

CPP 16: POSTERS Polyelectrolytes and Biological Systems

Time: Tuesday 14:00–16:30

Location: P3

CPP 16.1 Tue 14:00 P3

Temperature dependence of positron annihilation in high permeability polymers: Teflons AF — ●KLAUS RÄTZKE¹, JAN KRUSE¹, FRANZ FAUPEL¹, YURI YAMPOLSKII², VICTOR SHANTAROVICH³, and GÜNTER DLUBEK⁴ — ¹Faculty of Engineering, University of Kiel, Germany — ²A.V. Topchiev Institute of Petrochemical Synthesis, Moscow, Russia — ³N.N.Semenov Institute of Chemical Physics, Moscow, Russia — ⁴Institute for Innovative Technologies, Köthen/Halle, Germany

The performance of polymeric membranes for gas separation is given by the free volume. Positron annihilation lifetime spectroscopy (PALS) is an accepted technique for investigation of free volume; the ortho-Positronium (o-Ps) lifetime is directly related to the mean hole size. PALS was done on amorphous Teflon AF 1600 and AF 2400. (copolymers of tetrafluoroethylene and 2,2-bis(trifluoromethyl)-4,5-difluoro-1,3-dioxole units). From the data mean hole size and width were calculated. Both polymers show large o-Ps lifetimes (\Rightarrow large hole sizes) and glass transition near the expected values. AF 2400 shows a non-linear temperature dependence of the ortho-positronium lifetime, extraordinarily large mean values of o-Ps lifetimes and the widths of the lifetime distributions. Explanations will be discussed in relation to the microstructure of the copolymer.

M. Rudel, J. Kruse, K. Rätzke, F. Faupel, Y. P. Yampolskii, V. P. Shantarovich, G. Dlubek, *Macromolecules*, 41 (2008) 788.

G. Dlubek, J. Pionteck, K. Rätzke, J. Kruse, F. Faupel, *Macromolecules* (2008); 41; 6125.

CPP 16.2 Tue 14:00 P3

Allocation of crystalline and amorphous minerals in calcified tissues: A confocal Raman study — ●SABINE HILD^{1,2}, HELGE FABRITIUS², TORSTEN FISCHER², and DIERK RAABE² — ¹Institut für Polymerwissenschaften, JKU Linz, Linz, Austria — ²Max-Planck-Institut fuer Eisenforschung, Duesseldorf

The mineralized exoskeleton formed by the cuticle of crustaceans is an excellent model to study biological nano-composite materials. In spite of the diversity of crustacean species they share a similar structural principle for their cuticle: An organic matrix composed of chitin-protein fibers associated with variable amounts of biominerals. The most widespread mineral is crystalline and amorphous calcium carbonate and to lower amounts calcium phosphate. In contrast to calcium carbonate, only little is known about the modification, the distribution and the function of the latter. Using the combination of electron microscopy, Energy-Dispersive X-Ray Analysis, Raman spectroscopy and atomic force microscopy we studied the mineral distribution within the claw cuticle of the american lobster *Homarus americanus*. Similar to other crustaceans, in the lobster cuticle crystalline calcium carbonate is restricted to the exocuticle forming a continuous calcite layer only close to the surface. Further inside the crystalline phase forms a post-like structure. Amorphous calcium carbonate (ACC) is localized in between the crystalline domains and appears homogeneously distributed within the endocuticle. It is accompanied by amorphous calcium carbonate (ACP). Selective dissolution and SFM nano-indentation experiments will provide further information about the function of ACC and ACP.

CPP 16.3 Tue 14:00 P3

Fluorescence Lifetime Measurements of Molecular Crystals and Giant Unilamellar Vesicles — ●MAREK BLASZCZYNSKI and LOTHAR KADOR — University of Bayreuth, Institute of Physics and BIMF, D-95440 Bayreuth, Germany

Fluorescence lifetime imaging microscopy in the frequency domain is applied to mixed molecular crystals and giant unilamellar vesicles (GUVs). The custom-built set-up is based on a confocal microscope and uses a cw laser which is amplitude-modulated in the MHz regime with an acousto-optic modulator (AOM). The phase shift and modulation amplitude of the fluorescence signal with respect to the excitation yield information about the fluorescence lifetime(s). The fluorescence decay of pentacene in *p*-terphenyl host crystals shows a bi-exponential behavior, which is ascribed to the presence of pentacene monomers and dimers. Spatially resolved studies on GUVs of binary mixtures (DOPC/DPPC) and ternary mixtures (DOPC/DPPC/cholesterol) with the head-labelled phospholipid

Rhod-DMPE as a fluorescent probe were performed, and preliminary results of their phase behavior are presented.

