HL 69: Poster Session: II-VI semiconductors; Organic semiconductors; Heterostructures

Presenters are kindly asked to be near their posters at least 17:00–18:00 or to leave a note at the poster indicating a time period of availability for discussions. — Beverages will be served starting at 18:00.

Time: Wednesday 16:00–20:00 Location: Poster A

HL 69.1 Wed 16:00 Poster A

Fabrication and characteristics of ZnO/ZnS core-shell nanotubes based on template-fabrication techniques — •Samar Tarish[1,2], Ahmed Al-Haddad[1,2], Chengliang Wang[1], Huaping Zhao[1], Yan Mi[1], and Yong Lei[1] — [1]Fachgebiet 3D-Nanostrukturierung, Institut für Physik & IMN MacroNano (ZIK), Technische Universität Ilmenau, Prof. Schmidt Str. 26, 98693 Ilmenau, Germany. — [2]Department of Physics, College of Science, University of Al-Mustansiryah, Baghdad, Iraq.

Here we will introduce a new technique that has been employed by fabricating ZnO/ZnS one-dimensional core-shell nanotubes, where synthesized by a two-step growth process with the assistance of AAO templates. Phase and structural analyses reveal that the ZnO core has a single crystalline phase, whereas the ZnS shell has a polycrystalline phase covering the surface of the core. First ZnO nanotube arrays are synthesized within AAO templates by atomic layer deposition (ALD) at 2500C. Then, by using an electrodepostion route, Na2S and ZnN were employed to supply S and Zn atoms at different temperatures to form ZnS-coated ZnO nanotubes structures. Then ZnO/ZnS core-shell coaxial nanotubes are created .The morphology and structure of ZnO/ZnS coaxial nanotubes are characterized by X-ray diffraction (XRD), field-emission scanning electron microscopy (FESEM), X-ray energy-dispersive spectroscopy (EDX), transmission electron microscopy (TEM).

HL 69.2 Wed 16:00 Poster A

Doping of ZnO micro and nano crystals prepared by sol-gel technique — •Christoph Brodehl, Jahanzeb Azam, Tim Baumgarten, and Sigmund Greulich-Weber — University of Paderborn, 33098 Paderborn, Warburger Str. 100, Germany

Zinc oxide (ZnO) is a wide-bandgap semiconductor with promising applications in the optoelectronic domain. Our main focus is on micro and nano crystalline ZnO as a transparent conductor in solar cells and photonic crystals, and as diluted magnetic semiconductor (DMS) for development of left-handed materials. We prepared ZnO nano and micro crystals via sol-gel routes and doped them with donors, acceptors and regarding to DMS with manganese. Annealing series of doped and as-grown crystals were characterized with electron paramagnetic resonance (EPR), photoluminescence, electron microscopy, X-ray diffraction and conductivity measurements. The annealing studies investigated by EPR together with photoluminescence measurements allow an identification of the commonly observed positively charged oxygen vacancy and the positively charged interstitial zinc as intrinsic defects in as-grown nominally undoped sol-gel ZnO. Beside shallow intrinsic defects and dopants a surface-related defect was always present and determines the crystal conductivity at least at room temperature. Doping with lithium allows a partly compensation of shallow intrinsic defects. Depending on the annealing temperature, we observed changes in EPR spectra of manganese doped ZnO. The samples show paramagnetic behavior for low annealing temperatures and ferromagnetic behavior for temperatures higher than 800°C.

HL 69.3 Wed 16:00 Poster A

Magneto-Stark effect on excitons in ZnO investigated by nonlinear optical spectrosopy — •David Brunne[1], Marco Lafrentz[1], Victor V. Pavlov[2], Roman V. Pisarev[2], Anna Rodina[2], Dmitri R. Yakovlev[1,2], Dietmar Fröhlich[1], and Manfred Bayer[1] — [1]Experimentelle Physik 2, Technische Universitaet Dortmund, D-44221 Dortmund, Germany — [2]Ioffe Physical-Technical Institute, Russian Academy of Sciences, 194021 St. Petersburg, Russia

The magneto-Stark effect on moving excitons is proved as a driving mechanism enabling resonant second harmonic generation (SHG) in hexagonal ZnO. Strong SHG signals induced by external magnetic fields are observed in the spectral range of 2s and 2p excitons. Theoretical microscopic analysis shows, regardless the fact that the magnetic field is an even parity perturbation, for excitons with a finite k-vector wave functions of opposite parities are mixed by an effective odd parity electric field. Magnetic field, spectral and polarization dependencies of SHG intensity confirm the proposed mechanism.

