CPP 9 SYMPOSIUM: Polymer networks and beyond: From molecular structure to materials and biological functions POSTER

Zeit: Samstag 16:45–18:45 Raum: Poster TU D

CPP 9.1 Sa 16:45 Poster TU D

Adhesion of biomimetic microcapsules — •Fery Andreas, Nils Elsner, Marc Nolte, Ashok Raichur, and Helmuth Möhwald — Max Planck Institut für Kolloid und Grenzflächenforschung

Polyelectrolyte multilayer capsules can be designed in their compliance and in their interactions, which makes it possible to control their adhesion behavior. The size of adhesion areas and the geometry of adhering capsules can be studied using microinterferometry. While we have investigated adhesion triggered by electrostatic interactions in detail, we present first results on adhesion triggered by specific interactions. On homogenous substrates, we can study the impact of interaction strength and nature of interaction on adhesion. Patterned substrates can be used to direct microcapsule adhesion. In this way, self assembled arrays of immobilized capsules can be formed.

CPP 9.2 Sa 16:45 Poster TU D

Chromatin elasticity simulated by a Monte Carlo model — •Frank Aumann, Maïwen Caudron, and Jörg Langowski — Div. Biophysics of Macromolecules, German Cancer Research Center, INF 580, D-69120 Heidelberg

In the present work we estimate basic structural and physical properties of the 30 nm chromatin fiber such as the persistence length and stretching elasticity. The data was obtained by simulating the stretching of a single chromatin fiber on a computer. Our program, applying a Monte Carlo (MC) algorithm, is based on a flexible polymer chain with Debye-Hückel electrostatics, using the two-angle model for the chromatin fiber geometry. Flat disks interacting via an attractive Gay-Berne potential represent the nucleosome core particles. Our results show that a rise of the linker DNA length from 5 to 15 bp leads to a at least 5 times less stiffer chromatin fiber. A Variation of the twisting angles between nucleosomes form 90° to 130° gives a significantly stiffer fiber for higher angles. The simulated persistence lengths and elastic moduli confirm experimental data. Most importantly, we show that the chromatin fiber does not behave as an isotropic elastic rod, its rigidity depends on the direction of deformation: in particular, chromatin is much more resistant to stretching than to bending.

CPP 9.3 Sa 16:45 Poster TU D

Bionanoparticles at Fluid Interfaces: Assembly, Crosslinking and Ultrathin Membranes — •Alexander Böker[1], Yao Lin[2], Heiko Zettl[1], Philippe Carl[3], Andreas Fery[3], Su Long[4], Qian Wang[4], and Thomas P. Russell[2] — [1]Lehrstuhl für Physikalische Chemie II, Universität Bayreuth, 95440 Bayreuth, Germany — [2]Department of Polymer Science and Engineering, University of Massachusetts, Amherst, MA 01003, USA — [3]Max Planck Institut für Kolloide und Grenzflächen, 14424 Potsdam, Germany — [4]Department of Chemistry and Biochemistry, University of South Carolina, Columbia, SC 29208, USA

We report on an approach to fabricate nanoporous, functional membranes for encapsulation, delivery, and sensing by self-assembly of bionanoparticles. Here, we use horse spleen ferritin/HSF and cow pea mosaic virus/CPMV as building blocks for the desired materials. Fluid interfaces as found in oil-water emulsions serve as templates to guide the particle self-assembly, followed by crosslinking of the three-dimensional constructs. We studied the systems with respect to their self-assembly dynamics and the structures formed at the interface, using a pendant drop tensiometer. The nanometer-thin membranes formed after crosslinking the particle assembly, were characterized using TEM, FE-SEM and AFM force spectroscopy.

CPP 9.4 Sa 16:45 Poster TU D

Protein Deformation of Lipid Hybrid Bilayer Membranes Studied by Sum Frequency Generation Vibrational Spectroscopy — •Andrew Doyle[1,2,3], Joerg Fick[1], Michael Himmelhaus[1], Wolfgang Eck[1,3], Irene Graziani[4], Igor Prudovsky[4,3], Michael Grunze[1,3], Thomas Maciag[4,3], and David Neivandt[2,3] — [1]University of Heidelberg, Department of Applied Physical Chemistry, INF 253, Heidelberg, Germany 69120 — [2]University of Maine, Department of Chemical and Biological Engineering, Jenness Hall, Orono, ME USA, 04469 — [3]Institute for Molecular Biophysics, The Jackson Laboratory, Bar Harbor, ME USA, 04609 — [4]Center For Molecular Medicine, Maine Medical Center Research Institute, Scarborough, ME USA, 04704

