CPP 25 POSTER Electronic Structure and Spectroscopy

Time: Thursday 17:00–19:00 Room: P2

CPP 25.1 Thu 17:00 P2

Theoretical investigation of the excited states of tungstate molecular groups in zinc tungstate crystals — •Tatiana Nikolaenko, Sergiy Nedilko, and Yuriy Hizhnyi — Faculty of Physics, Kyiv National Taras Shevchenko University, 2, block 1, Hlushkova av., 03680, Kyiv, Ukraine

The crystals of zinc $ZnWO_4$ tungstate are well known scintillation and laser materials, which are used in different applications. The composition and structure of the luminescence centers in zinc tungstate are still the subjects of discussion. Nevertheless, it is commonly believed that the optical and luminescence properties of $ZnWO_4$ are determined largely by their anionic structural components, the tungstate groups. In order to study the luminescence processes in zinc tungstate theoretically, we perform quantum-chemical calculations of the electronic structure of ${WO_6}^{6-}$ molecular groups in $ZnWO_4$.

Molecular cluster of $ZnWO_4$ consisted of ${WO_6}^{6-}$ group and the nearest Zn^{2+} cation was taken into consideration. Multiconfigurational self-consistent field wavefunctions of the cluster are calculated using GAMESS quantum chemistry package [1]. Dependencies of energies of the ground and excited electronic states of the cluster on several normal coordinates are obtained. The schemes of luminescence processes in $ZnWO_4$ are constructed using the obtained results. The origin of several bands in absorption and reflection spectra of the crystals is discussed on the base of the calculations.

[1] Schmidt M.W., et al., J. Comput. Chem., 14, 1347, (1993)

CPP 25.2 Thu 17:00 P2

Electronic Properties of Metals Embedded into Porous Polymeric Nanotemplates — •Radim Krenek[1], Vera Cimrova[2], Olaf Seifarth[3], Vera Bocharova[1], Ganna Gorodyska[1], Alexander Sidorenko[4], Dieter Schmeisser[3], and Manfred Stamm[1] — [1]Leibniz-Institut für Polymerforschung e.V., Dresden, Germany — [2]Institute of Macromolecular Chemistry, Academy of Sciences of Czech Rep., Prague, Czech Rep. — [3]Brandenburgische Technische Universität, Cottbus, Germany — [4]Bell Labs, Lucent Technologies, Murray Hill, USA

We report on electrical measurements (current-voltage characteristics (CVC)) of metals which are templated via porous polymeric nanotemplates. The nanotemplates are based on self-organization of poly(styrene-block-4-vinylpyridine) (PS-PVP). The cylindrical pores of 8 nm in the diameter are ordered in a hexagonal lattice (24 nm in the period). Chromium and gold were embedded in the nanotemplates by magnetron sputtering, nickel was electrodeposited. These thin films were characterized by AFM, ellipsometry, x-ray reflectivity, XAS, XPS and NEXAFS.

CVC were acquired by a connection common for light emitting diodes discussing a further use of nanotemplated metals in these devices. To make the connection, the nanotemplate was deposited on glass with ITO electrodes, then metal was embedded into it and finally Al electrodes were evaporated on the device. Behaviour of space charge limited currents (SCLC) was observed. Also, we deal with the electrical mode of AFM as well. Finally electronic behaviour of the metallic nanorods embedded in polymeric nanotemplates is discussed in respective to the structure and chemical composition obtained by AFM and x-ray techniques.

CPP 25.3 Thu 17:00 P2

7Li NMR as a tool for the characterization of functional materials for lithium secondary batteries — •Nikolaus Nestle[1], Sina Gumann[1], Verena Liebau[2], Robert Kolb[2], Claudia Fasel[2], Hans-Gerhard Bremes[2], Ralf Riedel[2], Natalia Bramnik[2], and Helmut Ehrenberg[2] — [1]Institute of condensed matter physics, TU Darmstadt, Hochschulstr. 6, D-64289 Darmstadt, Germany — [2]Department of materials science, TU Darmstadt, D-64289 Darmstadt, Germany

