

were investigated for different filler degrees.

CPP 13.32 Tue 14:00 P3

Nano two-point Microrheology: Structure and Dynamics of Polymer-melts near T_g — ●MARKUS SELMKE, SUBHASIS ADHIKARI, and FRANK CICHOS — Molecular Nanophotonics Group, University Leipzig

The structure of glassy polymer melts near their glass transition point has been controversially debated for a long time, and so are the numerous partly successful models suggested for such complex systems. A qualitatively proposed one, the view that cage-like structures form, i.e. soft cavities in-between interlocked stiff polymer-backbone arches, is one among others. To investigate the structure, molecular dynamics in the low M_w glass former glycerol have been studied by Orrit et. al. (2006), and rheological data has been found to agree with SM rotational relaxation times. Our group has not only extended this comparison to the complex high- M_w glass-former PMA, where such a match is far from being evident, but also compared the SM experiments to dielectric data that yields information on local flexibility and reorientation of the matrix the molecules are embedded in, confirming the expected difference in timescales due to different observable physical phenomena underlying the methods (Ngai, 1988). To further study polymer networks, the cross-correlated thermal motion of suitably chosen fluorescent tracer-dyes attached to the ends of bi-functionalized polymer strands is to be explored in the system with FRET on a nm-scale with the method of 2-point microrheology as introduced by (Crocker, 2000). This way, a 1/r-strain-field consistent correlation, or any deviation, is expected to shed light on the cage structure.

CPP 13.33 Tue 14:00 P3

Shapes of two dimensional star polymers — ●CHRISTIAN VON FERBER^{1,2}, YATES MONTEITH³, and MARVIN BISHOP³ —

CPP 14: POSTERS Nanoparticles

Time: Tuesday 14:00–16:30

Location: P3

CPP 14.1 Tue 14:00 P3

Energy Transfer on Molecular Aggregates — ●JAN RODEN¹, ALEXANDER EISFELD¹, and WALTER STRUNZ² — ¹MPI-PKS Dresden, Finite Systems — ²TU Dresden, Theoretische Quantenoptik

Since the discovery in the 1930's, molecular aggregates have attracted experimental and theoretical research, due to their unique linear and non-linear optical properties [1]. Furthermore they are possible candidates for artificial light harvesting units.

The properties of such molecular aggregates are strongly affected not only by static disorder, but also by internal vibrations of the constituting monomers, which couple strongly to electronic excitation [2]. To understand the optical properties and the energy transfer dynamics of molecular aggregates a theory has to properly take into account these effects.

Using a new approach based on a non Markovian Schrödinger equation [3] allows the non-perturbative treatment of internal vibrational modes of the monomers which are coupled to the surrounding. The comparison with results obtained by direct diagonalization of a model Hamiltonian containing one vibrational mode per monomer shows good agreement. The influence of vibrations to the energy transfer is discussed.

[1] T. Kobayashi, (ed.) J-Aggregates, World Scientific, 1996

[2] A. Eisfeld, J. S. Briggs, Chem. Phys. 324, (2006) 376

[3] T. Yu, L. Diosi, N. Gisin, W. Strunz, Phys. Rev. A. 60, (1999) 91

CPP 14.2 Tue 14:00 P3

About the active role of aluminum oxide nanoparticles on network formation in epoxy nanocomposite system: Influence of mixing sequence. — ●BARTOSZ ZIELINSKI, MARTINE PHILIPP, ULRICH MÜLLER, PIERRE-COLIN GERVAIS, ROLAND SANCTUARY, JÖRG BALLER, and JAN KRISTIAN KRÜGER — LPM, University of Luxembourg, Luxembourg

Many properties of polymer nanocomposites can be significantly improved by adding appropriate fillers like nanoparticles. The desired features of the polymer nanocomposites can be achieved by the properties of the nanoparticles themselves and/or by interactions between the polymer matrix and the particles. Due to chemical and/or physi-

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We explore the shapes of excluded volume, two dimensional star polymers by both renormalization group methods and Monte Carlo computer simulation of a tangent hard disk model. The mean-square radius of gyration, the g-ratio and the asphericity of linear and star polymers are examined. The standard expansion for the g-ratio is modified to use the known exact value of the radius of gyration exponent $\nu = 3/4$ rather than only the first order ϵ -expansion value. Good agreement is obtained with the current Monte Carlo Pivot algorithm results and previous simulations of other polymer models. Our approach also improves the predictions of the g-ratio in three dimensions significantly enhancing the accuracy of the renormalization group results for calculating shape properties.