CPP 16.4 Tue 14:00 P3

Controlling Protein Interfacial Affinities by Ionic and Non-Ionic Cosolvents — FLORIAN EVERS¹, JUNY KOO², THOMAS GUTBERLET³, ROLAND STEITZ⁴, ●METIN TOLAN¹, and CLAUS CZESLIK² — ¹Fakultät Physik, TU Dortmund, 44221 Dortmund — ²Fakultät Chemie, TU Dortmund, 44221 Dortmund — ³Paul-Scherrer-Institut, CH-5232 Villigen — ⁴Helmholtz-Zentrum Berlin, 14109 Berlin

In a biological cell, proteins perform their functions in a highly complex environment comprising crowding and confinement effects as well as interactions with interfaces and cosolvents. Cosolvents can stabilize or destabilize proteins in solution. Here, we present recent studies on how ionic and non-ionic cosolvents affect the interfacial affinity and structure of proteins at hydrophilic and hydrophobic solid surfaces. RNase A at a silica-water and a polystyrene-water interface were used as model systems and studied by neutron and optical reflectometry. The degree of protein adsorption and the density profile of the adsorbed protein films were determined in the absence and the presence of cosolvents. In the case of the hydrophilic silica-water interface, both the protein stabilizing glycerol and the destabilizing urea cause a distinct reduction in the interfacial affinity of RNase A. At the hydrophobic polystyrene surface, two trends become apparent: The kosmotropic SO_4^{2-} ion lowers the amount of adsorbed protein when it is present at sub-molar concentrations, whereas the chaotropic SCN^- ion significantly enhances the degree of protein adsorption at concentrations of a few moles per liter. The obtained results will be discussed in terms of the underlying effects of the cosolvents on the adsorption mechanisms.

CPP 16.5 Tue 14:00 P3

Optical Bloch equations of light harvesting nanostructures — ALEXANDER CARMELE¹, ●MARTEN RICHTER¹, THOMAS RENGER², and ANDREAS KNORR¹ — ¹Institut für Theoretische Physik, AG Nicht-lineare Optik und Quantenelektronik, Technische Universität Berlin, Hardenbergstr. 36, 10623 Berlin, Germany — ²Institut für Chemie und Biochemie, Freie Universität Berlin, Takustr. 3, 14195 Berlin, Germany

Within a Bloch equation approach [1], we calculate linear and pump-test spectra of Coulomb-coupled nanostructures (like pigments in pigment-protein complexes in LHC-II or the Fenna-Matthews-Olson (FMO) complex). The theory includes Förster-coupling induced excitation transfer between the nanostructures, electron-vibrational coupling between the nanosystems and their environment as well as the interaction with external optical fields and is based on many particle Liouville and cluster-expansion techniques. Hereby, we include self-consistently the structural data for the optical transition energies of pigments in protein environments and the spectral density of exciton-vibrational coupling [3].

[1]M. Richter, Th. Renger, G. Renger, A. Knorr, *J. Chem. Phys.* 127, 075101 (2007)

[2]M. Richter, Th. Renger, A. Knorr, *Photosyn. Res.* 95, 2-3, 119 - 127 (2007)

[3]J. Adolphs, F. Müh, M. El-Amine Madjet, Th. Renger, *Photosyn. Res.* 95, 1-2, 129 - 141 (2007)

CPP 16.6 Tue 14:00 P3

X-Ray Reflection Study on Block Copolymer Langmuir Films — ●VOLKER SCHÖN and PATRICK HUBER — Saarland University, 66123 Saarbrücken, Germany

We present X-ray measurements on Langmuir films of amphiphilic block copolymers of variable length at various surface pressures corresponding to different phases in their compression isotherms.

The measurements were taken on a home made butterfly X-ray reflectometer with an accessibility of up to 9 orders of magnitude in reflected intensity while the films were prepared and controlled in a Langmuir trough.

The obtained reflectivities give hints to distinct conformational changes within the films investigated.

