HL 36: Poster Ib

Topics: ZnO and II-VI and their relatives, Organic semiconductors, New materials, Surfaces, Heterostructures and interfaces, Optical properties, Ultra-fast phenomena

Time: Tuesday 15:00–19:00 Location: Poster A

HL 36.1 Tue 15:00 Poster A

H_2S-sensing in the ppb regime with ZnO nanowires — •Florian Huber, Sören Riegert, Manfred Madel, and Klaus Thonke — Institute of Quantum Matter / Semiconductor Physics Group, Ulm University

The detection of hydrogen sulfide (H_2S) plays a crucial role in several medical applications. On the one side it indicates different diseases such as asthma, on the other side it is used for therapeutic purposes, e.g. as so called "slow releasing H_2S-donors". However, the detection of small amounts of this gas is still a challenge, and especially for the analysis of the breath of patients a fast sensing method is needed.

In this project we investigate the electrical behaviour of ZnO nanowires towards H_2S detection in order to develop a fast and very sensitive sensor. The goal is the detection of H_2S concentrations in the lower ppb regime. Furthermore, the response of the nanowires to other gases, especially towards oxygen, is investigated in order to realize a breath sensor for medical use.

HL 36.2 Tue 15:00 Poster A

Growth of tilted ZnO nanowires by PLD on pre-structured sapphire substrates — •Alexander Shkurmanov[1], Chris Sturm[1], Guy Feuillet[2], Florian Tendille[3], Philippe De Mierry[3], Holger Hochmuth[1], and Marius Grundmann[1] — [1]Universität Leipzig, Inst. for Exp. Phys. II, Linnéstr. 5, 04103 Leipzig, Germany — [2]CEA/LETI 17, rue des Martyrs, 38054 Grenoble Cedex 9, France — [3]CNRS-CRHEA, rue Bernard Grégory, 06560 Valbonne, France

Nanowires (NWs) are highly interesting since they are building blocks, e.g. in light emitters, sensors and resonators. An advantage of ZnO NWs is that they can be grown self-organized within the bottom up approach. This growth leads typically to randomly organized growth of NWs or to NWs which are well oriented perpendicular to the surface. Here we report the well oriented growth of NW tilted against the surface normal. In doing so, we used a r-plane sapphire substrate where we apply a wet chemical etching process in order to prepare c-plane oriented facets [1]. These c-plane facets are tilted with respect to the r-plane oriented surface by an angle of about 57°. By using a high-pressure pulsed laser deposition process, an oriented growth of ZnO NWs on these c-plane facets along its normal was achieved.

[1] P. de Mierry et al, Appl. Phys. Lett. 96, 231918 (2010)

HL 36.3 Tue 15:00 Poster A

On the E3 deep-level in ZnO crystals — Rainer Pickenhain[1], Matthias Schmidt[2], •Holger von Wenckstern[1], and Marius Grundmann[1] — [1]Universität Leipzig, Institut für Experimentelle Physik II, Abteilung Halbleiterphysik, Linnéstraße 5, 04103 Leipzig — [2]Helmholtz-Zentrum für Umweltforschung GmbH, Abteilung Isotopenbiogeochemie, Permoserstraße 15, 04318 Leipzig

The deep-level E3 is frequently detected in n-doped ZnO crystals. Its thermal activation energy for electron emission into the conduction band amounts to approximately 280meV determined by deep-level transient spectroscopy (DLTS). In this work ZnO crystals from different sources were investigated by various space charge spectroscopic techniques with additional optical excitation. In the experiments the parameters temperature $4\,\mathrm{K} < T < 350\,\mathrm{K}$, photon energy $0.25\,\mathrm{eV} < h\nu < 4\,\mathrm{eV}$ and DLTS rate window $10^{-3}\,\mathrm{Hz} < r < 10^{4}\,\mathrm{Hz}$ were varied. The photo-ionisation cross-sections of two optical emission processes of electrons bound by E3 into the conduction band were measured. The results of these experiments suggest E3 to be a double centre with negative-U properties. Such model also explains the observed optical transitions. Based on the findings in this study a model for the E3 level is suggested. The model is discussed in the context of previously published theoretical work on native defects in ZnO.

