surface tension that is a function of the wave vector of the excitation modes. The coefficient of the quadratic order term of the effective surface tension can be identified with Helfrich's bending rigidity, the sign and magnitude of which has been a long standing issue in theoretical as well as experimental research. Also, simulation studies of simple liquids have not given a conclusive answer yet. One of the main problems in the analysis of capillary waves at liquid interfaces is that at small scales interfacial fluctuations are entangled with bulk-like density fluctuations. For an unambiguous determination of the bending rigidity, these contributions have to be separated. We present results from large scale molecular dynamics simulations that elucidate the effect of this entanglement and give quantitative results for the bending rigidity of the liquid/vapour interface of water.

CPP 28.20 Wed 17:00 P3

Internal structure of PNIPAM microgel particles — •Martin Medebach[1], Anna Burmistrova[1], Matthias Karg[1], Yvonne Hertle[2], Weinan Wang[3], Peter Müller-Buschbaum[3], and Regine v. Klitzing[1] — [1]Technische Universität Berlin — [2]Universität Bayreuth — [3]Technische Universtät München

Thermosensitive microgel particles are of great interest in basic research and also for technical applications. For instance Poly-(N-Isopropylacrylamide), PNIPAM, undergoes a temperature induced phase transition at approx. 32 °C. This transition leads to shrinking by a factor of 10, while the shrinking effect at the solid/liquid interface is only about factor 2 perpendicular to the surface. These findings raise the question how the interactions with the solid surface affect the internal structure of the microgel particles. We report about experiments (GISANS, SANS, AFM and ellipsometry) with charged PNIPAM microgel particles (diameter in bulk between 100 to 1000 nm, depending on the degree of swelling) adsorbed on oppositely charged Silicon wafers. The PNIPAM particles are copolymerized with 5% acrylic acid and they are adsorbed on top of a Silicon wafer that is coated with Polyethyleneimine (PEI). The particles are close packed. From ellipsometry and AFM measurement the swelling is observed normally and laterally (AFM) to the surface. SANS experiments show the correlation length in the bulk system while GISANS measure the correlation length of the absorbed particles in lateral direction. Taken all experiments together we can describe the change of the internal structure during the swelling.

CPP 28.21 Wed 17:00 P3

AFM Studies of photoswitchable nanocomposite films — •M. Müller[1], Y. Gonzalez-Garcia[1], C. Pakula[2], V. Zaporojtchenko[2], F. Faupel[2], and O. Magnussen[1] — [1]Institut für Experimentelle und Angewandte Physik,Leibnizstrasse 19,Universität Kiel — [2]Lehrstuhl für Materialverbunde,Kaiserstrasse 2,Universität Kiel

Photoswitchable conductive nanocomposites of metal nanoparticles and polymers containing photoizomerizable groups may have interesting applications as sensors and photoswitchable filters. We have investigated composite films of Au clusters and PMMA with embedded azobenzene, which can be optical switched between the trans and the cis isomer, resulting in photo-induced changes in the film conductivity. The film morphology and local conductivity have been characterized by a conductive sensing AFM (CS-AFM) with integrated UV/visible optics that allows in situ studies of illumination effects. According to these studies the change in configuration is accompanied by changes in the nanoscale film morphology, such as changes in free volume and a decrease of the surface roughness.

CPP 28.22 Wed 17:00 P3

Block Copolymer Templating using Periodic Chemical Nano-Patterns Induced with the Tip of an Atomic Force Microscope — •Tobias Heiler[1], Regina Weingaertner[2], Vassilios Kapaklis[3], Roland Groeger[2], Stefan Walheim[1] und Thomas Schimmel[1,2] — [1]Institute of Nanotechnology (INT), Forschungszentrum Karlsruhe, Germany — [2]Institute of Applied Physics and DFG-Center for Functional Nanostructures (CFN), Universität Karlsruhe, Germany — [3]present address: Engineering Science Department, University of Patras, 26504 Patras, Greece

The nanoscale phase morphology of an amphiphilic block copolymer film was controlled by a chemical periodic surface energy pattern made by molecular exchange with the tip of an Atomic Force Microscope (AFM). The two polymer components of the copolymer, as well as the two surface molecules of the chemically patterned substrate posses a high contrast in polarity, so that a defect-tolerant pattern replication with a line width of 40 nm in the polymer film is observed after a short (vapor-)annealing process. We used polyethylenoxide-polyisoprene-polyethylenoxide block copolymers and methyl- vs. carboxyl-terminated alkane thiols as self-assembled monolayers.