CPP 16.7 Tue 14:00 P3

Photothermal imaging of gold particles in living cells — ●NILS NEUBAUER¹, CARSTEN STÜBER², JOSEF KÄS², and FRANK CICHOS¹ — ¹Molecular Nanophotonics Group, University of Leipzig, Linnéstraße

5, 04103 Leipzig — ²Soft Matter Physics Group, University of Leipzig, Linnéstraße 5, 04103 Leipzig

Many biochemical processes in living cells depend strongly on temperature. Local heating might provide a versatile tool for manipulating such processes. Nevertheless a strongly localized heat generation is required for this purpose. This can be achieved by optical heating of single nanometer sized gold particles. Optical excitation of the plasmon resonance of the gold nanoparticle allows precise control of heat release. Furthermore the thermal field around a single particle is strongly localized. Here we present a study on the following two questions: How do the particles distribute within a cell and secondly, how do they affect the cell metabolism? Gold nanoparticles have been visualized in living cells by photothermal heterodyne detection. By absorbing laser light and the subsequent conversion into heat, these particles locally induce a change in refractive index of the surrounding media, which can be probed with a confocal laser scanning setup. This technique offers both imaging and studying the local effect of heat release by the gold nanoparticles. In the first experiments fibroblasts were used to study the distribution of gold nanoparticles with 40 nm down to 10 nm in size. While the 40 nm particles do not penetrate the membrane and adhere around the cell, the 10 nm particles enter and accumulate inside the cell.

CPP 16.8 Tue 14:00 P3

Two-dimensional Lamellar Phase of Poly(styrene) — JENS-UWE GÜNTHER, HEIKO AHRENS, and CHRISTIANE A. HELM — Institut für Physik, Uni Greifswald, Felix-Hausdorff-Str. 6, 17487 Greifswald

Polystyrene sulfonate (PSS) adsorbed onto oppositely charged dodecyltrimethylammonium bromide (DODA) monolayers at the air/water interface is investigated with X-ray reflectivity and grazing incidence diffraction. DODA in the condensed phase is in an oblique lattice. At low PSS bulk concentrations (0.001 * 0.1 mmol/L) the surface pressure corresponding to the fluid/condensed phase transition and the DODA molecular area in the condensed phase are decreased, the latter due to a reduced tilt angle. Both findings are attributed to PSS shielding the electrostatic repulsion between the DODA molecules. Bragg peaks caused by flatly adsorbed, aligned PSS chains are observed, with DODA in the fluid or the condensed phase. The two-dimensional lamellar phase is only found at intermediate PSS bulk concentrations (0.001 * 1 mmol/L). In this phase, the PSS coverage can be varied by a factor three, depending on DODA molecular area and polymer bulk concentration. Charge compensation in the lamellar phase is almost achieved at 1 mmol/L. At larger bulk concentrations, PSS adsorbs flatly yet without chain alignment. Presumably, a necessary condition for a two-dimensional lamellar phase is a pronounced electrostatic force which causes a large persistence length as well as repulsion between the aligned chains.

CPP 16.9 Tue 14:00 P3

Solvation structure of ice-binding antifreeze proteins —

HENDRIK HANSEN-GOOS and JOHN WETTLAUER — Department of Geology and Geophysics, Yale University, New Haven, CT 06520, USA
Antifreeze proteins (AFPs) can be found in organisms which survive at subzero temperatures. They were first discovered in polar fishes since the 1950's [1] and have been isolated meanwhile also from insects, plants, and bacteria. While AFPs shift the freezing point of water below the bulk melting point and hence can prevent recrystallization; the effect is non-colligative and there is a pronounced hysteresis between freezing and melting. For many AFPs it is generally accepted that they function through an irreversible binding to the ice-water interface which leads to a piecewise convex growth front with a lower nonequilibrium freezing point due to the Kelvin effect.

Recent molecular dynamics simulations of the AFP from *Chorisoneura fumiferana* reveal that the solvation structures of water at ice-binding and non-ice-binding faces of the protein are crucial for understanding how the AFP binds to the ice surface and how it is protected from being overgrown [2]. We use density functional theory of classical fluids in order to assess the microscopic solvent structure in the vicinity of protein faces with different surface properties. With our method, binding energies of different protein faces to the water-ice-interface can be computed efficiently in a simplified model.

