Directing the Self-Assembly of Nanoparticles

Alexander Böker

DWI an der RWTH Aachen e.V., Lehrstuhl für Makromolekulare Materialien und Oberflächen, RWTH Aachen University, Germany

boeker@dwi.rwth-aachen.de

This talk deals with the use of different interfaces as templates for the self-assembly of various colloidal particles. First, we describe classical oil/water emulsion systems, the so-called Pickering Emulsions.[1] Here, the controlled nanoparticle assembly can lead to permeable, yet robust membranes and capsules. Furthermore, fluid interfaces as found in block copolymer nanostructures can be employed.[2] Here, the nanoparticles impart specific functions to the nanostructures, such as magnetism or charge transport as required in magnetic data storage media or polymer-based photovoltaic devices, respectively.

Moreover, we demonstrate that wrinkled polydimethylsiloxane substrates, with wavelengths on the order of only a few hundred nanometers, guide the assembly of rod-like tobacco mosaic virus (TMV) nanoparticles.[3] Wrinkled substrates with pre-aligned TMV are used as "inked" stamps to transfer the virus onto flat substrates, yielding a large array of well-aligned virus-stripes. Their distance can be controlled by the wavelength of the stamp.[4]

References

[1] A. Böker, J. He, T. Emrick, T.P. Russell "Self-assembly of Nanoparticles at Interfaces" *Soft Matter* **2007**, *3*, 1231.

[2] Y. Lin, A. Böker, J. He, K. Sill, H. Xiang, C. Abetz, X. Li, J. Wang, T. Emrick, S. Long, Q. Wang, A. Balazs, T.P. Russell "Self-directed Self-assembly of Nanoparticles/Copolymer Mixtures" *Nature* **2005**, *434*, 55.

[3] A. Horn, H. G. Schoberth, S. Hiltl, A. Chiche, Q. Wang, A. Schweikart, A. Fery, A. Böker "Nanostructured Wrinkled Surfaces for Templating Bionanoparticles - Controlling and Quantifying the Degree of Order" *Faraday Discussions*, **2009**, *143*, 143.

[4] A. Horn, S. Hiltl, A. Fery, A. Böker "Ordering and Printing Virus Arrays: A Straightforward Way to Functionalize Surface" *Small*, **2010**, *6*, 2122.