Structural deformations of lipid hybrid bilayer membranes induced by signal peptideless (SPL) proteins have been studied for the first time using the inherently surface specific nonlinear optical technique of sum frequency generation vibrational spectroscopy. Specifically, deformations of 1,2 distearoylphosphatidylglycerol (DSPG) membranes induced by interaction with FGF-1, a SPL protein which is released as a function of cellular stress through a nonclassical pathway, have been investigated. FGF-1 was found to induce lipid alkyl chain deformations in previously highly ordered DSPG membranes at the extremely low concentration of 1 nM at 60 °C. The deformation process was shown to exhibit a degree of reversibility upon removal of the protein by rinsing with buffer solution.

CPP 9.5 Sa 16:45 Poster TU D

Elektronenmikroskopie an Silica — •Stefan Fink, Gerald J. Schneider und Diemar Göritz — Intitut für Polymerphysik, Universität Regensburg, 93040 Regensburg

Der aktive Füllstoff Silica verbessert die mechanischen Eigenschaften von Kautschuk.Unklar ist bisher, wie die Struktur der Silica auf mikroskopischer Ebene die Eigenschaften beeinflußt. Aufgrund der interessierenden Längenskala von (5-500) nm eignet sich hierfür die Elektronenmikroskopie. Um ein dreidimensionales Abbild der Probe zu bekommen, wird die Untersuchung unter verschiedenen Winkeln durchgeführt und anschließend im Computer das dreidimensionale Abbild der Struktur rekonstruiert (Elektronentomographie). Mit Hilfe dieser Methode ist es erstmalig gelungen, die 3D-Struktur von Silica auf der Längenskala von Nanometern im Realraum zu untersuchen.

CPP 9.6 Sa 16:45 Poster TU D

Bestimmung der Volumenänderung bei schnellem Verstrecken von Naturkautschuk — •Sandra Habermann, Gerald Schneider und Dietmar Göritz — Universität Regensburg, Universitätsstr. 31, 93051 Regensburg

Zur theoretischen Beschreibung der Deformation von Elastomeren wird in der Regel die Volumenkonstanz vorausgesetzt. Experimentell beobachtbar sind dagegen für ungefüllte Systeme relative Volumenänderungen im Bereich von Promille, für gefüllte Systeme im Bereich von Prozent. In diesem Beitrag wird der Einfluss der Deformationsgeschwindigkeit auf die Volumenaufweitung untersucht. Zu diesem Zweck wurde ein optisches Dilatometer gebaut, das eine Messung von Volumenänderungen im Bereich von Millisekunden erlaubt. In unseren Experimenten stellte sich heraus, dass sehr viel höhere Änderungen auftreten als aufgrund von bisher bekannten Ergebnissen aus langsamer Deformation erwartet wurde.

CPP 9.7 Sa 16:45 Poster TU D

Multi-compartment micellar networks formed by lipophilic-hydrophilic-fluorophilic triblock copolymers in aqueous solution — •R. Ivanova[1], T. B. Bonné[1], T. Komenda[2], K. Lüdtke[2], R. Jordan[2], and C. M. Papadakis[1] — [1]Physik Department E13, TU München, 85747 Garching, Germany — [2]Chemie Department, TU München, 85747 Garching, Germany

The self-assembly of novel poly(2-oxazoline)-based lipophilic-hydrophilic-fluorophilic block copolymers in aqueous solution was studied using SANS with the aim to design networks consisting of two separate micelles (i.e. with a lipophilic or a fluorophilic core). It was shown that the block copolymers aggregate into micelles that at high concentrations

are expected to form a micellar network. The size and shape of the micelles, the effect of the copolymer concentration and the hydrophilic block length on the structure were studied. The use of neutron scattering allowed us to match the block contrast using D2O/H2O mixtures to determine the structure of the micellar network. The studied block copolymers offer the possibility to design multi-compartment systems able to dissolve two kinds of solvates that have large practical potential e.g. as selective vehicles for drug delivery.