Rechargeable lithium batteries have found wide-spread use in mobile electronic appliances during the last few years. Improving the performance of the electrode materials and the electrolyte with respect to electrical cycling stability, safety, energy density and cost is a major challenge for the further improvement of lithium batteries. To achieve these goals, a microscopic understanding of the chemical structure of the materials and the processes taking place during charging and discharging is needed. A significant part of the research efforts in the SFB 595 "Electric fatigue in functional materials" is devoted to this topic. One of the experimental tools in this project is solid state NMR which is used to characterize the chemical environment of the Li ions in the materials and also their dynamic and transport properties. Results on various types of materials such as lithiated SiCN ceramics and LiCoO2 are presented and discussed in the context of findings from other techniques such as electrochemical measurements, ESR, X-ray and Raman spectroscopy. Furthermore, approaches to improving the sensitivity of NMR for studies on materials extracted from tiny battery models are discussed.

CPP 25.4 Thu 17:00 P2

Irradiation defects in Fluoranthene radical cation salts - an Overhausershift analysis — •Dominik Stöffler, Malte Drescher, and Elmar Dormann — Physikalisches Institut, Universität Karlsruhe (TH), D-76128 Karlsruhe, Germany

After the exposure of Fluoranthene radical cation salts with high-energetic protons, we encountered various interesting changes in their physical properties, e.g. a lowered Peierls transition temperature and an increased strength of a narrow line low temperature ESR signal. Analysing the caused defects, which can be detected at low temperatures by their Curie-paramagnetism, we hope to obtain details of the electronic and crystallographic structure. We deduce from the narrow ESR-linewidth that the electron spin is delocalised over several molecules, but it is a priori unclear if this arises from either the exchange interaction of several localized spins or the delocalisation of a single electron over multiple molecules. Method of choice is the ESR and the Overhausershift technique to gather additional information about the wave function of the unpaired electrons at low temperature.

CPP 25.5 Thu 17:00 P2

Hierarchical and approximate quantum master equations based on a decomposition of the spectral density applied to electron injection into a DNA base pair — •G.-Q. Li, M. Schröder, M. Schreiber, and U. Kleinekathöfer — Institut für Physik, Technische Universität Chemnitz, 09107 Chemnitz

The relaxation process of a system of one and of two interacting harmonic oscillators coupled to a thermal heat bath is studied. On short time scales memory effects play an important role for the relaxation behavior of the systems density matrix. For the description of such dynamical effects Meier and Tannor proposed a time-nonlocal scheme [1] based on second-order perturbation theory. In their scheme a set of auxiliary density matrices enters the quantum master equation and gives rise to the memory effects [2]. In our work we will use a modified and numerically less expensive version of recently proposed hierarchical methods [3,4] for exactly solving the quantum master equation of the reduced systems density matrix. This method can be shown to be identical with the scheme of Meier and Tannor to second order in the system-bath coupling but can be easily extended to higher orders. The different levels of theories are tested for a damped harmonic oscillator and for two coupled oscillators mimicking the electron injection from a donor into a DNA base pair.

[1] C. Meier, D. Tannor, J. Chem. Phys. **111** 3365, (1999).
[2] U. Kleinekathöfer, J. Chem. Phys. **121**, 2505 (2004).
[3] Y. Yan, F. Yang, Y. Liu, J. Shao, Chem. Phys. Lett. **395** 216 (2004).
[4] R.-X. Xu et al, J. Chem. Phys. **122** 041103 (2005).

CPP 25.6 Thu 17:00 P2

CIDNP and ^{19}F-^{1}H Spin Polarization Transfer in 3-Fluorotyrosine — •Sergey Korchak[1], Vitor Nascimento de Carvalho Pinto[1], Konstantin Ivanov[2], and Hans-Martin Vieth[1] — [1]Department of Physics, Free University of Berlin, Arnimallee 14, D-14195 Berlin, Germany — [2]International Tomography Center of SB RAS, 630090, Institutskaya 3a, Novosibirsk, Russia