HL 69.4 Wed 16:00 Poster A

Struktierte Ag-Diffusionsprofile in CdTe durch Cu-Filme — •Johannes Lehnert, Herbert Wolf, Manfred Deicher und Thomas Wichert — Experimentalphysik, Universität des Saarlandes, 66123 Saarbrücken

Das Diffusionsverhalten von Ag in CdTe lässt sich durch das Aufdampfen von Metallfilmen vor der Diffusion stark verändern. Dieser Effekt wurde für Cu, Au, Ni und Al gezeigt. Für die verschiedenen Metalle ergeben sich große quantitative Unterschiede, der stärkste Effekt wird von einem Cu-Film verursacht. Radiotracer-Messungen haben gezeigt, dass sich auf diese Weise das Ag-Diffusionsprofil bei einer Diffusionstemperatur von 500 K und einer Diffusionszeit von 30 min um mehrere 100 μm in das Kristallinnere verlagern lässt [1]. Wird ein CdTe-Kristall lateral homogen mit radioaktivem ^{111}Ag implantiert und anschließend die implantierte Seite mit einem strukturierten Cu-Film bedampft, so lässt sich auf diese Weise ein lateral strukturiertes Tiefenprofil von Ag in CdTe erzeugen. Die laterale Verteilung wurde mit Autoradiographie bestimmt. In Kombination mit der tiefenauflösenden Radiotracer-Technik lässt sich die dreidimensionale Verteilung der radioaktiven ^{111}Ag-Atome rekonstruieren. In diesem Beitrag werden Beispiele für lateral strukturierte Ag-Profile in CdTe vorgestellt. Mit dieser Vorgehensweise konnte z.B. eine Ag-Verteilung im CdTe-Kristall erzeugt werden, die der Form eines Zylinderhutes entspricht.
Gefördert durch das BMBF, Projekt 05K10TS2.
[1] H. Wolf *et al.*, Appl. Phys. Lett. **100** (2012) 171915

HL 69.5 Wed 16:00 Poster A

Bandgap engineering in $Cd_xZn_{1-x}Te$ ternary alloy nanowires — •Nazli Kheirabi[1], Keivan Davami[1], Mehrdad Shaygan[1], Judith Pohl[2], Giovanni Cuniberti[1,2], Jeong-Soo Lee[1], and Meyya Meyyappan[1,3] — [1]Division of IT Convergence Engineering, Pohang University of Science and Technology, Pohang, 790-894, Korea — [2]Institute for Materials Science, Dresden University of Technology, D-01062, Dresden, Germany — [3]NASA Ames Research Center, Moffett Field, CA, USA

Herein, we report Au catalyzed vapor-liquid-solid growth and band gap engineering of single-crystalline alloy $Cd_xZn_{1-x}Te$ nanowires where a continuous tuning of x value ($0<x<1$) and desired nanowire composition were achieved by a precise substrate temperature control. A full investigation of the characteristics of our nanowires such as their morphology, crystal structure, lattice constant and composition was conducted by analyzing SEM and EDS results, TEM images, XRD patterns, Raman and photoluminescence (PL) spectra, and a monotonic increase in the Cd proportion in the alloy composition was confirmed. Near band gap peaks in PL spectra of alloy nanowires revealed a continuous decrease in energy bands from 2.24 eV to 1.52 eV when moving from ZnTe towards CdTe composition. The outcome of this work opens up new frontiers in the field of tunable band gap emission nano photonic devices operating in the range of visible to new infrared regions.

