Effect of Local Curvature on the Interaction Between Hydrophobic and Superhydrophobic Surfaces

Summary

Detailed understanding of the effect of local curvature on the extent of surface interaction forces in hydrophilic, hydrophobic and superhydrophobic systems is required to improve the design of a variety of adsorbents, including those used for pitch and stickies control in paper making. By preparing surfaces with controlled structure, roughness and chemical heterogeneities and measuring interactions between the surfaces and colloidal probes, valuable information about the interaction of particles with e.g. hydrophobic species in the paper industry, is obtained.

Background

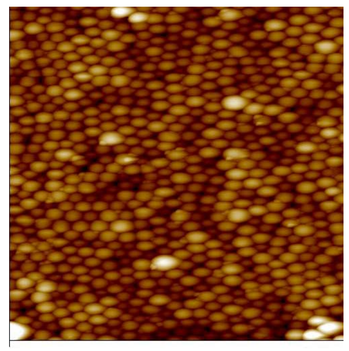
Long-range attractive forces, considerably stronger than the van der Waals force, dominate the interaction between hydrophobic surfaces in water. This is thought to be due to cavitation or bridging bubbles on the surface. Not only the hydrophobicity, but also surface roughness and chemical heterogeneities, are of vital importance for the range and magnitude of the interaction.

Main Techniques

Atomic force microscopy (AFM) - Imaging + Force measurements with colloidal probe
Langmuir-Blodgett (LB) - Film deposition

Results

Structured, particulated monolayer films were created by LB deposition of 200 (figure), 800 and 4000 nm silica particles modified with a cationic surfactant and studied by AFMImaging and Scanning electron microscopy (SEM). Films with smaller particle sizes contained large aggregates formed before spreading of the particles in the LB trough, as shown by particle size and zeta potential measurements.



On-going experiments use the AFM colloidal probe technique to probe the interaction between a micro-size hydrophobic particle and the hydrophobized particulated LB films, in order to investigate how the forces are influenced by the surface roughness.

Financing and collaboration

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