CPP 9.8 Sa 16:45 Poster TU D

High frequency interfacial rheology on rubbery materials in adhesive contact — •Miriam Kunze, Binyang Du, and Diethelm Johannsmann — Institute of Physical Chemistry, Clausthal University of Technology, Arnold-Sommerfeld-Str. 4, 38678 Clausthal-Zellerfeld

Mechanical and rheological properties of adhesives are of prime importance for their adhesive strength, their debonding behavior, and their durability. For instance, the critical energy release rate of a pressure sensitive adhesive strongly depends on stress relaxation processes near the crack tip. We report on the combination of a classic instrument of adhesion science - the JKR apparatus - with the quartz crystal microbalance (QCM). Frequency shift and bandwidth of the resonator provide rheological spectra of the material in close proximity (ca. 100 nm) to the substrate. Advantages and limitations of the technique are discussed. Measurements were performed with Kraton G and a PDMS gel. In a few cases, we do find interfacial shear-softening. In most cases, however, the near-surface properties appear to be independent of stress.

CPP 9.9 Sa 16:45 Poster TU D

Preparation and Structure of Polystyrene Gels — •Ruigang Liu and Wilhelm Oppermann — Institute of Physical Chemistry, Technical University of Clausthal, Arnold-Sommerfeld Strasse 4, 38678 Clausthal-Zellerfeld, Germany

Static and dynamic light scattering measurements were performed on polystyrene gels prepared by crosslinking poly(styrene-co-aminomethylstyrene) with terephthalaldehyde in toluene. Static light scattering results show that the spatial inhomogeneities strongly decrease with increasing polymer concentration and grow stronger with cross-linker concentration. The analysis of the angular dependence of the excess scattering intensity by the Debye-Bueche method results in correlation lengths of some 10-50 nm. Relative mean-square concentration fluctuations on this length scale are about 8% for gels containing 5% PS and rise up to 75% when the PS concentration drops to 2%. Dynamic light scattering results show that the fluctuation component of the scattering intensity decreases with increasing polymer concentration while there is no obvious change with increasing crosslinker concentration. The cooperative diffusion coefficient Dc increases with increasing polymer concentration and crosslinker concentration.

CPP 9.10 Sa 16:45 Poster TU D

In situ ultra small angle x-ray scattering on pressure sensitive adhesives — •E. Maurer, S. Loi, and P. Müller-Buschbaum — TU München Physik Department LS E13 James- Franck-Str. 1 85748 Garching

Pressure sensitive adhesives (PSA) stick to a huge variety of materials by applying a slight pressure. One of the most prominent applications in daily life are stick-on notes. Scientifically, the quality of adhesion can be quantified in the so called tack test. Under defined condition a probe punch is pressed onto a PSA film and after a defined time again retracted. The force on the probe is registered as a function of the film punch distance. Even for film punch distances of multi film thickness a non-zero force value is detected. As the punch is retracted from the substrate the material has to face the challenge to occupy a rapidly increasing volume and to respect as well its low compressibility. For this reason density heterogeneities are introduced in several length scales. Macroscopically bubbles embedded in the polymeric material can been observed by optical microscopy. In order investigate density heterogeneities beyond the optical resolution limit we applied ultra small angle scattering (USAX) in-situ to the tack test [1, 2]. Well ordered substructures existing beside the macroscopically visible cavities have been detected for several PSA systems.

[1] E. Maurer, S. Loi, D. Wulff, N. Willenbacher, P. Müller-Buschbaum; Physica B at press

[2] P. Müller-Buschbaum, T. Ittner, W. Petry; Europhys. Lett. 66 (2004) 513

CPP 9.11 Sa 16:45 Poster TU D

Dynamisch-mechanische Messungen an Polydimethylsiloxan (PDMS) — •Christian Maurer, Gerald J. Schneider, Willibald Hengl und Dietmar Göritz — Institut für Physik, Universität Regensburg, 93040 Regensburg

Die mechanischen Eigenschaften von Kautschuken zeigen im Allgemeinen eine deutliche Temperaturabhängigkeit. Für diesen Beitrag wurde der dynamische Speichermodul von Polydimethylsiloxan, gefüllt mit Silica, auf Temperaturabhängigkeit untersucht. Mit der Messapparatur, dem Vibron [1], wurden dynamisch-mechanische Experimente durchgeführt. Hierbei wird eine Nadel in den Kautschuk eingeführt, die Probe sinusförmig ausgelenkt und die dabei entstehenden Kräfte im Bereich von 296-413K aufgezeichnet. Daraus kann der dynamische Schermodul der Proben in Abhängigkeit von der Temperatur bestimmt werden. Diese Daten wurden mittels des Modells der variablen Netzbogendichte [2] ausgewertet, wodurch man Aussagen sowohl über die mechanischen Eigenschaften von PDMS, als auch über den Einfluss des Füllstoffs erhält.