The transfer of dynamic spin polarization between different nuclei in biological molecules can be used for labeling specific nuclear positions and applied to NMR spectroscopy in biology and medicine or for sensitivity enhancement in magnetic resonance imaging. Here, we report on strong Chemically Induced Dynamic Nuclear Polarization (CIDNP) created in reversible photoreactions between biological molecules and triplet exited dyes involving transient radical pairs. In particular, the ^{19}F-^{1}H polarization transfer in CIDNP experiments with 3-fluoro-DL-tyrosine is examined by means of ^{19}F-CIDNP and ^{1}H-CIDNP. For the first time, the magnetic field dependence of ^{19}F-CIDNP at 0-7 T is obtained. The

mechanism of polarization transfer is revealed and optimum conditions for getting high spin polarization transfer are discussed. By comparing the experimental results with model calculations the g-factor of the 3-fluorotyrosine radical is obtained. The fluorinated amino acids incorporated in proteins may be used for the investigation of protein folding with the advantage that fluorine exhibits a higher CIDNP effect than proton and that the background ^1H polarization is absent.

CPP 25.7 Thu 17:00 P2

Comparison of the Layered Semiconductors GaSe, GaS, and $GaSe_{1-x}S_x$ by Raman and Photoluminescence Spectroscopy — •Lothar Kador[1], Carmen Pérez León[1], Kerim R. Allakhverdiev[2], Tarik Baykara[2], and Ali A. Kaya[2] — [1]University of Bayreuth, Institute of Physics and Bayreuther Institut für Makromolekülforschung (BIMF), D–95440 Bayreuth, Germany — [2]Marmara Research Centre of TÜBITAK, Materials Institute, P. K. 21, TR–41470 Gebze/Koçaelı, Turkey

The room-temperature Raman spectra of single crystals of GaSe, GaS, and mixed compounds $GaSe_{1-x}S_x$ with $0.02 \leq x \leq 0.8$ were measured with a HeNe laser in confocal configuration. The changes in the spectra indicate changes of the crystal structure. The spectra of pure GaSe and of the mixed compound with $x = 0.02$ show, in addition, pronounced photoluminescence signals blue-shifted from the laser line. Their origin is interpreted as second-harmonic generation in the laser focus causing the formation and radiative decay of Wannier excitons. Two-photon absorption is ruled out, since the effect is absent in the centrosymmetric crystals with $x > 0.02$. With a green laser whose photon energy is larger than the band gap, strong photoluminescence is also observed in crystals with higher sulfur content.

CPP 25.8 Thu 17:00 P2

Imaging and Spectrally Discriminated Time-Resolved Photoluminescence of Single Aggregates of Semiconductor Nanocrystals — •Thomas Blaudeck and Frank Cichos — Photonics and Optical Materials, TU Chemnitz, 09107 Chemnitz

In our contribution, we present results of single-particle spectroscopy and time-resolved photoluminescence measurements on single NP aggregates. We make use of a home-built confocal microscope and time-resolved single-photon counting equipment with a precision in the ps regime. Using a photon-by-photon correlation technique, our idea is to determine fluorescence lifetime fluctuations on timescales shorter than accessible via conventional techniques. The results are correlated with typical processes of charge diffusion in the nanocrystals. The optical detection allows spectral discrimination in two channels.

CPP 25.9 Thu 17:00 P2

Photothermal Microscopy on Single Quantum Objects — •Romy Raduenz, Achim Gruber, and Frank Cichos — Photonics and Optical Materials, Institute of Physics, Chemnitz University of Technology, 09107 Chemnitz

Single chromophore detection is typically restricted to highly fluorescent entities such as dye molecules or quantum dots. But it fails to access non-fluorescent species. An extension of single chromophore detection to the spectroscopy of non-fluorescent species would thus open a completely new field of studies and analytical possibilities. A technique, which can provide this extension is photothermal detection. Within this technique the conversion of the absorbed photon energy into heat and finally a refractive index change of the local environment is employed to detect single chromophores. This refractive index change is directly proportional to the absorption cross section of the chromophore and therefore allows in principle the measurement of the absorption spectrum. Within our study we present experimental and theoretical results of photothermal confocal microscopy. Our detection scheme is based on the creation of a photothermal lens in the local surrounding of the absorbing species, that is excited by a laser beam. The thermal lens is used to modulate a probe laser beam. The sensitivity of this method is evaluated based on measurements on single gold nanoparticles.