HL 69.6 Wed 16:00 Poster A

Photoresponse properties of ZnTe nanowire photodetectors — •Mehrdad Shaygan[1], Nazli Kheirabi[1], Keivan Davami[1], Jong-Soo Lee[1], Gianaurelio Cuniberti[1,2], and Meyya Meyyappan[1,3] — [1]Division of IT Convergence Engineering, Pohang University of Science and Technology, Pohang, South Korea — [2]Institute for Materials Science and Max Bergmann Center of Biomaterials, Dresden University of Technology, Dresden, Germany — [3]NASA Ames Research Center, Moffett Field, CA 94035, USA

Photoconductivity in semiconductors is the electrical conductivity enhancement due to the electron hole pair generation induced by radiation exposure. This phenomenon is the main mechanism of photodetection in sensors. There has been increasing interest for nanosensors of all kinds which can be light weight and less expensive and can be easily incorporated into MEMS/NEMS devices. Nanowires as one dimensional high aspect ratio nanostructures have several advantages over their bulk and thin film counterparts when applied as photodetectors. Zinc telluride, an important II-IV semiconductor with a direct

band gap of ~ 2.26 eV, has been considered as a prospective material for photosensing application. In this work, ZnTe nanowires have been synthesized by Vapor-Liquid-Solid method with optimized growth parameters. They have been incorporated in the well known single nanowire field effect transistor (SNFET) device structure to be electrically characterized in dark and under illumination. The wavelength dependent response of our ZnTe NW based photodetector has been investigated under near IR to near UV illumination.

HL 69.7 Wed 16:00 Poster A

Analysis of the energy transfer process in ZnS:Mn and ZnS:Tb by a modified Förster model — •Sebastian Gies[1], Uwe Kaiser[1], Wolfram Heimbrodt[1], Sebastian Geburt[2], and Carsten Ronning[2] — [1]Dept. of Physics, Philipps-University Marburg, Germany — [2]Institute of Solid State Physics, Friedrich-Schiller University Jena, Germany

Zinc Sulphide nanowires doped with different luminescence centers, i.e. Manganese and Terbium, are characterized by means of time-resolved photoluminescence spectroscopy, in order to analyze the energy transfer process quantitatively. To achieve this, a modified Förster model is utilized, describing the energy transfer with respect to migration, quenching processes and dimensionality of the energy transfer.

To test the resilience and validity of the modified Förster model nanowires with doping concentrations from $4 \cdot 10^{-3}$% to 4% were manufactured. The luminescence of the internal $4f^8$- (Tb^{3+}) and $3d^5$-transitions (Mn^{2+}) was measured over four orders of magnitude. Furthermore, the measurements were performed at varying excitation densities and temperatures, leading to a deeper understanding of the energy transfer process and its description via the modified Förster model. We were able to determine the hitherto unknown Förster radius of Tb^{3+} ions. Moreover, using μ-photoluminescence we have performed measurements on single nanowires and compared the results with measurements on macroscopic numbers of wires. We found, that the decay characteristics of single wires resemble the ensemble measurements. The statistical reason will be discussed in detail.

HL 69.8 Wed 16:00 Poster A

Excitons in ZnCdSe/ZnSe quantum dots with parabolic confinement potential — •Tamar Tchelidze[1] and Irakli Noselidze[2] — [1]Iv. Javakhishvili Tbilisi State University , Faculty of Exact and Natural Sciences, 3 Chavchavadze Ave. 0179 Tbilsi, Georgia — [2]Rustaveli National Science Foundation , 1 Aleksidze st . Tbilsi, Georgia

Material distribution profile is found to have significant influence on emission properties of quantum structures. It was reported that core/shell ZnCdSe/ZnSe semiconductor nanocrystals individually exhibit continuous, non-blinking photoluminescence, which was explained by softening the abrupt confinement potential of a typical core/shell nanocrystal, suggesting that the structure is a radially graded alloy of CdZnSe into ZnSe(Xiaoyong Wang et al, Nature 459, 686-689, 2009). We present exact calculation of electronic states for spherical core*shell quantum dots with realistic boundary condition: inside the dot potential is taken equal to -ar2, outside the dot - zero. Calculations are carried out for ZnCdSe/ZnSe structure. We use single band effective mass approximation for finding single particle states of electrons and holes. Exciton states with corresponding energies are calculated by direct diagonalization of Hamilton matrix for 8 lowest excitonic states and their radiative decay probability in dependence of quantum dot radius are calculated. We found that for quantum dots with radius less than 8 nm there is no electron levels inside the dot. For this radius exciton binding energy is 56 meV.