HL 36.4 Tue 15:00 Poster A

Electrical properties of ZnO single nanowires — •Markus Stiller, José Barzola-Quiquia, Mahsa Zoraghi, and Pablo Esquinazi — Abteilung für Supraleitung und Magnetismus, Universität Leipzig, Linnestr. 5, D-04103, Germany

We have investigated the electrical resistance $R(T)$ of a ZnO nanowire of $\approx$ 400nm diameter as a function of temperature, between 30K and 300K, and frequency in the range 40Hz to 30MHz. The measurements were done on the as-prepared and after low-energy proton implantation at room temperature. The temperature dependence of the resistance of the wire, before proton implantation, can be well described by two processes in parallel. One process is the fluctuation induced tunneling conductance (FITC) and the other the usual thermally activated process. The existence of a tunneling conductance was also observed in the current-voltage ($I-V$) results, and can be well described by the FITC model. Impedance spectroscopy measurements in the as-prepared state and at room temperature indicate and support the idea of two contributions of these two transport processes in the nanowires. Electron backscatter diffraction confirms the existence of different crystalline regions. After the implantation of H^+ the electrical resistance $R(T)$ as well as the $I-V$ curves can be described by taking into account the contribution of the modified surface of the ZnO nanowire and a third thermally activated process is found. This can be explained by taking into account the impurity band splitting due to proton implantation.

HL 36.5 Tue 15:00 Poster A

B-induced inhomogeneous Broadening of the Electronic Spin Flip Resonance in $Zn_{.94}Mn_{.06}Se$ near the Metal-Insulator Transition — •Alexander Gerhard Knapp[1], Michael Hetterich[2], and Jean Geurts[1] — [1]Universität Würzburg, Experimentelle Physik 3, Würzburg, Germany — [2]Institute of Applied Physics, Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany

The diluted magnetic wide-gap semiconductor $Zn_{1-x}Mn_xSe$ allows the independent tuning of the magnetic and the electronic properties by variation of either the Mn content or the dopant concentration. The strong s-d exchange coupling between the Mn-iond d-levels and the s-type donor electrons gives rise to a giant Zeeman splitting in an external B-field. This short-range exchange interaction with the spatially randomly distributed Mn should result in a B-induced broadening of the donor energy distribution. We have investigated this effect for $Zn_{.94}Mn_{.06}Se$:Cl with various Cl-concentrations up to 4.5 10^{17} cm^{-3} by electron spin flip Raman spectroscopy (ESFRS) at $T = 1.6$ K. In ESFRS, the spin flip transition of the donor-bound electron is mediated by optically induced donor-bound excitons (D^0, X), which results in a sharp resonance of the ESFRS efficiency when the exciting laser photon energy matches the (D^0, X) energy. Therefore, we interpret the spectral dependence of the ESFRS-efficiency (resonance profile) in terms of the energy distribution of the donor states. We actually observe a significant broadening of the ESFRS resonance profiles with increasing B-field, up to 11.5 meV (FWHM) for $B = 5$ T.

HL 36.6 Tue 15:00 Poster A

Analyzing the crystal structure of CdSe nanowires — •Philip Harder, Tobias Redder, Tobias Kipp, and Alf Mews — Institute of Physical Chemistry, University Hamburg, Grindelallee 117, 20146 Hamburg, Germany

Semiconductor nanowires have interesting optical and electronical properties since their diameter scales on the nanometer size whereas their length can reach hundreds of microns. Their electronic properties strongly depend on the crystal structure. CdSe nanowires synthesized in solution via the SLS (solution-liquid-solid) method can exist in Zincblende and Wurtzite crystal structure. We developed a method that can determine the Wurtzite to Zincblende ratio and diameter of nanowires via powder X-ray diffraction measurements. The analalysis of the measured powder diffraction patterns was carried out via differential evolution algorithms and provides results with only few assumptions.