CPP 25.10 Thu 17:00 P2

Defocused Wide Field Imaging of Single Quantum Dots — •Roman Schuster[1], Michael Barth[2], Rebecca Wagner[3], Achim Gruber[3], Thomas Blaudeck[3], and Frank Cichos[3] — [1]Leibniz Institute for Solid State and Materials Research Dresden, 01171 Dresden — [2]Nano-Optics group, Institute of Physics, Humboldt University Berlin, Hausvogteiplatz 5-7, 10117 Berlin — [3]Photonics and Optical Materials, Institute of Physics, Chemnitz University of Technology, 09107 Chemnitz

We have applied fluorescence wide-field imaging to study the details of the transition moment of single CdSe/ZnS core/shell quantum dots. [1] Introducing a slight defocusing into the imaging creates a well resolved pattern from the light emitted by a single quantum dot. This pattern is a consequence of the diffraction of the light on the aperture of the microscope objective and contains information on the angular anisotropy of the light emitted by the quantum dot. By comparing these images to numerical calculations of the diffraction patterns we find, that the transition moment of CdSe quantum dots is not circular at room temperature. All images can be either fitted with an elliptical transition moment or even a 3-dimensional transition moment. The results suggest that the transition moment at room temperature is more complex than so far suggested and determined by the mixing of different valence band states, which form finally a 3-dimensional transition moment. A combination of different polarization projection methods with defocused imaging are evaluated to unraval the details of the 3-dimensional transition moment.

[1] R. Schuster et al., Chem. Phys. Lett.,2005 , 413, 280.

CPP 25.11 Thu 17:00 P2

Electronic excitation energy transfer in individual donor-acceptor dyads — •Remi Metivier[1], Florian Feist[1], Fabian Nolde[2], Klaus Müllen[2], and Thomas Basché [1] — [1]Institut für Physikalische Chemie, Johannes Gutenberg-Universität Mainz — [2]Max Planck-Institut für Polymerforschung, Mainz

We have studied a new class of structurally well-defined donor-acceptor dyades which exhibit efficient unidirectional energy transfer.The dyads are formed by connecting a variable number of donor chromophores (peryleneimide/perylenediimide) to an acceptor chromophore (terrylenediimide) through a rigid poly(phenylene) linker. In a first set of experiments a linear dyad was investigated, where the donor and the acceptor are linked by a p-terphenyl spacer. Fluorescence emission spectra showed acceptor emission only indicating highly efficient energy transfer. Single molecule spectroscopy at low temperature (1.4K) offers the possibility to directly extract the energy transfer rates from the line widths of the donor fluorescence excitation spectra. The distribution of energy transfer times was centered around 5 picoseconds. Comparison to a distribution calculated by assuming a Förster mechanism showed that an additional through-bond interaction might play a role in this bichromophoric dyad. The second multichromophoric system studied is a polyphenylene dendrimer in which four peripheral donor chromophores are build around a central acceptor core. Besides measuring energy transfer rates for individual donor chromophores within an isolated aggregate, we will also show that the orientation of the donor chromophores can be estimated from the distribution of transfer times.

CPP 25.12 Thu 17:00 P2

Setup for flowcytometric based fluorescence measurements of red fluorescent dyes — •Babette Hinkeldey, Alexander Schmitt, and Gregor Jung — Biophysical Chemistry, Saarland University, Building B2.2, D-66123 Saarbrücken, Germany

In the last decades, Single Molecule Detection (SMD) has become an important scientific field in biophysical and biomedical applications. By coupling individual molecules with fluorescent dyes, observation of the movements of these individual molecules even in living cells is possible. Due to reduced autofluorescence in living cells, red dyes are favoured. Thus, the understanding of the photophysical properties of fluorescent dyes is one of the relevant domains. Especially the photostability is of great interest, as a precise prediction of the average number of excitation cycles before dye degradation is highly recommended for quantitative and comparable results. In addition, the correlation between chemical structure and physical properties could result in improved strategies of synthesis of application matched dyes. Therefore it is necessary to develop a method which fulfills the conditions to obtain quantitative results in order to being able to compare different fluorescent dyes. In our contribution we show the setup for flowcytometric based fluorescence measurements. Finally, perfomance data and first results with a red fluorescent dye are presented.