HL 69.9 Wed 16:00 Poster A

Single crystals by vapor and solution growth of organic semiconductors — •Jan-Peter Bäcker, Natalija van Well, and Cornelius Krellner — Physikalisches Institut, Goethe-Universität Frankfurt, Deutschland

The growth and investigations of single crystals of small molecule organic semiconductors is of crucial importance for the deeper understanding of these materials. We apply both a horizontal vapor-growth technique as well as growth from solutions to fabricate mm-sized single crystals of Phenanthrene, Pentacene, and Dibenzopentacene. In this contribution, we present the optimized crystal growth parameters together with investigations of the structural properties.

Recently, it was found that in some of these materials superconductivity can emerge after intercalation with alkali-earth metals [1]. Therefore, these materials are promising with respect to their semiconducting as well as superconducting properties. Here, we show the results of our preliminary intercalation experiments on single crystals to investigate the crossover from semi- to superconducting behaviour.

[1] M. Xue et al., Scientific Reports 2, 389 (2012).

HL 69.10 Wed 16:00 Poster A

Surface functionalization and optical characterization of self-organized surface structures on sublimation grown polyaromatic single crystals — •Teresa Schmeiler[1], Stefan Thoms[1], and Jens Pflaum[1,2] — [1]Inst. Exp. Phys. VI, Julius-Maximilians-University of Würzburg, 97074 Würzburg — [2]ZAE Bayern e.V., 97074 Würzburg

Previously we presented different approaches, such as epitaxial growth or surface etching, to generate micrometer-sized 3D pyramidal surface structures on polyaromatic single crystals of rubrene and diphenylanthracene. By means of FDTD-simulations as well as photoluminescence measurements an enhanced luminescence emission at the lateral edges has been observed. Upon further optimization this could lead to cavity structures with defined optical properties. In this context, one of the major drawbacks are refection losses at the interfaces of these organic structures resulting in a significantly reduced quality factor Q. In this contribution we will discuss a possible solution to this problem by means of an additional metallic, e.g. gold, cover layer. Optical investigation revealed an enhanced emission at the pyramidal cone ends when covered by a 50 nm gold layer. Consequently, the influence of surface functionalization on the cavity quality factor as well as on the population density of optical states was investigated as a function of material and cover layer thickness. Complementary, the coated surface structures were analysed by AFM as well as SEM which showed a homogenous metallic surface coverage. Financial support by the DFG research unit FOR1809 is gratefully acknowledged.

HL 69.11 Wed 16:00 Poster A

Influence of the presence of residual gases during sample fabrication on the performance and lifetime of OLEDs — •Florian Wölzl[1], Ines Rabelo de Moraes[2], Björn Lüssem[1], Karl Leo[1], and Malte C. Gather[1] — [1]Institut für Angewandte Photophysik, Technische Universität Dresden, George-Bähr-Str. 1, 01062 Dresden, Germany — [2]Institut für Photonische Technologien Jena Albert-Einstein-Straße 9 07745 Jena

Due to their application potential in lighting and display technology, organic light emitting diodes (OLEDs) have been attracting considerable attention. However, the lifetime of these devices is still a bottleneck for a broad application of the technology. Revealing the degradation processes, especially the chemical degradation is of great interest. In particular the processing conditions, such as the amount of residual gases during the deposition of the materials might have considerable influence. To manipulate their partial pressures during evaporation, a needle valve was added to the processing chamber which can be connected to a nitrogen or oxygen gas bottle as well as to a water-filled gas-washing bottle. This allows us to intentionally contaminate the chamber with these gases. The devices are prepared under a base pressure of $5 \cdot 10^{-6}$ to 10^{-8} mbar. In this work we will focus separately on the influence of nitrogen oxygen and water during the OLED preparation on the performance and lifetime of a p-i-n OLED based on the stable red triplet emitter tris(1-phenylisoquinoline) iridium(III) ($Ir(piq)_3$). By LDI-TOF-MS technique, the chemical degradation processes of an electrically driven OLED are investigated.