CPP 13.34 Tue 14:00 P3

Characterization of flexible dendrimers by small-angle scattering — ●SABINE ROSENFELDT¹, MATTHIAS BALLAUFF¹, and LUDGER HARNAU² — ¹Physikalische Chemie I, Universität Bayreuth, Germany — ²MPI für Metallforschung, Universität Stuttgart, Germany

Solutions of flexible dendrimers are investigated up to volume fractions of 0.23, which is a value slightly over the overlap concentration of the dendrimers. Small-angle neutron scattering and contrast variation were used to determine the radial structure and the interparticular interactions. The experimental structure factors will be used to test the validity of the decoupling approximation of the total scattering intensity. The data were interpreted using the PRISM integral equation formalism. It is shown that the decoupling approach using the form factor of an undisturbed dendrimer is a good approximation, even for the data in the range of the overlap concentration.

cal interactions between the nanoparticles and the polymer matrix the properties of the composite are often more affected than predicted, as such interactions lead to the creation of an additional morphology called interphase. The formation of interphases is often in concurrence with the bulk polymerization process. In consequence the mixing sequence of the nanoparticles and the other constituents of the nanocomposite can already have a strong impact on the final properties.

It will be shown that by optical investigations already in the primary suspensions (resin/nanoparticles and hardener/nanoparticles) significantly different properties and therefore different interactions are present. As a matter of fact the different optical properties do not vanish but even increase in the course of polymerization. Accordingly the network formation has to be influenced by the interactions, too.

Refractometry was chosen as experimental technique.

CPP 14.3 Tue 14:00 P3

Photophysical studies of zinc porphyrin oligomers — ●ĘDRZEJ SZMYTKOWSKI^{1,2}, JONAS CONRADT¹, WOLFGANG LÖFFLER¹, TEODOR SILVIU BALABAN^{2,3}, MATTHIEU KOEPF⁴, JENNIFER WYTKO⁴, JEAN WEISS⁴, and HEINZ KALT^{1,2} — ¹Karlsruhe Institute of Technology (KIT), Universität Karlsruhe (TH), Institute of Applied Physics, Karlsruhe, Germany — ²Center for Functional Nanostructures (CFN), Karlsruhe, Germany — ³Karlsruhe Institute of Technology (KIT), Forschungszentrum Karlsruhe, Institute for Nanotechnology, Karlsruhe, Germany — ⁴Institut de Chimie, UMR 7177, Université Louis Pasteur, Strasbourg, France

The fabrication of novel multiporphyrinic arrays is important for the progress of molecular electronics and to mimic self-assembling chromophores in artificial light harvesting devices. We report on the time resolved photoluminescence studies of two novel phenanthroline strapped Zn-porphyrins having an imidazole pendant arm and C₁₂ or C₁₈ alkyl chains. The luminescence dynamics have been analyzed using decay associated spectra (DAS). The obtained results show the formation of well-ordered J-aggregates. Such self-assembled species have been recently directly observed for these porphyrins deposited on the mica surface by various nanoscopic techniques. No evidence of energy transfer from the phenanthroline strap to the zinc porphyrin has been found, a fact which can be explained by unfavourable Förster-

and Dexter-type energy transfer processes.

CPP 14.4 Tue 14:00 P3

Time resolved luminescence spectroscopy of self-assembling magnesium porphyrins — ●JĘDRZEJ SZMYTKOWSKI^{1,2}, JONAS CONRADT¹, CHILLA MALLA REDDY³, TEODOR SILVIU BALABAN^{2,3}, and HEINZ KALT^{1,2} — ¹Karlsruhe Institute of Technology (KIT), Universität Karlsruhe (TH), Institute of Applied Physics, Karlsruhe, Germany — ²Center for Functional Nanostructures (CFN), Karlsruhe, Germany — ³Karlsruhe Institute of Technology (KIT), Forschungszentrum Karlsruhe, Institute for Nanotechnology, Karlsruhe, Germany