CPP 25.13 Thu 17:00 P2

Single-Molecule Spectroscopy of Individual Perylene Bisimide Derivatives — •Hanna Engelke[1], Erwin Lang[1], Peter Osswald[2], Frank Würthner[2], and Jürgen Köhler[1] — [1]Experimental Physics IV, University of Bayreuth — [2]Institute for Organic Chemistry, University of Würzburg

We present a detailed characterisation of the photophysical properties of three different perylene bisimide derivatives. The probe molecules have been immobilized in a Shpol'skii matrix of hexadecane and were investigated by single-molecule spectroscopy at cryogenic temperatures. Exploiting single-molecule techniques, we compare the three derivatives as regards their saturation behaviour, triplet substate kinetics and fluorescence quantum yield.

CPP 25.14 Thu 17:00 P2

Photobleaching on the Single Molecule and Ensemble Level — •Jörg Brabandt, Jörg Schuster, and Christian von Borczyskowski — Institute of Physics, TU Chemnitz, 09107 Chemnitz

We study the photobleaching of dye molecules on the single molecule and ensemble level. Ensemble photobleaching is characterized by a reversible and an irreversible part, the latter one being the well established photodestruction of the dye. The reversible part of the photobleaching is due to the existence of dark periods where the molecule reversibly switches between on- and off-states, so called photoblinking [1] [2]. The discrimination between the two mechanisms is a difficult task, since the decision wether a given dye molecule is in a long dark state or already irreversibly photochemically destructed requires extremely long observation times. We show, how both aspects of photobleaching can be inferred from single molecule observations. Furthermore, we present a detailed analysis of the reversible part of photobleaching by a number of ensemble experiments.

[1] Orrit et al., J. Phys. Chem. A 107 (2003), 6770
[2] Schuster et al., Appl. Phys. Lett. 87 (2005), 051915

CPP 25.15 Thu 17:00 P2

Optical Switching and Dielectric Response of Nematic Liquid Crystals Dispersed in a Ferroelectric Poly(Vinylidene Fluoride/Trifluoroethylene) Matrix — •Lakshmi Meena Ganesan, Axel Mellinger, Michael Wegener, Werner Wirges, and Reimund Gerhard-Multhaupt — Department of Physics, University of Potsdam, Am Neuen Palais 10, 14469 Potsdam

Liquid-crystal (LC) droplets embedded in a polymer matrix induce switching behaviour in the composite film through the alignment of the director along an external electric field. When a ferroelectric material is used as host polymer, hysteretic effects in the electric-field dependence of the optical transmission occur, making these materials interesting candidates for electro-optical switches (light valves) and fundamental studies of the internal electric field in the LC cavities. Polymer-dispersed liquid-crystal (PDLC) films were prepared by dispersing a nematic liquid crystal in a ferroelectric copolymer of vinylidene fluoride and trifluoroethylene [P(VDF-TrFE)] using a solvent-induced phase-separation method. Along with the field-dependent optical transmission of the PDLC, the hysteresis between electric displacement and electric field was measured and compared with that of the pure copolymer. As the liquid-crystal content was increased in the composite film, the coercive field was reduced, whereas the difference in transmission between the "on" and "off" state increased. In addition, the dielectric behaviour of the pure liquid crystal, of the PDLC and of the pure copolymer was measured and compared with each other.

CPP 25.16 Thu 17:00 P2

Non-linear optical properties of fluorescein — •Christian Meffert, Sven Verpoort, and Hilmar Franke — Fachbereich Physik / Angewandte Physik, Universität Duisburg-Essen, Lotharstr. 1, D-47048 Duisburg, Germany

During the irradiation of an optical cuvette filled with flourescein by laser-light a self-focusing effect has been detected. At first this effect has been measured quantitatively before the light-induced change of the refractive index has been characterized. The refractive index change of guest-host films was measured as a function of light exposure using ATR leaky mode spectroscopy. Fluorescein has been indiffused into the polymer Nafion. The non-linear optical feedback of the ATR-layer stack with the incoupling light has been investigated. Finally the non-linear influence on the fluorescence coupling in optical fibers is being discussed.