HL 69.12 Wed 16:00 Poster A

Simulations of electronic states at grain boundaries in polycrystalline naphthalene — •Marko Mladenović, Nenad Vukmirović, and Igor Stanković — Scientific Computing Laboratory, Institute of Physics Belgrade, University of Belgrade, Serbia

One of the limiting factors for charge carrier transport in polycrystalline organic semiconductors based on small molecules are grain boundaries. We investigated the electronic structure of grain boundaries in polycrystailline organic semiconductor naphthalene. Energy of the system was modeled using TraPEE potential for the interaction between atoms. Atomic structure was obtained by a Monte Carlo method. Electronic structure was obtained using the Charge patching method (CPM) [1], which is based on Density Functional Theory (DFT).

Results for small systems (1000 molecules) indicate that grain boundaries produce trap energy states within the band gap of the material. These states are localized on molecule pairs (called trapping pairs) at the grain boundaries with the distance between molecules sig-

nificantly smaller than the distance between two adjacent molecules in a naphthalene crystal. Strong correlation between trapping pair mutual distance and trap state energy relative to the top of the valence band energy was found. As a consequence, on the basis of the densities of trapping pairs, densities of trap states for bigger systems (100 000 molecules) were calculated.

[1] N. Vukmirovic, L. Wang, J. Chem. Phys. 128, 121102 (2008)

HL 69.13 Wed 16:00 Poster A

Polarization-resolved absorption of perfluoropentacene — •Jan Kuhnert, Kolja Kolata, Tobias Breuer, Gregor Witte, and Sangam Chatterjee — Philipps-Universität Marburg

Organic semiconductors are promising materials for future electronic applications. A well investigated and prototypical organic semiconductor is the p-type pentacene (PEN). Crystalline PEN films exhibit a pronounced Davydov-splitting of the excitonic excitations owing to the herringbone arrangement of both molecules within the unit cell (adopting an angle of about 52°). Perfluorination yields an n-type semiconductor (perfluoropentacene, PFP) which also exhibits a herringbone packing in the crystalline phase but with almost orthogonal arrangement (91,2°) between both molecules. Using polarization-resolved absorption measurements we demonstrate the presence of a Davydov-splitting in crystalline PFP films that were epitaxially grown on NaF(100) substrates. Moreover, by employing micro-spot illumination single crystalline domains and their azimuthal dependent excitation were analyzed. Measurements were performed at room temperature and at 10K, and yield an energetic splitting of both Davydov components of 27meV. Azimuthal resolved measurements reveal that the transition dipole moment of the high energy component is maximal for polarization parallel to the b-axis; accordingly, the transition dipole of the low energy component is oriented along the c-axis. The experiments demonstrate a Davydov-splitting like behavior despite an almost orthogonal molecular packing in the unit cell where a degeneration of excitonic components is anticipated.

HL 69.14 Wed 16:00 Poster A

Optical Spectroscopy on planar ZnO/Pentacene Hybrids — •Ingo G. Meyenburg, Manuel Demper, Jonatan Helzel, Mira El Helou, Tobias Breuer, Gregor Witte, and Wolfram Heimbrodt — Philipps Universität Marburg department of physics and material sciences centre Germany, Renthof 5, D-35032 Marburg

