[1] D. Kowerko, J. Schuster, Ch. von Borczyskowski: Molecular Physics submitted

CPP 28.13 Wed 17:00 P3

Application of in-situ ellipsometry for the investigation of stimuli-responsive polymer brushes and adsorption processes thereon — •Eva Bittrich[1], Dennis Aulich[2], Klaus - Jochen Eichhorn[1], Karsten Hinrichs[2], Petra Uhlmann[1], and Manfred Stamm[1] — [1]Leibniz Institute of Polymer Research Dresden, Hohe Str. 6, 01069 Dresden, Germany — [2]ISAS - Institute for Analytical Sciences, Department Berlin, Albert-Einstein-Str. 9, 12489 Berlin, Germany

Thin polymer brushes, with the polymer chains grafted chemically by one end to the surface, have thoroughly proven their ability to modify physico-chemical interface properties as well as the adsorption behaviour of proteins at artificial surfaces. With the help of in-situ spectroscopic ellipsometry these thin polymer films can be investigated according to their swelling behaviour and adsorption processes at the polymer-solution interface.

We report on swelling measurements of homopolymer and mixed polymer brushes consisting of pH- and temperature sensitive polymer chains. Furthermore we investigated the adsorption of human serum albumin, a protein of the blood plasma, onto charged polymer brushes. Here we monitored the influence of changes in the environmental conditions and the composition of the polymer brush on the adsorbed amount as well as the optical properties of the protein layer.

CPP 28.14 Wed 17:00 P3

Collective behavior during dewetting — •Cristina-Maria Pop[1], Ana Maria Florescu[2], Yves Bréchet[3], and Zoltán Néda[4] — [1]Arnold Sommerfeld Center and CeNS, Ludwig-Maximilians-Universität München, Germany — [2]LSP, Université Joseph Fourier, St Martin d'Hères Cedex, France — [3]SiMAP-ENSEEG, Institut National Polytechnique de Grenoble, St Martin d'Hères Cedex, France — [4]Babeş-Bolyai University, Cluj-Napoca, Romania

When a liquid film on a substrate is unstable, dry spots appear and the liquid breaks into droplets: this phenomenon is called dewetting. It can be observed every day on a windshield or in a cooking pan, and the stability of liquid films on solid substrates is crucial for numerous technological applications. In biology, dewetting governs the dynamics of adhesion on wet substrates in the case of mushroom spores or living cells. Dewetting can take place through amplification of capillary waves in thin films, or by spontaneous nucleation and growth in thicker films.

We studied the mechanism of dewetting by introducing a two-dimensional model in which the dynamics of the dewetting hole is given by capillarity (the line tension which tends to shrink the hole, and the difference between the surface energy of the substrate when dry and wet). Dissipation makes the motion overdamped. With the aid of this model we performed numerical simulations which enabled us to find the critical parameters for the growth of a dewetting hole, and to study the collective dynamics of many holes in a dewetting process with spontaneous nucleation. Thus we obtained a size distribution of the liquid droplets on the substrate after dewetting has taken place.

CPP 28.15 Wed 17:00 P3

Effect of geometrical confinement and surface charge on the structuring in colloidal silica suspensions — •Yan Zeng[1], Sabine Klapp[2], and Regine v.Klitzing[1] — [1]Stranski-Laboratorium für Physikalische & Theoretische Chemie, Institut für Chemie, TU Berlin — [2]Institut für Theoretische Physik, Freie Universität Berlin

This work focuses on the effect of geometric confinement on the structuring of colloidal suspensions in thin film geometry. Colloidal silica suspensions with different particle concentration and ionic strength allow a deeper insight into the ion distribution around the particles. Results from colloidal probe atomic force microscopy (CP-AFM) force-distance measurements in films are compared with results from small-angle X-ray scattering (SAXS) in bulk. It is found that the characteristic lengths obtained from force oscillation measured by AFM, correlate well with the intermediate particle distance from the structure peak measured by SAXS, scale with particle concentration with an exponent of -1/3. In order to study the effect of the surface elasticity the bare silicon surfaces are modified by polymer coatings. The effect on the structuring of particles is measured by AFM and compared with our preliminary results from Thin Film Pressure Balance (TFPB).

