CPP 33 Novel materials I

Zeit: Mittwoch 09:45–11:00 Raum: TU C230

CPP 33.1 Mi 09:45 TU C230

Direct measurements of mechanical properties of Pickering emulsions by AFM — •Philippe Carl[1], Alexander Boker[2], Qian Wang[2], Yao Ling[2], Thomas P. Russell[2], Jhonny Rodrigues[3], Bernie Binks[3], Helmuth Moehwald[1], and Andreas Fery[1] — [1]MPI fur Kolloid und Grenzflachenforschung, Am Muhlenberg, D 14424 Potsdam (Germany) — [2]Department of Polymer Science & Engineering, University of Massachusetts, Amherst, MA 01003 (USA) — [3]Surfactant & Colloid Group, Department of Chemistry, University of Hull, Hull. HU6 7RX. (U.K.)

Emulsions stabilized by self-assembly of particles at the fluid interfaces, driven by the reduction in interfacial energy, also called Pickering emulsions attracted much attention in the last years. These systems are interesting since they allow size-selective particle assembly, two-dimensional phase behavior, as well as functionalization, abling the fabrication of nanoscopic materials with unique optical, magnetic, and electronic properties. Moreover, the particles stabilizing the emulsion drops can also be locked together to form some elastic shells, which can be used as solid capsules with tailored size, permeability, mechanical strength, and compatibility perfectly aimed for encapsulation or drug delivery. But while the self assembly of this particles, the interaction between the particles and the interfaces and the size of the drops are well characterized, little is known so far on the mechanical properties of these emulsion drops. We report first results using colloidal probes and standard AFM techniques to directly measure the forces necessary to deform such drops and thus evaluate the influence of these parameters.

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Different phases of electroluminescent Alq_3: triplet and quartet states studied by EPR — •A. Mirea[1], M. N. Grecu[2], M. Cölle[3], J. Gmeiner[1], and M. Schwoerer[1] — [1]Experimentalphysik II, Universität Bayreuth, D-95440 Bayreuth — [2]National Institute for Materials Physics, R-76900 Bucharest, Romania — [3]Philips Research, NL-5656 AA Eindhoven, The Netherlands

The metal chelate complex tris-(8-hydroxyquinoline)aluminium (Alq_3), which is one of the most frequently used low-molecular weight material for organic light-emitting devices (OLED's), was studied by means of EPR. Different crystalline phases, obtained by drain sublimation (320–380°C), were identified. We confirmed the conversion from one phase into the other by different thermal treatment cycles: sublimation, annealing (380–390°C), annealing and fast quenching (77 K) and melting (419°C), and melting and fast quenching. X-band EPR spectra of the sublimated powders show two types of signals centered at g = 2.00 and g = 4.33 whose intensities are dependent on the phase structure and exhibit different temperature dependencies. The Q-band spectrum of annealed Alq_3 consist of overlapping of randomly oriented triplet and quartets. Depending on the thermal cycle their appearence could be separated. Their simulation and analysis based on a spin Hamiltonian appropriate to a high spin system (S = 1, S = 3/2) indicates the existence of triplet and quartet states in annealed Alq_3. The D and E zero-field parameters are evaluated. The temperature dependence of the line intensity shows an antiferomagnetic like behaviour (T_N = 90 K). Around 50 K a reversible phase transition takes place and the line intensity increases rapidly.

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Polymer Controlled Mineralization — •Ingo Lieberwirth, Laurent Herschke, Rafael Munoz-Espi, and Gerhard Wegner — Max-Planck Institute for Polymer Research, Ackermannweg 10, 55028 Mainz, Germany

Due to their specific sizedependent optical and electrical properties and their large surface anorganic particles such as metallcolloids, -oxides and -phosphates are of special interest. These powders normally have a non-uniform morphology, a broad grain size distribution and may even consist of several phases. Suitable polymeric additives can control their properties by meshing with the nucleation process and the subsequent crystal growth, comparable to processes in biomineralization.

In order to examine the complex mechanisms of polymer controlled crystallization from aqueous solution zincite (ZnO) and hopeite ($Zn_3(PO_4)_2$) have been selected as model systems. Amphipolar diblockcopolymers (DBCP) and functionalized latices were used as admixtures to control the crystallization process.

Crystallization of zincite from aqueous medium without any additional polymer results in elongated hexagonal prismatic crystals, having a broad grain size distribution covering a range from 1 to 5 μm. Addition of PEO-b-PMAA during the crystallization results in a marked decrease in crystal size as well as in a narrowed grain size distribution (0.4 to 1.4 μm). The same effect is observed when replacing the DBCP by the latices. Moreover, it is found that latices are incorporated into the crystal building a "swiss cheese" morphology without destroying the single-crystalline character of the zincite crystallites.

CPP 33.4 Mi 10:30 TU C230

Flat freestanding polyelectrolyte films: Fabrication, and applications — •Marc Nolte, Björn Schöler, Claire Peyratout, Dirk Kurth und Andreas Fery — MPI-Kolloid und Grenzflächenforschung, 14424 Potsdam

Ultrathin, semi-permeable membranes are often found in natural systems (membranes of cells or organelles) and they are interesting for applications (separation, filtering). Within artificial membrane systems, polyelectrolyte multilayer membranes can be produced with well defined membrane thickness down to the nm regime and are known to be permeable for low molecular weight molecules while they are impermeable for high molecular weight species. Therefore they are interesting new materials for nanoscale separation membranes. However they are usually solid supported, which limits their use as separation membranes. We present here a novel procedure that allows for producing freestanding membrane patches of polyelectrolyte multilayer membranes with thicknesses down to 50 nm without film rupture or folding, which is commonly observed for other systems. As a result, we can use these membranes for separating arrays of micron sized (this means pico-litre volume) compartments from bulk solution, in which large molecular weight molecules are entrapped. These molecules react to changes of the properties of the external media, because the PE membrane is semipermeable. It is also possible to access single compartments. These both offer the possibility to use those systems for combinatorial chemistry and sensing.

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Structure and properties characterization of novel Hybrid organic-inorganic nanomaterials based on modified titanium oxo-clusters — •Sondes trabelsi[1], Rüdiger Hässler[1], Sergio Bocchini[2], Guilia Fornasieri[3], Andreas Janke[1], Nikolaos. E Zafeiropoulos[1], Jocelyne Galy[2], Laurence rozes[3], Manfred Stamm[1], Jean. Francois Gerard[2], and Clément Sanchez[3] — [1]Department of Nanostructured Materials, Leibniz-Institut für Polymerforschung Dresden e.V, — [2]LMM, INSA de Lyon, 20 Avenue A. Einstein, 69621 Villeurbanne Cedex, France — [3]LCMC, UMR 7574, Université Pierre et Marie Curie, 4 Place Jussieu, 75252 Paris Cedex, France

Novel hybrid materials have been prepared via free radical polymerization of dimethacrylate/HEMA (50/50) in the presence of 2.5, 5 and 7.5 wt of organically modified titanium-oxo-clusters. SAXS, TEM and AFM Investigations, lead to consistent structural characteristics for the hybrid materials, with aggregate size distributions between 5 and 160 nm, depending also upon the Ti content. DMTA analysis of the hybrids revealed the presence of an optimum for the Ti content, which leads to an increase in the elastic moduli in the glassy state. On the other hand, in the rubbery state, the storage moduli and the Tg were found to increase with increasing of the Ti cluster content. TGA revealed an increase in the thermal stability of the hybrids compared to the matrix. UV- Vis spectra showed that the Ti clusters modified the optical properties of the matrix.