[1] Y. Yeh and R.E. Feeney, Chem. Rev. **96**, 601 (1996).

[2] D.R. Nutt and J.C. Smith, J. Am. Chem. Soc. **130**, 13066 (2008).

CPP 16.10 Tue 14:00 P3

Assessing different mapping schemes for coarse grained sim-

ulations of peptide systems. — OLGA BEZKOROVAYNAYA and CHRISTINE PETER — Max Planck Institute for Polymer Research

The study of organic/inorganic interfaces using theoretical methods became in the last years of central importance in many fields of condensed matter, material science and chemistry due to the large number of applications in current technology.

The aim of the present project is to explore the ability and the limitation of a coarse-grained (CG) model to reproduce structural and conformational properties of a peptide.

At first, it is necessary to devise a CG model and the corresponding potentials. Important aspects of the CG model are the mapping scheme, i. e. the relationship between the CG particles and the underlying atomistic coordinates; the intramolecular interaction potentials and the non-bonded potentials between CG particles. At this moment we are testing several CG mapping schemes for a short peptide (poly-alanine) with 24 atoms. We determined bonded potentials for the different CG models using Boltzmann inversion. We compared their ability to reproduce structural properties of the molecule that had been previously determined by atomistic simulation.

At a later stage we will extend this work to other peptides and peptides in proximity to a surface.

CPP 16.11 Tue 14:00 P3

Silk - as seen by X-ray microdiffraction and small angle X-ray scattering with *in situ* tensile tests — IGOR KRASNOV¹, IMKE DIDDENS², CHRISTINA KRYWKA¹, FLORIAN KUNZE¹, and MARTIN MÜLLER³ — ¹Christian-Albrechts-Universität zu Kiel, Institut für Experimentelle und Angewandte Physik, Leibnizstraße 19, D-24098 Kiel — ²University of Oxford, Dept. of Zoology, South Parks Road, OX1 3PS United Kingdom — ³GKSS Forschungszentrum Geesthacht, Max-Planck-Straße 1, D-21502 Geesthacht

Silkworm silk is a natural composite material produced by the silkworm *bombyx mori* and is known to have a high tensile strength comparable to that of steel. Unlike steel however, it is extremely stretchable with an extreme elongation before breaking and a high degree of toughness. It would be highly desirable to mimic nature's spinning process to produce artificial fibres with optimized mechanical performance either from silkworm or recombinant spider silk spinning dope. Using a combination of *in situ* tensile tests and X-ray microdiffraction [1] as well as small angle X-ray scattering, we have determined the mechanical properties of both the crystalline and the disordered phase of the biological nanocomposite silk by adapting a model from linear viscoelastic theory to the semicrystalline morphology of silk. We have observed a strong interplay between the morphology of silk and the fibers' mechanical properties. It is apparent, that the high extensibility of silk results mainly from the disordered phase, however, we have observed that the crystals are also elastically deformed.

[1] I. Krasnov et al. *Phys. Rev. Lett.* **100**, 048104 (2008)

CPP 16.12 Tue 14:00 P3

The Nanostructure of the Tracheid Wood Cell Wall — MALTE OGURRECK^{1,2}, PEKKA SARANPÄÄ³, MANFRED BURGHAMMER⁴, SEBASTIAN SCHOEDER⁴, CHRISTINA KRYWKA¹, WIEBKE KNOLL¹, and MARTIN MÜLLER² — ¹IEAP, University Kiel — ²GKSS, Geesthacht — ³METLA, Vantaa (Finland) — ⁴ESRF, Grenoble (France)

Tracheid wood cell walls are mainly composed of cellulose nanocrystals (microfibrils) embedded in an amorphous matrix. These microfibrils are helically wound around the cell axis and are arranged in several layers.

While the structure of tracheid wood cells has been a research topic for many decades now and the structure on the biological and molecular level are well known, the detailed structure on intermediate length scales is still largely unknown. Here, we present results of a nanodiffraction experiment carried out at the microfocus beamline ID13, ESRF.

Tracheid cross sections have been scanned with a position resolution of 200 nm. A novel mathematical description of the scattering geometry for tracheid wood cells allows for the calculation of the crystal orientation from the scattering data. Thus, it is possible to determine the cellulose crystal orientation on a length scale of 200 nm and refine tracheid cell wall models.