Self-assembled porphyrins are promising materials to mimic natural bacteriochlorophylls (BChl) *c*, *d* or *e* encountered in the chlorosomes of photosynthetic bacteria. Such large assemblies of porphyrin metal complexes can be also used in hybrid solar cells as light harvesting antennas. In order to address their suitability we have studied the time resolved luminescence of novel magnesium diacetyl porphyrins. The decays of luminescence have been analyzed by a fitting procedure, which produces decay associated spectra (DAS). The analysis shows a short-lived component associated with the supramolecular architecture. This has implications for optimizing device geometries where the exciton diffusion lengths are not surpassed.

CPP 14.5 Tue 14:00 P3

Magnetische Eigenschaften Mn-dotierter CdSe/CdS-Halbleiternanopartikel bei thermischer Behandlung — ●ANDREAS HOFMANN¹, SHIH-HAO KUNG¹, CHRISTINA GRAF¹, KRISCHAN JELTSCH¹, CHRISTINE BOEGLIN² und ECKART RÜHL¹ — ¹Inst. f. Chemie u. Biochemie, Freie Universität Berlin, 14195 Berlin — ²Inst. de Physique et Chimie d. Matériaux de Strasbourg, 67034 Strasbourg

Mn-dotierte CdSe/CdS-Nanomischkristalle mit variabler Mn-Konzentration und einem Durchmesser von 2.9-3.8 nm wurden mit chemischen Hochtemperaturverfahren synthetisiert. Im Anschluss daran wurden die Partikel bei 210 °C für 48-72 h in Hexadecylamin getempert. Um die elektronische Struktur und die magnetischen Eigenschaften der Mn-Atome während dieser Erhitzungsphase näher zu untersuchen, wurden an den Partikeln magnetische Röntgenzirkulardichroismus-Messungen durchgeführt.[1] Dabei wurde untersucht, inwieweit hierbei eine Änderung des paramagnetischen Verhaltens erfolgt und ob eine lokale Mn-Se-Mn-Clusterbildung auftritt.[2] Die durchgeführten Messungen zeigen eine Änderung des Spinmoments nach dem Tempern infolge der veränderten lokalen Umgebung des Mn. Dabei konnte gezeigt werden, dass der Syntheseprozess den Temper-Effekt deutlich beeinflusst. Ein in Ref. [2] diskutierter Übergang des Mn vom paramagnetischen hin zum superparamagnetischen Verhalten konnte jedoch für diese Systeme ausgeschlossen werden, da keine oder nur eine unvollständige Clusterbildung stattfindet. [1] A. Hofmann et al. Chem. Phys. Chem. 8, 2008 (2007). [2] D. Magana et al. J. Am. Chem. Soc. 128, 293 (2006).

CPP 14.6 Tue 14:00 P3

Spectroscopic fingerprints of photodegrading CdSe/ZnS quantum dots — ●DANNY KOWERKO, JÖRG SCHUSTER, and CHRISTIAN VON BORCZYKOWSKI — Center of nanostructured materials and analytics, TU-Chemnitz, 09107 Chemnitz

Colloidal semiconductor nanocrystals have been under investigation for more than a decade with a growing field of applications in science and industry. However, photophysics and chemistry are still not fully understood, since crystal structure of core and shell as well as ligands may vary slightly between different charges, thus yielding individual optical properties even of single quantum dots from the same stock. We will discuss the role of surface (states) and its defined modification (e.g. by functionalized dye molecules) with special regard to nanocrystal degradation processes which are obviously accompanied by distinct spectral shifts and lifetime alterations. Besides time resolved ensemble studies in solution, we have chosen a multiparameter single particle approach, giving insight to spectral and luminescence lifetime fluctuations of individual quantum dots. Comparison of individual - on SiO₂ immobilized - untreated and modified species will provide a deeper insight towards the underlying mechanisms of surface manipulation induced photodegradation and thus allow for a correlation with the ensemble results.