In recent years organic semiconductors have attracted considerable attention because of their unique optical, electronic and mechanical properties. It has been shown, for example that inorganic organic hybrids like p-type Pentacene on ZnO are feasible to prepare p-n-junction. To study the excitonic properties of the organic layer we prepared pentacene films with thicknesses in the range between 10 nm and 100 nm on different ZnO surfaces by molecular beam deposition under ultra-high vacuum. By varying the growth temperature we obtain pentacene films in an amorphous, in the thin film and the Campbell phase which were characterized by AFM and X-ray diffraction measurements. Due to a formation of crystalline islands in the range of several micrometres in the non-amorphous phases we were able to study the absorption behavior of these single crystals by varying the temperature and the light polarization. In comparison to the pentacene molecules in solution the absorption spectra of the crystalline pentacene exhibit additional pronounced Davydov-splitted excitonic features with characteristic polarization dependence. A detailed discussion will be given of the exciton properties at the organic-inorganic interface in dependence on the crystallographic structure and the orientation of the ZnO surfaces.

HL 69.15 Wed 16:00 Poster A

Temperature dependent exciton diffusion length in organic solar cells — •Bernhard Siegmund, Johannes Widmer, Christian Körner, Debdutta Ray, Karl Leo, and Moritz Riede — Institut für Angewandte Photophysik, Dresden, Germany

The photo-current of organic solar cells is the result of a multi-step process from the generation and diffusion of excitons to their separation into free charge carriers being then transported to the electrodes and extracted. In this work, the exciton diffusion length as function of temperature as well as a combined probability for charge carrier recombination and extraction are investigated in devices with a flat heterojunction between ZnPc and C60. To accomplish this, jV-characteristics of organic solar cells and the optical properties of the constituting single layers are studied at different temperatures in the range of 100 to 350K. Furthermore, the thickness of ZnPc is systematically varied from 7 to 70nm as well as the illumination intensity over two orders of magnitude to verify the obtained values. The results may lead to a better understanding of the temperature behaviour of organic solar cells.

HL 69.16 Wed 16:00 Poster A

Excitation of surface plasmon polaritons via prism coupling and metallic nanostructures for applications in organic solar cells — •Michael Mayr, Björn Gallheber, Mark Gruber, and Wolfgang Brütting — University of Augsburg, Germany

Organic photovoltaic cells based on diindenoperylene (DIP) exhibit high crystallinity in thin films resulting in long-range exciton transport and high charge carrier mobilities[1,2]. Due to nearly perpendicular orientation of the transition dipole moment with respect to the substrate, however, DIP exhibits only weak absorption for direct illumination, but tends to couple strongly to the near-field of surface plasmon polaritons (SPPs). Moreover, DIP provides a low lying HOMO and LUMO, which results in high open circuit voltages when using it as acceptor in combination with commonly used donor materials like oligo- or polythiophenes[3]. This makes DIP a promising candidate for using SPPs to increase the efficiency of organic solar cells. Due to the need for conservation of momentum and energy, light induced far-field excitation of SPPs at metal/dielectric medium interfaces is impossible. We use glass prisms and metallic nanostructures made by nanosphere lithography to overcome this problem, as they can manipulate the in-plane wave vector of incident photons to fulfill this condition. Particularly metallic nanostructures permit tuning of the excited SPPs by adjusting the size of the used nanospheres.

[1] J. Wagner et al. *Adv. Func. Mater.* **20**, 4295 (2010).
[2] D. Kurrle et al. *Appl. Phys. Lett.* **92**, 133306 (2008).
[3] U. Hörmann et al. *phys. stat. sol. RRL* **5**, 241 (2011).

HL 69.17 Wed 16:00 Poster A

Loss mechanisms in organic bulk heterojunction solar cells investigated by differential photocurrent density measurements — •Philipp Pelchmann[1], Simon Hein[1], Andreas Zusan[1], Vladimir Dyakonov[1,2], and Carsten Deibel[1] — [1]Experimental Physics VI, Julius-Maximilians-University of Würzburg, D-97074 Würzburg — [2]Bavarian Centre for Applied Energy Research (ZAE Bayern e.V.), D-97074 Würzburg

Organic solar cells are interesting for contributing to the solution of the growing demand for renewable energy sources. One of the main problems is their lower efficiency compared to their inorganic counterparts. For its optimization, a fundamental understanding of the loss mechanisms, i.e. geminate and non-geminate recombination, is crucial. The non-geminate recombination, a function of light intensity under short-circuit conditions, can be investigated by differential photocurrent (DPC) measurements [1]. Therefor, the electrical response of a solar cell to a superposition of a continuous background light and a modulated low intensity light is determined. We measured the DPC signal for bulk heterojunction solar cells made from poly(3-hexylthiophene) (P3HT) blend with [6,6]-phenyl C61-butyric acid methyl ester (PCBM) with various active layer thicknesses. The results are discussed with regard to non-geminate recombination of free and trapped charge carriers.

