

Optical tweezers to study the interaction between polymer-brushes

Friedrich Kremer

Institute of Experimental Physics I, Leipzig University,

Linnéstrasse 5, 04103, Leipzig, Germany

Abstract

Optical Tweezers are ideal tools to measure the interaction forces between polyelectrolyte-grafted colloids with an extraordinary resolution of ± 0.5 pN and nanometer positioning accuracy [1-3]. Experiments are presented on i) Forces between blank surfaces as measured by the colloidal probe technique and by optical tweezers-a comparison [4], ii) Forces of interaction within single pairs of poly(acrylic acid) (PAA) grafted colloids [5] and iii) The interaction forces within single pairs of poly(2-vinylpyridine) (P2VP) grafted colloids [3,5]. Parameters to be varied are the concentration and valency of the counterions of the surrounding medium as well as its pH. The forces of interaction between blank surfaces are well described by the Derjaguin-Landau-Verwey-Overbeek (DLVO) theory. The PAA- and P2VP-grafted colloids data are quantitatively described by a recently published model of Jusufi [6] for spherical polyelectrolyte brushes which takes into account the entropic effect of the counterions. The transition from the osmotic to the salted brush regime is observed in PAA- and P2VP-grafted colloids. At low salt content the brush thickness is nearly independent on the salt concentration while at high salt concentration the slope of the brush thickness versus concentration is $\sim 1/3$, in good agreement with scaling laws.

References

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