CPP 16.13 Tue 14:00 P3

Crystallization and melting of fibrous silk — ANDREAS WURM, DANIELA ARBEITER, and CHRISTOPH SCHICK — University of Rostock, Institute of Physics, Polymerphysics, 18051 Rostock, Germany

The fundamental thermodynamic properties of materials based on fibrous proteins are important parameters, which are needed in order fully to understand the behavior of these materials in vitro and as structural elements in vivo.

Often these proteins exist in nature as semi-crystalline material. As for semi-crystalline polymers, differential scanning calorimetry (DSC) would be the easiest tool for determination of thermal properties like heat capacity, temperatures of transitions, melting enthalpy, crystallinity etc.

For fibers from the bombyx mori silk worm it arises the difficulty, that thermal decomposition during a DSC scan with common heating rate of about 10 K/min starts about 30 K above glass transition temperature, already before melting. To overcome this problem we applied faster calorimetric methods, like HyperDSC and ultra fast chip calorimetry with heating rates up to 500 K/min and 1 MK/min, respectively. These methods are suitable to prevent thermal decomposition on heating into the melt because of the short exposition time at high temperatures. We will present results from several crystallization-melting experiments of silk, using these fast calorimetric methods.

CPP 16.14 Tue 14:00 P3

CIDNP as a tool for determining the structure and magnetic resonance parameters of transient radicals of biomolecules —

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Combining NMR spectroscopy with the effect of spin hyperpolarization opens new ways to get information about structure of transient radicals and their pathways. A way for creating transient non-thermal signal amplitudes in proteins is Chemically Induced Dynamic Nuclear Polarization (CIDNP) resulting from the formation of a radical pair of a photo-excited dye molecule and an amino acid residue. Field dependence of CIDNP allows to determine structure and magnetic resonance parameters (hyperfine coupling constants and g-factor) of elusive radicals. Furthermore, from time dependence with microsecond resolution it is possible to differentiate geminate and bulk processes, so that reaction pathways and rate constants of dynamic processes can be extracted.

In present study, CIDNP results for free amino acids and different peptides containing combination of methionine, glycine and tyrosine in aqueous solution at ambient temperature are obtained. Dependence of intramolecular electron transfer in the peptides on pH and its pathways are discussed.

CPP 16.15 Tue 14:00 P3

The influence of substrates on protein adsorption: adsorption kinetics studies and structural investigations. — •HENDRIK HÄHL, HUBERT MANTZ, and KARIN JACOBS — Saarland University, Experimental Physics, D-66041 Saarbruecken, Germany

Surfaces that come into contact with an aqueous solution of proteins will be immediately covered with a thin protein layer. We seek to better understand the driving forces of this process. Concentrating on the influence of the substrate on the adsorption, the surface chemistry has been the focus of many studies. Recent studies have shown that, next to the chemical composition of the uppermost surface layer, also the substrate's composition influences the adsorption kinetics of proteins such as α -amylase and BSA [1, 2]. The experimental findings are corroborated by simulations assuming conformational or orientational changes of the protein molecules upon adsorption.

Thus, one also assumes different structures of the formed protein layers. To experimentally observe such differences, high resolution measurements of film thickness and density are needed. Therefore, we used surface plasmon resonance enhanced ellipsometry as well as neutron and X-ray reflectivity measurements for better film thickness and density data.

[1] A. Quinn et al., EPL, 2008, **81**, 56003.

[2] M. Bellion et al., J.Phys.: Condens. Matter, 2008, **20**, 404226.

CPP 16.16 Tue 14:00 P3

Investigation of Hofmeister effects in the swelling behaviour of polyelectrolyte microgels — •MICHAEL ZEISER, YVONNE HERTLE, and THOMAS HELLWEG — Universität Bayreuth, Physikalische Chemie I, Universitätsstr. 30, 95447 Bayreuth, Germany

The present contribution describes the swelling behaviour of differ-

ent poly(N-isopropylacrylamide) copolymer microgels with charged comonomers as a function of counterion type and concentration. To our knowledge Hofmeister effects were not yet studied for these responsive polymer colloids. The swelling behaviour is studied by means of photon correlation spectroscopy and small angle neutron scattering. Also influences with respect to the lower critical solution temperature are reported.