[1] M. Knerr; Dynamisch-mechanische Charakterisierung von Kautschukmischungen; Diplomarbeit (Universität Regensburg, 1996)

[2] P. Maier; Molekulare Interpretation des Payne-Effekts Dissertation (Universität Regensburg, 1996)

CPP 9.12 Sa 16:45 Poster TU D

ACTIVE vs PASSIVE MICRORHEOLOGY — •Daisuke Mizuno[1], Fred Mackintosh[2], and Christoph Schmidt[1] — [1]Dept. biophysics and physics of complex systems, Div. Physics and Astronomy, Fac. Science, Vrije universiteit, Amsterdam — [2]Dept. theoretical physics, Div. Physics and Astronomy, Fac. Science, Vrije universiteit, Amsterdam

We have performed passive and active 2-particle microrheology (MR) in actin solutions by using the same micron-sized colloidal particles as a probes. In passive MR, viscoelasticity is measured from the correlated thermal fluctuations of the probe particles. In active MR, one probe particle is sinusoidally driven by an oscillating optical trap while the correlated motion of the other one is detected by laser interferometry.

In equilibrium, both methods give the same results. In non-equilibrium, however, such as in living cells, random, nonthermal stress fluctuations prevent the use of the fluctuation-dissipation theorem. Probe motions are influenced by e.g. the activity of motor proteins or directional polymerization/depolymerization of actin and microtubules. Active components also modify the viscoelastic response of the cytoplasm. The main aim of our research is to gain a better understanding of microscopic dynamics in such non-equilibrium systems by combining active and passive microrheology.

CPP 9.13 Sa 16:45 Poster TU D

Der Einfluss von Additiven in Elastomeren auf die Röntgenstreukurve — •Gerald J. Schneider, Verena Vollnhals und Dietmar Göritz — Institut für Physik, Universität Regensburg, 93040 Regensburg

Die mechanischen Eigenschaften eines Elastomers können durch Zugabe von Füllstoffen, wie Carbon Black und Silica, verbessert werden. Ziel vieler Untersuchungen ist es, eine Verbindung von der Struktur der Füllstoffe zu den Eigenschaften des Polymers zu finden. Zur Untersuchung dieser Strukturen auf der Nanometerskala bieten sich Röntgen- und Neutronenkleinwinkelstreuexperimente an. Jedoch wird häufig nicht beachtet, dass es sich bei den zu untersuchenden Verbundwerkstoffen um eine Mischung handelt, die neben den Füllstoff noch weitere Komponenten, die für den Herstellungsprozess und die spätere Verwendbarkeit notwendig sind, enthält.

In diesem Beitrag soll gezeigt werden, wie verschiedene Additive das Röntgenstreudiagramm beeinflussen können. Dies verdeutlicht insbesondere ein Vergleich von Röntgen- mit Neutronenstreuexperimenten.

CPP 9.14 Sa 16:45 Poster TU D

Active Myosin-II Cross-Linked 2-Dimensional F-Actin Networks on Micro-Fabricated Pillar Arrays — •Simon Schulz[1], Wouter Roos[1], Albert Sugiharto[1], Alexander Roth[2], Erich Sackmann[2], and Joachim Spatz[1] — [1]Max-Planck-Institut für Metallforschung, Stuttgart + Universität Heidelberg, Biophysikalische Chemie, Heidelberg — [2]Physik-Department E22, Technische Universität München, 85747 Garching

Arrays of micro-fabricated pillars are constructed to serve as a template for mimicking the function of Actin cortices. Different methods to fabricate pillar arrays will be discussed; these involve photolithographic

techniques, plasma etching processes and replicative molding techniques. A two-dimensional network of F-Actin that is pending from the pillar tops is fabricated. Passive and active cross linkers are used as bundling agent. ATP dependent Myosin-II cross links allow for dynamic network studies. Due to the 3-dimensional template surface interaction of filaments bending between pillars with substrate surfaces is prevented. This opens new possibilities to study the mechanics of 2-dimensional F-Actin networks as a function of Actin-crosslinkers, and the active diffusion or contraction of molecular motors operating in pending networks.

CPP 9.15 Sa 16:45 Poster TU D

Length scales and mechanisms of motion in entangled polymer melts — •Ekkehard Straube[1] and Ralf Everaers[2] — [1]Martin-Luther-Universität Halle-Wittenberg, Fachbereich Physik, 06099 Halle — [2]Max-Planck-Institut für Physik komplexer Systeme, Nöthnitzer Str. 38, Dresden, Germany

Using a lattice-free dynamical Monte-Carlo method for rod-bead chains up to 512 segments as models of entangled polymer melts the monitoring of the behavior of copies of the system subjected to identical entanglement conditions but different time evolutions created by different sequences of random numbers allows the investigation of the structure of the topological constraints. The investigation of systems with different segment densities supports that the packing length governs the local motion in entangled melts. The analysis of scale and orientational correlations of the fluctuation structure of the copies gives estimations of the tube radius and the step length of the primitive path.