CPP 14.7 Tue 14:00 P3

Sidewall functionalization of carbon nanotubes for preparation of nanocomposites — ●ANASTASIA GOLOSOVA^{1,2}, GERHARD RICHTER², ANDREAS TIMMANN³, RAINER JORDAN², and CHRISTINE

PAPADAKIS¹ — ¹TU München, Physikdepartment, Garching — ²TU München, Department Chemie, Garching — ³HASYLAB at DESY, Hamburg

In polymer nanocomposites, the nanometer size active fillers can change the material properties of polymer matrices within a wide range. Among others, carbon nanotubes (CNTs) are some of the most intriguing additives due to their unique mechanical, thermal, and electrical properties. However, until now the challenge of efficient incorporation and compatibilization of the CNTs with the surrounding matrix, which is crucial for the anticipated improved properties of the composite, is still unsolved.

To tune the surface properties of CNTs we extended a recently developed modification to form well-defined self-assembled monolayers from (bi)phenyl diazonium salt derivatives on carbon-based substrates to the sidewall modification of CNTs. Successful covalent functionalization of the nanotubes was confirmed by Raman spectroscopy and thermo-gravimetric analysis.

In order to investigate the dispersion ability of modified samples, we performed SAXS experiments (HASYLAB at DESY). Intensive scattering from big agglomerates of raw carbon nanotubes in deionized water was observed, while the dispersions of modified CNTs were homogeneous, which confirms better solubility of functionalized samples.

CPP 14.8 Tue 14:00 P3

Characterization of optical active nanostructures on silicon — ●THOMAS BAUMGÄRTEL, HARALD GRAAF, and CHRISTIAN VON BORCZYKOWSKI — Center of Nanostructured Materials and Analytics, TU Chemnitz, 09107 Chemnitz, Germany

Anchoring optically active molecules on nanostructured surfaces is a promising step towards building complex structures with variable properties and functions. Recently we could demonstrate that nanostructures on silicon surfaces can be functionalized in a neat way through selective binding of dye molecules and nanoparticles [1]. Here we report on the characterization of nanostructures on silicon that have been optically functionalized by binding of cationic dye molecules. The nanostructures were created by AFM-induced local anodic oxidation of dodecyl-terminated silicon. The two cationic dyes rhodamine 6G and cresyl violet have been selectively attached to nanostructures via electrostatic interactions and were studied using wide-field and confocal microscopy. The spectrum of the bound dyes indicates the existence of two different species of molecules: some of the molecules show the same spectral emission compared to dye molecules in solution, for other molecules there is a clear blue-shift of the emission wavelength. The bleaching behaviour of the dyes on to the structure follows a biexponential decrease pointing also towards two different species of bound dyes.

[1] H. Graaf, M. Vieluf, and C. von Borczykowski, Nanotechnology 18, 265306 (2007)

CPP 14.9 Tue 14:00 P3

Mechanical properties of self-assembled mesoscale fibers investigated by AFM bending experiments — ●DANIEL KLUGE¹, FRANK ABRAHAM², STEPHAN SCHMIDT¹, HANS-WERNER SCHMIDT², and ANDREAS FERY¹ — ¹Department of Physical Chemistry II, University of Bayreuth, Universitätsstraße 30, 95440 Bayreuth, Germany — ²Department of Macromolecular Chemistry I, University of Bayreuth, Universitätsstraße 30, 95440 Bayreuth, Germany

Fibers with diameters in the range of nm to μm have a large field of applications, mainly for tissue engineering and in composite materials. However, little is known about the mechanical properties of individual fibers on the mesoscale. We used AFM (atomic force microscopy) for force measurements in analogy to a macroscopic 3 point bending test to investigate self-assembled fiber-like structures of aromatic benzene trisamides. These had the ability to form remarkable hexagonal hollow cylinder morphologies. Our results suggest that their elastic modulus is comparable to semi-crystalline polymers. One special feature of our measurements was the usage of the force mapping mode of the AFM. This was a facile way to enhance the reliability of the measurements and collect significant amounts of data at the same time. The extensive data collection of our method marks a good starting point for future modeling and a thorough understanding of single-fiber deformation on the mesoscale.

CPP 14.10 Tue 14:00 P3

Molecular dynamics simulations of nucleation and growth of mixed FeCl₂/NaCl nanoparticles from supercritical water — ●NORBERT LÜMMEN and BJØRN KVAMME — University in Bergen, De-