CPP 16.17 Tue 14:00 P3

Formation of necklace structures for intermediates of a Ca²⁺ induced shrinking of dilute anionic polyacrylate chains —

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Sodium polyacrylate coils in dilute aqueous solutions shrink drastically upon addition of stoichiometric amounts of Ca²⁺ ions. An essential feature of this shrinking mechanism is its enhancement upon increase of temperature. The conformational changes in response to the addition of Ca²⁺ cations and upon an increase of temperature are investigated by means of light and neutron scattering and by AFM on the same samples. To this end, partially collapsed coils at 15°C were further shrunken and modified in shape by increasing the temperature to 30°C. The scattering curves at 30°C could only be interpreted with a model, which included the feature of a dumbbell, a reflection of necklace-like shape. Supplementary AFM imaging supports the drastic changes inferred to the system upon addition of the Ca²⁺ cations and upon a temperature increase by 15°C. AFM images have been analysed for radius of gyration of single molecules and evaluation of a 2D form factor curve. The information obtained is compared with scattering data. The results are considered to be one of the rare direct evidences for a pearl necklace-like intermediate along the coil-to-globule transition of polyacrylate chains.

CPP 16.18 Tue 14:00 P3

Calculation of the helical interaction parameters and groove binding potentials for DNA like charged cylinders. —

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An effective (KL) theory was developed to calculate the interaction between helically charged macro-ions [1]. Helical effects, resulting from this theory, may be important in cholesteric phases and in columnar assemblies [1]. It relies upon a "linearized" PB equation; but nonlinearities in the electrostatic potential, bound counter-ions, finite sizes of ions, and some correlation effects can be included in effective KL parameters. These define the strength of the helical contributions to the interaction, which have so far been treated as phenomenological. However, the KL parameters can be calculated if one knows the counter-ion charge and fixed charge distributions about a single macro-ion [1]. We briefly review the KL theory. Then, we calculate these parameters utilizing a model of a charged cylinder with DNA like surface distributions, taking into account counter-ions adsorbed within the grooves of DNA. We use two methods: the non-linear PB equation and a modified PB equation that incorporates some correlation and finite size effects that adjust the counter ion atmosphere. The distributions of groove-adsorbed counter-ions are related to groove binding potentials, by calculation of an adsorption isotherm.

[1]A.A Kornyshev, D. J. Lee, S. Leikin, A. Wynveen, Rev. Mod. Phys. 79, 943 (2007); and references contained therein.; EPAPS Document No. E-RMPHAT-79-010702

CPP 16.19 Tue 14:00 P3

Correlation between swelling and internal mobility of polyelectrolyte multilayers — •SAMUEL DODOO and REGINE VON KLITZING — Stranski-Laboratorium für Physikalische & Theoretische Chemie, Institut für Chemie, TU Berlin, Strasse des 17. Juni 124, D-10623 Berlin

Polyelectrolyte multilayers (PEM) have emerged as a method to build up well-defined coatings for several kinds of surface modifications, ranging from photonics to biomaterials, membrane and sensor applications. Their preparation is via the layer-by-layer adsorption method. In this work the real-time monitoring of the layers adsorption and build-up in situ was performed by Quartz Crystal Microbalance (QCM). In addition, the lateral mobility of polyelectrolyte multilayers was investigated by means of the fluorescence recovery after photobleaching (FRAP) technique. The QCM results showed the suc-

cessive build-up process of two-component multilayer and structural information such as swelling. From the FRAP measurements the results emerged that at high charge density, more complexes are formed, and the diffusion coefficient decreases². Further more the lateral mobility increases with increasing ionic strength and with decreasing hydration shell of the added anion in the polyelectrolyte solution.

[1] G. Decher Science 1997, 277, 1232. [2] P. Nazaran, V. Bosio, W. Jaeger, D. F. Anghel, R. v. Klitzing J. Phys. Chem B 2007, 111,

CPP 16.20 Tue 14:00 P3

Structuring of Polyelectrolyte Solutions Under Confinement of Solid-Solid and Air-Air Interfaces — ●CAGRI ÜZÜM¹, JÉROME DELACOTTE², DOMINIQUE LANGEVIN², and REGINE v. KLITZING¹ — ¹Stranski-Laboratorium für Physikalische und Theoretische Chemie - Institut für Chemie TU Berlin, Sekr. TC 9 Strasse des 17. Juni 124 D-10623 Berlin, Germany — ²Laboratoire de Physique des Solides, UMR 8502 Université Paris-Sud, Bât. 510 91405 Orsay cedex, France