CPP 9.16 Sa 16:45 Poster TU D

Disorder effects on the strain response of model polymer networks — •Carsten Svaneborg[1], Gary S. Grest[2], and Ralf Everaers[1] — [1]Max-Planck-Institut für komplexer Systeme, Nöthnitzer Str. 38, D-01187 Dresden, Germany — [2]Sandia National Laboratories, Albuquerque, NM 87185, USA

Molecular Dynamics simulations are used to investigate polymer networks made by either end-linking or randomly crosslinking a melt of linear precursor chains. The resulting network structures are very different, since end-linking leads to nearly ideal monodisperse networks, while random crosslinking leads to polydisperse networks, characterized by an exponential strand length distribution. Networks with average strand length 20 and 100 were generated. These networks were used to study the effects of disorder in the network connectivity on observables averaged either over the entire network or selected sub-structures. Heterogeneities in the randomly crosslinked networks cause significant differences in the localization of monomers, however, neither the localization of crosslinks nor the microscopic strain response are significantly affected. Compared to end-linked networks, randomly crosslinked networks have a slightly increased tube diameter, and as a result a slightly decreased shear modulus, but otherwise identical stress-strain behavior. For the investigated systems, we conclude that the microscopic strain response, tube diameter, and stress-strain relation are all insensitive to the heterogeneities due to the linking process by which the network were made.

CPP 9.17 Sa 16:45 Poster TU D

Switching 2D-3D Growth of Epithelial Cells by Physical and/or Chemical Cues — •Jens Ulmer[1,2], Aldo Ferrari[3], Joachim Spatz[1,2], and Ruth Kroschewski[3] — [1]Universität Heidelberg, Biophysikalische Chemie — [2]MPI für Metallforschung, Stuttgart — [3]ETH Zürich, Institut für Biochemie

Adhesion of cells to the extracellular matrix (ECM) is a crucial event in multi-cellular organism. It modulates cellular processes such as cell growth, differentiation and apoptosis. 2D Collagen gels have been engineered for defined and quantitative studies of cell-ECM interactions. The 2D Collagen gel is a flexible substrate with a rigidity of 30-100 Pa and can influence cellular behaviour through biochemical signalling and its biophysical properties. To decouple chemical from physical cues, we have developed a micro arrayed substrate where modulation of surface stiffness is possible at constant presence of ECM molecules. Microfabricated PDMS posts, which have a post height dependent spring constant between 0.2-0.04 N/m were coated with reconstituted collagen Typ I. Kidney epithelial cells (MDCK) were seeded on top of the 2D Collagen gel. First results indicate that cell proliferation is reduced on softer substrates and guides polarized 3D cell lumen growth. In contrast, cells on stiffer substrates with same ECM density form 2D cell layers without polarized lumen.

CPP 9.18 Sa 16:45 Poster TU D

Untersuchung des Einflusses von Verschlaufungen auf die Energie — •Marcus Wacha und Stefan Kreitmeier — Universität Regensburg, Institut für Experimentelle und Angewandte Physik, Polymerphysik, Germany

Neben den chemischen Netzpunkten spielen in polymeren Netzwerken auch die physikalischen Netzpunkte eine entscheidende Rolle. Der Einfluss dieser Entanglements auf den Deformationsprozess wurde anhand von Computersimulationen für verschiedenen verschlaufte Basissysteme untersucht. Dafür wurde das kontinuierliche Bond- Fluktuationsmodell (CBFM) in Kombination mit der Methode der confined self-avoiding-walks (CSAW) verwendet. Um neben dem entropischen auch den energetischen Einfluss betrachten zu können wurde eine energetische Wechselwirkung mittels eines Morse- Potentials, das die Van der Waals Wechselwirkung zwischen benachbarten Monomer beschreibt, unter Zuhilfenahme des Metropoliskriterium integriert. Im Speziellen wird auf die während der Deformation auftretende Energieänderung sowie deren lokale Konzentration eingegangen und deren Abhängigkeit von den Verschlaufungszuständen diskutiert.