CPP 25.17 Thu 17:00 P2

Holographic Information Storage in Azobenzene-Containing Diblock Copolymers — •Michael Häckel[1], Lothar Kador[1], Daniela Kropp[2], Carsten Frenz[2], Roland Walker[2], Anja Gress[2], Klaus Kreger[2], and Hans-Werner Schmidt[2] — [1]Institute of Physics and BIMF, University of Bayreuth, 95440 Bayreuth, Germany — [2]Macromolecular Chemistry I and BIMF, University of Bayreuth, 95440 Bayreuth, Germany

The optically induced birefringence in different azobenzene- and mesogen-containing block copolymers has been studied with holographic methods. In the block copolymers, the light-sensitive blocks containing the azobenzene moieties are embedded in a matrix of polystyrene. Angular multiplexing of holographic plane-wave gratings as well as of two-dimensional images has been performed in samples with thicknesses up to 1.1 mm. The achievable refractive-index modulation, the photosensitivity, and the stability of the inscribed gratings were compared for different materials. In contrast to photopolymers, our materials do not exhibit shrinkage upon illumination. Instead a weak light-induced volume expansion was detected and studied in detail.

CPP 25.18 Thu 17:00 P2

Luminescent characterization of perovskite-like layered strontium lanthanum titanate compounds — •Volodymyr Chumak[1], Yu. Titov[1], M. Slobodyanik[1], S. Nedilko[2], O. Chukova[2], and P. Smolyar [2] — [1]Chemistry faculty of Kyiv National Taras Shevchenko University, 64, Volodymyrska str., 01033, Kyiv, Ukraine — [2]Physics faculty of Kyiv National Taras Shevchenko University

First the peculiarities of the luminescent emission of the five-slab perovskite-like $SrLa_{4-x}Ln_xTi_5O_{17}$ (Ln = Pr, Yb) compounds belonged to the $A_nB_nO_{3n+2}$ - family are found and described.

Photoluminescence and excitation spectra were obtained at 4.2, 77 and 300 K. Luminescence was excited by radiation from the the N_2-laser, the Ar-laser, powerful xenon lamp DKsL-1000. The luminescence was registered using MDR-2 and DFS-12 diffraction spectrometers which cover wide spectral region. Reflection, excitation and luminescence spectra were also investigated using synchrotron radiation in the energy region 3.5-20 eV. Experiments with synchrotron radiation were carried on at SUPERLUMI station at HASYLAB (DESY), Hamburg, Germany.

Results of experimental studies allowed us to conclude that mentioned above the sets of compound could be regarded as perspective phosphors, i. e. the transformers of the UV or IR emission into visible light, or the white-light-emitting and storage phosphors, perspective laser materials. When doped with the rare earth ions Pr^{3+} or Yb^{3+} they are considered as perspective fast-scintillation materials.

CPP 25.19 Thu 17:00 P2

Holographic recording of more-dimensional periodic refractive index patterns — •Rafael Meinhardt — University Duisburg-Essen, Applied Physics, 47057 Duisburg, Germany

Based on multiple-beam interference, 1-D, 2-D or 3-D optical lattices were created to generate refractive index patterns with crystalline and quasi-crystalline structure inside two different photosensitve material systems by applying the method of holographic lithography.

For the relationships between the recording parameters and the desired optical lattice numerical simulations calculate the spatial intensity profile formed by N coherent plane waves. The resulting optical lattice can be visualized in the form of an animation or several plots and its lattice constants can be discribed by using standard crystallographic formalisms.

Considering the simulation parameters, different holographic setups in vertical and horizontal geometry are realized, with which we are able to perform either consecutive or simultanous structuring of the material. These optical lattices were transfered both in solid plates of photosensitive PMMA and in evaporated films of the azo dye Disperse Red 1.

The recorded structures were characterized by evaluating the resulting diffraction patterns and AFM images. In PMMA a pure refractive index pattern was observed whereas in DR1 a dual grating was formed which is made up of a refractive and a surface relief. In both cases the simulated structures have been confirmed.