The presented work focuses on the structuring of polyelectrolyte solutions (PAMPS) which are confined either between two fluid interfaces in a free-standing foam film or between two solid interfaces. The forces between the opposing interfaces depend on the composition of the film interfaces and characteristics (e.g. type of charged and neutral groups, charge fraction, concentration) of the film fluid [1]. The confinement leads to oscillatory forces in a Colloidal Probe AFM and to a stepwise thinning in foam films. The oscillatory pressure curves are then compared to small angle scattering (SANS or SAXS, which give information about bulk structuring) spectra. Solutions of linear polyelectrolytes show a structure peak scaling with the polyelectrolyte concentration c as $q[\text{max}] \sim c^{1/2}$. The scaling law is predicted by theoretical models [2, 3]. The effect of the molecular architecture, e.g. linear, comb-like and branched polyelectrolytes on the structuring will be shown. [1] R. v. Klitzing. Adv. Coll. Interf. Sci. 2005, 114/115, 253. [2] R. v. Klitzing, B. Kolaric, W. Jaeger, A. Brandt. Phys. Chem. Chem. Phys. 2002, 4, 1907. [3] D. Qu, J.S. Pedersen, S. Garnier, A. Laschewsky, H. Möhwald, R. v. Klitzing. Macromolecules. 2006, 39, 7364.

CPP 16.21 Tue 14:00 P3

Ultrafast dynamics in polyelectrolyte/ gold multilayer structures studied by femtosecond pump-probe spectroscopy — ●MAREIKE KIEL^{1,2}, MARC HERZOG², DIRK KURTH¹, WOLFRAM LEITENBERGER², THORSTEN SIEVERS¹, HELMUTH MÖHWALD¹, and MA-

TIAS BARGHEER^{1,2} — ¹Max Planck Institute of Colloids and Interfaces, Research Campus Golm, 14476 Potsdam, Germany — ²Institute of Physics, University of Potsdam, 14476 Potsdam, Germany

The dynamic response of hybrid nanolayer systems composed of polyelectrolytes and gold colloids upon optical excitation is studied by ultrafast pump-probe spectroscopy. Relative intensity changes of transient absorption and reflection spectra are measured with light in the visible and near infrared region, providing information on the photoinduced dynamics within the structure. We investigate multilayer structures of gold colloid strata that are separated by several polyelectrolyte layers. The well pronounced Bragg peaks and Kiessig fringes from x-ray reflectivity measurements prove the excellent structural quality of the samples with clear separation of the gold particle layers. We observe intensity modulations due to coherently excited breathing modes in 10nm and 20nm gold particles. From the monitored transmission and reflection data we deduce the time-dependant values of the imaginary and real part of the dielectric function.

CPP 16.22 Tue 14:00 P3

Silicon Rubber as Support for PEM Films: Rubber Surface Properties at Different Preparation Procedures — ●JOHANNES FRÜH¹, RUMEN KRASTEV², and RALF KÖHLER^{3,1} — ¹MPI of Colloids and Interfaces, Dept. Interfaces, Potsdam, Germany — ²NMI, WB Bioanalytik, Tübingen, Germany — ³Helmholtz Centre Berlin for Materials and Energy, Dept. SF1, Berlin, Germany

Silicon rubber (polydimethyl siloxane [PDMS]) shall serve as support for polyelectrolyte multilayers (PEM) an organic material made from oppositely charged organic polyions. Both materials were intensively investigated in the past, but little is known about their conjoint behaviour and interactions.

Since the reproducible generation of compound PDMS-PEM systems demand for defined interfaces, the surface properties of PDMS have to be determined, and to be tuned in the end. Different techniques, as AFM, contact angle measurements, and X-ray reflectometry were used for surface characterisation. It turned out, that a gentle mixing process during the cross-linking of PDMS can supply microscopically flat rubber surfaces with roughnesses in nanometre range. Additional chemical surface treatment allows for tuning of adsorption behaviour (i.e. wetting/ dewetting) of PDMS-substrate. With it, a preparation techniques could be established which can provide molecularly flat soft-matter substrates with tunable surface properties.