HL 36.7 Tue 15:00 Poster A

Systematic investigation of charge transfer in organic single crystal interfaces — •Yulia Krupskaya[1,2] and Alberto Morpurgo[1] — [1]DQMP, University of Geneva, Geneva, Switzerland — [2]IAPP, Dresden University of Technology, Dresden, Germany

Interfaces formed by two different organic semiconductors often exhibit significantly enhanced electrical conductivity, originating from the charge transfer between the constituent materials. The mechanisms driving the charge transfer and determining its amount are still not well studied and not understood microscopically. We have performed a systematic study of single-crystal charge transfer interfaces based on rubrene and F_x-TCNQ, a family of molecules whose electron affinity can be tuned by increasing the fluorine content. The combined analysis of transport and scanning Kelvin probe measurements reveals that the interfacial charge carrier density, resistivity, and activation energy correlate with the electron affinity of F_x-TCNQ molecules, with a higher affinity resulting in larger charge transfer. Although the transport properties can be described consistently and quantitatively using a mobility-edge model, we find that a quantitative analysis of charge transfer in terms of single-particle band diagrams reveals a discrepancy 100 meV in the interfacial energy level alignment. We attribute the discrepancy to phenomena known to affect the energetics of organic semiconductors, which are neglected by a single-particle description, such as molecular relaxation and band-gap renormalization due to screening.

Financial support: DFG KR 4364/1-1 and KR 4364/2-1

HL 36.8 Tue 15:00 Poster A

Optical properties of aromatic hydrocarbons in vapor phase — •Jonathan Prexl, Andre Rinn, Robin Döring, Nils Rosemann, and Sangam Chatterjee — Faculty of Physics and Materials Sciences Center, Philipps-Universität Marburg, Renthof 5, D-35037 Marburg

Organic single crystals are generally bound by the comparatively weak van-der-Waals interaction between the molecules. Their optical response commonly shows many spectral features which resemble the molecular response in addition to solid-state phenomena such as various exciton resonances. Typically, the molecular properties are investigated in solution. This yields significant influence of the dielectric environment such as the solvent shift or aggregation effects like excimer formation. Measurements in the vapor phase offer potential advantages to solution spectroscopy as they eliminate both. Here, we present a cost-effective, low-pressure heating-chamber-based setup enabling stable high-temperature conditions combined with a low leak rate. This enables reproducible spectroscopic measurements, such as photoluminescence or linear absorption, on pure vapor of the molecules. Exemplary data on various aromatic hydrocarbons are discussed and, e.g., in the case of perylene, compared to the solution and solid state responses.

HL 36.9 Tue 15:00 Poster A

Optical Spectroscopy on Organic-Inorganic Hybrid Structures - Charge Transfer in Type-II Level Systems — •Ingo Meyenburg[1], Benjamin Heidelmeier[1], Nils Rosemann[1], Christian Prinzisky[2], Jane Falgenhauer[3], Jörg Sundermeyer[2], Derck Schlettwein[3], and Wolfram Heimbrodt[1] — [1]Philipps Universität Marburg Department of Physics and Material Sciences Centre, Renthof 5, 35032 Marburg — [2]Philipps Universität Marburg Department of Chemistry, Hans-Meerwein-Straße, 35032 Marburg — [3]Justus-Liebig-University, Institute of Applied Physics, Heinrich-Buff-Ring 16, 35392 Gießen, Germany

Understanding interface processes is crucial for improvements of existing and new functional materials based on organic-inorganic hybrid semiconductor structures.

The depletion of excited organic states by charge transfer into the inorganic semiconductor helps to determine the level alignment at the interface. Indoline was already successfully used in dye sensitized solar cells (DSSC) which imply a charge transfer from the organic molecules into the inorganic substrate. Indoline dyes on mesoporous ZnO and on other promising substrates have been studied. A variation of the indoline dyes gives acces to different level alignments. The charge transfer time acts as sensor for the interfaces. The influence of the anchoring carboxylate chain on the charge transfer at the interface is clearified. Furthermore, newly sensitized Anthraquinone derivates are discussed regarding their suitability in DSSC.

