Surface force measurements between titania surfaces prepared by Atomic Layer Deposition in aqueous electrolyte and CTAB solutions

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The investigation of surface forces between titania surfaces is of fundamental interest as, like silica, the surface potential is determined by acidic hydroxyl groups, but titania has a much higher iep and significantly larger dispersion forces. As such the balance between hydration forces and van der Waals attraction should differ considerably between silica and titania. However it is challenging to find Titania surfaces that are sufficiently smooth for force studies. Using Atomic Layer Deposition (ALD), we have produced suitably smooth titania surfaces (RMS roughness 0.4 nm) by coating silica colloids and silicon wafers. Examining the surface forces under a range of salt and pH conditions has allowed us to examine the measured short and long-range forces in the context of DLVO theory and hydration forces.

We have examined the adsorption of CTAB to titania using optical reflectometry and observed slow adsorption below the cmc as previously seen on silica. We will also report on the measured surface forces between titania surfaces in CTAB solutions.

AFM Image of Si wafer coated with titania using ALD

FESEM image of a silica colloid (20µm diameter) coated with titania using ALD