CPP 25.20 Thu 17:00 P2

Holographic recording of more-dimensional periodic refractive index patterns — •Rafael Meinhardt[1], Ansgar Draude[1], Hilmar Franke[1], and Roger A. Lessard[2] — [1]department of applied physics, university of Duisburg-Essen, Lotharstr.1, 47057 Duisburg, Germany — [2]COPL, departement de physique, university of Laval, G1K7P4, Quebec, Canada

Based on multiple-beam interference, 1-D, 2-D or 3-D optical lattices were created to generate refractive index patterns with crystalline and quasi-crystalline structure inside two different photosensitve material systems by applying the method of holographic lithography.

For the relationships between the recording parameters and the desired optical lattice numerical simulations calculate the spatial intensity profile formed by N coherent plane waves. The resulting optical lattice can be visualized in the form of an animation or several plots and its lattice constants can be discribed by using standard crystallographic formalisms.

Considering the simulation parameters, different holographic setups in vertical and horizontal geometry are realized, with which we are able to perform either consecutive or simultanous structuring of the material.

Optical lattices were transfered both in solid plates of photosensitive PMMA and in evaporated films of the azo dye Disperse Red 1.

The recorded structures were characterized by evaluating the resulting diffraction patterns and AFM images. In PMMA a pure refractive index pattern was observed whereas in DR1 a dual grating was formed which is made up of a refractive and a surface relief part. In both cases the simulated structures have been confirmed.

CPP 25.21 Thu 17:00 P2

Investigation of gratings formed in the interface pDR1m / PMMA — •Knut Morawetz[1], Ulrich Pietsch[2], Burkhard Schulz[1], Pertsh Mirzoyan[1], Marina Saphiannikova[1], Oliver Henneberg[1], and Birgit Dietzel[3] — [1]University of Potsdam, Institute of Physics, Am Neuen Palais 10, D-14469, Germany — [2]University of Siegen, Solid state physics, 57068 Siegen , Germany — [3]IDM-Teltow, Kantstraße 55, D-14513 Teltow, Germany

Surface relief gratings (SRGs) can be inscribed onto azobenzene polymer films by holographic illumination with the actinic light (488 nm). By exposing the initially flat surface of a polymer film to an interference pattern of two counter-circularly polarized beams one can create a SRG with amplitudes of several nanometer height within a few minutes of exposure. The lateral spacing D can be tuned between D= 500 and 5000 nm by changing the angle between the two parts of split up laser beam. To get a multiplayer system it was covered a pDR1m film by a second transparent polymer layer (PMMA) that is not affected by the actinic light. After holographic illumination of these layer system it was found a diffraction pattern of light. The PMMA layer was removed by washing the sample with a solvent. The free surface of the azobenzene polymer layer was inspected by AFM. In the washed region the grating height was found to be inverse proportional to the PMMA height. Theoretical simulations conform the experimental results.

CPP 25.22 Thu 17:00 P2

Photo induced aging of polymers — •Knut Morawetz[1], Burkhard Stiller[1], Jaroslav Ilnytskyi[1], Dieter Neher[1], Stefan Katholy[1], Ronald Ries[2], and Asta Richter[2] — [1]University of Potsdam, Institute of Physics, Am Neuen Palais 10, D-14469, Germany — [2]University of Applied Sciences, Engineering Physics Section, Bahnhofstraße ,15745 Wildau, Germany

The photo induced aging of freshly prepared azobenzene films is studied. It was found that under illumination the film undergoes essential changes in both its mechanical and optical properties. In the first illumination cycle, an abnormal response was observed. At first, the layer stiffness increased, afterwards the film becomes softer. However, a long time (24h) illumination leads to a strong increase of both hardness and stiffness as well as to the change of the film colour. The experiments were performed using different techniques. The method of nano indentation was used to obtain the absolute values for the E modulus and for a hardness of films, these data were compared with the measurements for the stiffness and thickness made by AFM with high lateral resolution. Optical properties, in particular the absorption and refractive index were measured by UV-VIS spectroscopy and ellipsometry.