[1] L. J. A. Koster et al., Adv. Mater., 23, 1670 (2011)

HL 69.18 Wed 16:00 Poster A

Hybrid Organic Photodetectors for Radiography — •Patric Büchele[1,2], Oliver Schmidt[2], Sandro Tedde[2], David Hartmann[2], Moses Richter[3], and Uli Lemmer[1] — [1]Light Technology Institute, Karlsruhe Institute of Technology. Karlsruhe, Germany — [2]Siemens AG. Corporate Technologies. Erlangen, Germany — [3]Institute for Materials for Electronics and Energy Technology, Friedrich-Alexander University. Erlangen, Germany

Most of todays x-ray detectors are using an indirect conversion mechanism. The x-ray radiation is converted into visible light within a thick scintillator layer. The visible light is then absorbed by standard thin-film photodetectors. The isotropic propagation of light in the scintillator reduces the resolution of the x-ray imager. This work avoids the stacked structure by integration of inorganic PbS quantum dots directly into the bulk hetero junction (BHJ) of an organic photodetector. X-ray photons are immediately converted into charge carriers and travel in direction of the electrical field towards the electrodes. However, this concept demands much thicker organic layers than known from conventional OLED and OPV processing. We demonstrate that thick diodes can be achieved with a spray coating process and the

influence of spraying parameters on device performance is discussed.

HL 69.19 Wed 16:00 Poster A

Investigation of carrier dynamics in Ga(As1-xBix)/GaAs heterostructures by time-resolved photoluminescence — •Dimitri Kalincev[1], Mohammad Khaled Shakfa[1], Alexey Chernikov[1], Sangam Chatterjee[1], Xianfeng Lu[2], Shane R. Johnson[2], Dan A. Beaton[3], Thomas Tiedje[4], and Martin Koch[1] — [1]Department of Physics and Materials Sciences Center, Philipps-Universität Marburg, Renthof 5, D-35032 Marburg, Germany — [2]Department of Electrical Engineering, Arizona State University, Tempe, Arizona 85287-6206, United States — [3]Department of Physics and Astronomy, University of British Columbia, Vancouver, British Columbia V6T 1Z4, Canada — [4]Department of Electrical and Computer Engineering, University of Victoria, Victoria, British Columbia V8W 3P6, Canada

The ternary Ga(AsBi) semiconductor alloys have received considerable attention over the last decade due to their potential application in photonic and spintronic devices, especially in the near- and mid-infrared spectral range. Bi incorporation into GaAs leads to a great reduction in the band gap resulting from the giant band gap bowing effect. In our recent work, time-resolved photoluminescence (TR-PL) is used to investigate carrier dynamics of Ga(As1-xBix)/GaAs single quantum wells (SQWs) with different Bi contents. The TR-PL measurements are performed as function of excitation density and lattice temperature. The disorder effects and the presence of Bi clusters within the alloy structure are found to strongly influence the spectra and the dynamics.

HL 69.20 Wed 16:00 Poster A

The band alignment of the cuprous and cuprite oxide — •Benedikt Kramm, Philipp Hering, Daniel Reppin, Angelika Polity, and Bruno K. Meyer — 1. Physikalisches Institut, Justus-Liebig-Universität Gießen, Heinrich-Buff-Ring 16, 35392 Gießen

In recent work we showed the band alignment for the heterostructures of cuprous oxide, gallium nitride and zinc oxide. We found a conduction band offset (CBO) value of 0.97 eV for Cu_2O/ZnO and 0.24 eV for Cu_2O/GaN [1]. The low conduction band offset of Cu_2O/GaN making GaN a more suitable candidate for the front contact of Cu_2O based solar cells. Now we investigated heterostructures of CuO/GaN and CuO/Cu_2O. Details about the copper oxide thin films can be found here [2]. We analyzed the photoelectron characteristics of the heterostructures, on the surface and in the depth, and out of this we determined the band alignment of the copper oxide phases among each other and to gallium nitride and zinc oxide.

