well with Monte Carlo simulation results.

[l] K. Bohinc, J.M.A. Grime, Soft Matt. **8 (20)**, 5679 (2012).
[2] K. Bohinc, J. Rescic, Soft Matt. **12(19)**, 4397 (2016).
[3] K. Bohinc, L. Lue, Mod. Phys. Lett. **29(32)**, 1550202-1 (2015).
[4] J.M. Grime, M.O. Khan, K. Bohinc, Langmuir, **26(9)** 6343 (2010).