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Tuesday, 28<sup>th</sup> January 2020, 16:00 s.t.

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Yellow Tower „B“, 5<sup>th</sup> floor, SEM.R. DB gelb 05 B



### Direct Force Measurements in Aqueous and Non-Aqueous Solutions

In recent years, measurements of interactions between solid surfaces across liquids brought interesting new fundamental results, which gave insight in microscopic structure of highly concentrated ionic systems. Furthermore, these kind of forces are also important in many industrial applications. In order to better understand mechanisms of such interactions we measure the forces between negatively charged particles with the colloidal probe technique, which is based on atomic force microscope (AFM). In my talk I will present our recent work, where we explore the influence of like-charged polyelectrolytes on double-layer forces, see Fig. 1a [1,2]. At higher concentrations of polyelectrolytes and larger distances, oscillatory structural forces are observed. While at smaller separation distances the non-exponential electrostatic forces appear. In the second part of my talk I will focus on interactions between silica particles in alcohol solutions (Fig. 1b). In pure alcohol the interactions between silica surfaces is repulsive due to overlap of the double-layers. At high salt concentrations the interactions are attractive and the van der Waals force is dominant. Interestingly, the range of double-layer interactions in alcohols is longer as one would expect from the Debye lengths calculated from the nominal salt concentrations. This mismatch is due to pronounced ion-pairing in alcohol solutions. In the presence of multivalent ions the charge neutralization and charge reversal of silica are observed. Charge reversal in alcohols is much stronger and shifted to lower concentrations as compared to the aqueous systems.

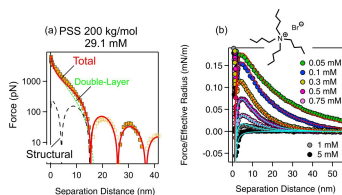


Figure: (a) Forces between silica spheres in an aqueous solution of sodium polystyrene sulfonate (NaPSS). (b) Forces between silica spheres in isopropanol in the presence of tetrabutylammonium bromide.

[1] Moazzami Gudarzi, M.; Kremer T.; Valmacco, V.; Maroni, P.; Borkovec, M. & Trefalt, G. Interplay between Depletion and Double-Layer Forces Acting between Charged Particles in Solutions of Like-Charged Polyelectrolytes. *Phys. Rev. Lett.* 117, 088001 (2016).

[2] Moazzami Gudarzi, M.; Maroni, P.; Borkovec, M. & Trefalt, G. Depletion and double layer forces acting between charged particles in solutions of like-charged polyelectrolytes and monovalent salts. *Soft Matter* 19, 3284-3295 (2017)

All interested colleagues are welcome to this seminar lecture (45 min. presentation followed by discussion).

Friedrich Aumayr  
(LVA-Leiter)

Markus Valtiner  
(Seminar Chair)