CPP 28.23 Wed 17:00 P3

Transient waviness of polymer films during spin-coating — •Joerg Pfeifer[1], Stefan Walheim[2], and Thomas Schimmel[1,2] — [1]Institute of Applied Physics and DFG-Center for Functional Nanostructures (CFN), Universität Karlsruhe, Germany — [2]Institute of Nanotechnology (INT), Forschungszentrum Karlsruhe, Germany

The development of roughness (waviness) during spin-coating of polymer films is a well known phenomenon of high technological relevance. We have investigated the transient formation of such waves in film thickness using time-resolved light reflectance measurements during the spin-coating process. Our model system (Polystyrene (PS) in Cyclohexane) develops this instability during the last 200 milliseconds of the drying process. By controlling the process atmosphere containing a defined load of solvent vapour, the formation and recovery of film waviness (wavelength: 20-50 micron) was observed. In this way, we were able to pre-adjust the amplitude of the developing waves from zero to 100 nm in films with an average thickness of 200 nm. The results of our quantitative investigations give rise to a model of solvent-polymer phase separation during spin-coating as the driving mechanism for this widely observed instability.

CPP 28.24 Wed 17:00 P3

Polymer phase separation on surface energy patterns generated by single pulse laser interference — •Alexander Foerste[1], Tobias Geldhauser[2], Johannes Boneberg[2], Paul Leiderer[2], Stefan Walheim[1], and Thomas Schimmel[1,3] — [1]Institute of Nanotechnology (INT), Forschungszentrum Karlsruhe, Germany — [2]Department of Physics, Universität Konstanz, Germany — [3]Institute of Applied Physics and DFG-Center for Functional Nanostructures (CFN), Universität Karlsruhe, Germany

Single pulse laser interference lithography is used to structure self-assembled monolayers of thiols on gold. The molecular desorption process is investigated by attenuated total reflection measurements. The resulting surface energy patterns are investigated by AFM and are used to control the phase morphology of a polymer blend - subsequently spin-cast on these structured surfaces. The laser lithography was realized with different wavelengths (266, 532, and 1064 nm) which shows that the structuring is a thermal process. As a first demonstration of this process, structures down to 800 nm period and 300 nm width are fabricated. Ref.: Langmuir 24 (22), 13155-13160 (2008)

CPP 28.25 Wed 17:00 P3

A transient triple layer leads to a purely lateral morphology in a spin-cast polymer blend film — •Cheng Huang[1], Aaron Weis[2], Fengzhen Zhang[3], Othmar Marti[3], Stefan Walheim[1], and Thomas Schimmel[1,2] — [1]Institute of Nanotechnology (INT), Forschungszentrum Karlsruhe, Germany — [2]Institute of Applied Physics and DFG-Center for Functional Nanostructures (CFN), Universität Karlsruhe, Germany — [3]Insitute for Experimental Physics, Universität Ulm, Germany

We study the phase separation process of PS/PMMA during spin-coating from a Methy-Ethyl-Ketone (MEK) solution. Using this solvent this polymer blend forms a purely lateral structure on a hydrophilic substrate with PS cylinders in PMMA matrix. Our results of time-resolved reflectometry point in the direction of a transient triple layer formation during the spin-coating process which then transforms via an instability into the final lateral morphology. The process parameters can be tuned so that a purely horizontally layered situation can be observed in the dried state. Humidity, spin rate and the concentration of the polymer blend solution are the most important parameters which define the final structure. The PS or PMMA phase was later selectively dissolved and the film was subsequently used as a lithographic mask.

CPP 28.26 Wed 17:00 P3

Thickness dependence of diffusion in thin liquid crystalline films — •Benjamin Schulz, Jörg Schuster, and Christian von Borczyskowski — TU Chemnitz, Institut für Physik, 09107 Chemnitz

Liquid crystals are of high technical interest especially for the use in