CPP 9.19 Sa 16:45 Poster TU D

Glassy states and microphase separation in crosslinked homopolymer blends — •Christian Wald[1], Annette Zippelius[1] und Paul M. Goldbart[2] — [1]Institut für Theoretische Physik, Universität Göttingen, Friedrich-Hund-Platz 1, 37077 Göttingen — [2]Department of Physics, University of Illinois at Urbana-Champaign, 1110 West Green Street, Urbana, Illinois 61801-3080, U.S.A.

We address the physical properties of blends of distinct homopolymers, crosslinked beyond the gelation point, via a Landau approach involving a pair of coupled order-parameter fields: one describing vulcanisation, the other describing local phase separation. Thermal concentration fluctuations, present at the time of crosslinking, are "frozen in" into the gel network. The resulting glassy fluctuations are analysed at the Gaussian level in various regimes, determined by the relative values of certain physical length-scales. We also analyse the enhancement, due to crosslinking, of the stability of the blend with respect to demixing. Beyond the corresponding stability limit, complete phase separation is prevented by gelation and replaced by microphase separation, which occurs up to a length-scale set by the mesh size of the network, as a simple variational scheme reveals.

CPP 9.20 Sa 16:45 Poster TU D

Model treatment of tensile deformation of semi-crystalline polymers: Evaluation of temperature and crystallinity effects for low crystallinity polyethylenes — •Ke Hong and Gert Strobl — Physikalisches Institut, Albert-Ludwigs-Universität, Hermann-Herder-Str.3, 79104 Freiburg, Germany

A model constructed to treat tensile deformation of semi-crystalline polymers introduced in previous work is again applied to measurements on low crystallinity polyethylenes and is now used for an evaluation of temperature and crystallinity effects. We measured true stress-true strain relationships at constant strain rates, determined the elastic and plastic part of imposed strain in cyclic unload-relaxation experiments, and followed the stress-relaxation at fixed strains. The model treats the stress as arising from three contributions, quasi-static stresses originating from the stretched network of entangled chains in the fluid regions and from the force-transmitting skeleton of crystallites, plus the viscous forces described by Eyring's equation. Adjustment of the measured data to the model provides a decomposition of the stress in the three parts. The results show that a rising temperature or a lowering of the crystallinity leads the shear modulus of amorphous network essentially unchanged, whereas crystalline stress and the viscous stress decrease.

CPP 9.21 Sa 16:45 Poster TU D

Surface morphology of pressure sensitive adhesive blend films as probed by atomic force microscopy — •K.M. Schlögl, E. Maurer, S. Loi, and P. Müller-Buschbaum — TU München, Physik-Department E13, James-Franck-Str. 1, D-85747 Garching, Germany

Pressure sensitive adhesives (PSA) play an important role as materials in the glue industry as well as in everyday life. Beside of homo- and copolymers polymer mixtures are of great interest due to their ability to increase the stickiness of the surface. The adhesion properties are depending decisive on the bonding history, which means parameters like contact pressure and time, temperature and debonding rate. One central

aspect in understanding the adhesion process lies therefore in characteristics and conditions of the examined surface. The atomic force microscope (AFM) is a widespread spectroscopic method for surface analysis. Information about the structure and composition of these polymer blends are obtained down to the molecular scale. In this way characteristic illustrations of the roughness and surface morphology can tend to control the adhesive process.

CPP 9.22 Sa 16:45 Poster TU D

Mechanischer Abbau von Silica gemessen mit der Röntgen-Kleinwinkelstreuung — •Verena Vollnhals, Gerald J. Schneider und Dietmar Göritz — Institut für Physik, Universität Regensburg, 93040 Regensburg

Untersucht wurde, welche Strukturänderungen sich auf der Nanometerskala ergeben, wenn äußere mechanische Kräfte auf die Silica einwirken. Dies spielt für ein besseres Verständnis des Einmischvorgangs von Kieselsäure in Kautschuk eine Rolle, da die Dispersion des Füllstoffes in der Matrix die Eigenschaften der Mischungen zu beeinflussen scheint. In dieser Arbeit wird die Strukturveränderung von Silica nach einer mechanischen Zerkleinerung in einem Mörser verfolgt.

Zur Untersuchung von Strukturen im Bereich von 5nm bis 150nm eignen sich Röntgen-Kleinwinkel-Streuexperimente. Die Beschreibung der Streukurve erfolgt mit einem Ansatz für fraktale Strukturen. Als Funktion der Zerkleinerungszeit werden Strukturgröße und ihr Aufbau durch die primären Bausteine ermittelt.