CPP 28.16 Wed 17:00 P3

Optical microscopy of colloidal polymeric thin films - ordering on large length scales — •Jannis Lehmann[1,2], Gerd Herzog[1,3], Adeline Buffet[1], Peter Müller-Buschbaum[4], Rainer Gehrke[1], and Stephan V. Roth[1] — [1]DESY, Notkestr. 85, D-22607 Hamburg, Germany — [2]Univ. Hamburg, Dep. f. Physik, Jungiusstr. 9, D-20355 Hamburg, Germany — [3]IExpPh, Univ. Hamburg, Luruper Chaussee 149, D-22761 Hamburg, Germany — [4]Physik-Department E13, TU München, D-85748 Garching, Germany

Colloidal films are widely applied in many areas of research and technology, e.g. magnetic data storage or due to their optical properties [1,2,3]. We focused on the long-range order of spin-coated (on top of basic cleaned Si-wafers) colloidal polystyrene spheres (diameter 100nm) by using optical microscopy. We investigated the influence of colloidal concentration, spin-coating parameters and annealing on the structure of the colloidal film. Especially, annealing is performed far below as well as near the glass transition temperature of polystyrene of about 100°C to investigate the influence of mobility on the structure of the film during. We clearly see a regular periodic constitution of colloid-islands, which are homogeneously ordered on the surface. This long-range order extends from some ten micrometers to over several millimeters.

[1] Abul Kashem et al., Macromolecules 40, 5075-5083 (2007)
[2] Siffalovic et al., Phys. Rev. B 76, 195432 (2007)
[3] Roth et al., Appl. Phys. Lett. 91, 091915 (2007)

CPP 28.17 Wed 17:00 P3

AFM based approach to measure adhesion energies of micron sized particles predicated on JKR apparatus — •Johann Erath and Andreas Fery — University Bayreuth, Universitätsstr. 30, 95440 Bayreuth, Germany

Determination of adhesion energies is of interest for both fundamental science and applications. The aim of this contribution is to introduce a novel, AFM based approach for the case of soft surfaces.

Our approach builds up on the so called JKR (Johnson, Kendall and Roberts) apparatus. This device is used for macroscopic measurements and is based on the fact that the contact area of elastomeric lenses is only dependent on adhesion energy as well as elastic properties and load force. Thus, adhesion energy can be determined from measurement of contact area as a function of load.

In our case, the same principle is used for micron sized particles made from PDMS. Me attach the particles to an AFM setup (soft colloidal probe AFM), whereby one can control the load and simultaneously measure the particle-surface contact area using microinterferometry .

We discuss the potential and advantages of this microscopic approach compared to classic JKR apparatus.

CPP 28.18 Wed 17:00 P3

Surface energy patterns generated by single pulse laser interference lithography — •Tobias Geldhauser[1], Stefan Walheim[2], Thomas Schimmel[2,3], Paul Leiderer[1], and Johannes Boneberg[1] — [1]Universität Konstanz, 78457 Konstanz, Deutschland — [2]Institute of Nanotechnology (INT), Forschungszentrum Karlsruhe, 76021 Karlsruhe, Deutschland — [3]Institute of Applied Physics, Center for Functional Nanostructures (CFN), Universität Karlsruhe, 76128 Karlsruhe, Deutschland

Single pulse laser interference lithography is used to structure self-assembled monolayers of thiol on gold by thermal desorption in a rapid and large area (mm2) process. The desired structure can be varied by different angles of incidence and numbers of interfering laser beams. The structuring process is investigated by attenuated total reflection and AFM measurements. For comparison with the experiment 1D and 2D simulations of temporal heat distributions are presented. As a verification of this patterning process and example structures down to 200nm in width generated by demixing of polymers, sol-gel and guided assembly of colloids are shown.

CPP 28.19 Wed 17:00 P3

The bending rigidity of the liquid/vapour interface of water — •Felix Sedlmeier, Dominik Horinek, and Roland R. Netz — Physik Department, Technische Universität München, 85748 Garching, Deutschland

Whenever two liquid phases are in contact, thermally excited fluctuations of the interface position, i.e. capillary waves, occur. At large length scales, they are well described by a constant interfacial tension in the framework of capillary wave theory. On smaller scales, however, deviations from capillary wave theory arise, which lead to an effective