[1] B. Kramm et al., Appl. Phys. Lett. 100, 094102 (2012), DOI: 10.1063/1.3685719

[2] B.K. Meyer et al., Phys. Status Solidi B, 1-23 (2012), DOI: 10.1002/pssb.201248128

HL 69.21 Wed 16:00 Poster A

Exciton-polariton pseudospin in a planar ZnO based microcavity under external magnetic field — •Steffen Richter, Chris Sturm, Helena Franke, Rüdiger Schmidt-Grund, and Marius Grundmann — Universität Leipzig, Institut für Experimentelle Physik II, Linnéstr. 5, 04103 Leipzig, Germany

Strong light-matter coupling between excitons and photons leads to the formation of exciton-polaritons. These quasi-particles inherit exciton spin orientation as well as light polarization. Both are expressed by the pseudospin of a polariton ensemble. The effect of magnetic fields on the pseudospin was studied experimentally and theoretically. External magnetic fields of 3T were applied in three spatial orientations while the polarization was measured in photoluminescence experiments. The experimental findings cannot be explained by a simple model consisting of pseudospin precession, spin-independent scattering and decay. For the total magnetic field, an effective field arising from linear polarization splitting was considered additionally to the external one.
The planar microcavity under study consists of a $\lambda/2$ layer of ZnO with a slight wedge shape. The complete Stokes vector of the lower polariton branch was determined under non-resonant excitation. For the probed detuning, an energetic splitting of about 20meV between the TE- and TM-polarized eigenmodes is found for an emission angle of 37°. Unexpectedly, the emission from these modes shows even without external magnetic field a fraction of ca. 5% circular polarization with different sign for the TE and TM mode, respectively.

HL 69.22 Wed 16:00 Poster A

Magneto thermopower measurements on rolled-up 2DESs — •Nils Gayer, Matthias Schmidt, Gunnar Schneider, David Sonnenberg, and Wolfgang Hansen — Institut für Angewandte Physik, Universität Hamburg

We present magneto thermopower and magnetotransport measurements on an evenly curved two-dimensional electron gas (2DEG). The 2DEG is confined in a rolled-up GaAs/AlGaAs high electron mobility heterostructure (HEMT) grown by molecular beam epitaxy. In a rolled-up 2DEG the perpendicular magnetic field component is sinusoidally modulated and the density of states changes along the roll. This arises because in a magnetic field the 2D electronic density of states condensates on the Landau levels (LL) and the filling of the LL depends on the strength of the magnetic field component perpendicular to the 2DEG. We rotate the rolled up structure in the magnetic field and show the dependence of the diagonal and the off-diagonal (Nernst-Ettingshausen) magneto thermopower on the rotation angle.

HL 69.23 Wed 16:00 Poster A

Investigation of light emitting indicators — •Lia Trapaidze[2], Ivane Beragchian[1], Ia Trapaidze[1], and Gela Goderdzishvili[1] — [1]Dep. of Physics, Georgian Technical University, 77 Kostava Ave. IV block, 0175, Tbilisi, Georgia — [2]Dep. of Physics, Tbilisi State Univeristy,3 Chavchavadze Ave., 0179 Tbilisi, Georgia

In the system of information represent and transmission, widely used, light emitting monolithic construction indicators with multi-elements. In our work we investigated: radiation diagrams of neighbor elements in multi-element indicators; dependence of emitting angle on the construction element, also we investigated influence of isolating protective thin films on the technology. We improved measurement method and created experimental equipment. By using our method, we can exactly determine expected parameters, optimally choose element construction and as well their technological method during planning process.