HL 36.10 Tue 15:00 Poster A

Polarization-resolved reflectance spectroscopy of crystalline perfluoropentacene on various substrates — •Robin Carl Döring, David Leimbach, Tobias Breuer, Gregor Witte, and Sangam Chatterjee — Faculty of Physics and Materials Science Center, Philipps-Universität Marburg, Renthof 5, D-35032 Marburg, Germany

Perfluoropentacene (PFP) is the perfluorinated counterpart and hence n-type organic semiconductor to the prototypical p-type pentacene. It can be grown as highly crystalline thin films on various optically transparent substrates such as NaF, KCl, graphene and also graphene*s opaque multilayer counterpart, highly ordered pyrolytic graphite (HOPG). While PFP forms the typical herringbone motif on both NaF and KCl, it shows a π-stacking polymorph (PSP) on graphene and HOPG. Structural analyses show a π-stacking distance of only 3.07 Å, promising far higher values for electron and hole mobility and therefore greatly improved vertical transport, a desirable feature in potential organic electronic applications. Here, we investigate the influence of the packing motif and hence of the intermolecular coupling on the optoelectronic properties. Making use of polarization-resolved reflection contrast spectroscopy with high spatial resolution, we identify the corresponding exciton transition energies and correlate them with the orientation of crystalline domains and the substrate. Unfortunately, due to the face-on growth of the molecules, the π-stacking axis is inaccessible under normal angle of incidence. Hence, we perform close to grazing incidence photomodulated reflection spectroscopy.

HL 36.11 Tue 15:00 Poster A

The effect of electric field on polaron dynamics in quasi-one-dimensional conjugated polymers — •M.R. Mahani, A. Mirsakiyeva, and Anna Delin — Department of Materials and Nanophysics, School of Information and Communication Technology, Electrum 229, Royal Institute of Technology (KTH), SE-16440, Sweden.

Due to the strong electron-phonon coupling in conjugated polymers, the fundamental electronic excitations in these materials are always accompanied with a lattice distortion. The additional charge carriers dressed with a local structural deformation are called polarons and bipolarons. Among the successful theoretical methods to describe these excitations, density functional theory tends to underestimate the self-localizations, while the Hartree-Fock overestimates them. By use of the adopted Su-Schrieffer-Heeger Hamiltonian which has accurately reproduced the band structure, polaron formation, and other properties of the neutral and doped conjugated polymers, we investigate the effect of electric field on the polaron dynamics. We include an electric field in the Hamiltonian through the time-dependent vector potential via Peierls substitution of the phase factor. We solve the coupled quantum-classical equations for the electrons and the lattice displacements in the polymer chain, using numerical integration scheme. Our calculations elucidate the effect of electric field on the dynamics of polaron in quasi-one-dimensional polymers and contribute to the understanding of the polymer-based light-emitting diodes in which the injected carriers are usually under electric fields with different magnitudes.

HL 36.12 Tue 15:00 Poster A

Determination of trap distributions in organic semiconductors by fractional TSC measurements — •Michael Bretschneider, Alexander Wagenpfahl, and Carsten Deibel — Institut für Physik, Technische Universität Chemnitz, 09126 Chemnitz, Germany

The interplay between traps and charge transport is very important for virtually all organic electronic applications, as the charge carrier mobility has a direct impact on the performance. While hole traps are thoroughly investigated, only indirect information has been available on electron traps until recently. Therefore, we aim at correlating the energetic position and concentration of electron traps in soluble organic semiconductors with their charge transport properties. The properties of these electron trap states will be determined by defect spectroscopy. In particular, we performed thermally stimulated current (TSC) measurements on polymer diodes based on P3HT and PTB7. The resulting density of trap states distribution is compared to the results of time of flight measurements to gain deeper insight in the role of traps on charge transport.

HL 36.13 Tue 15:00 Poster A

Application of metal nanoparticle monolayers as highly tunable room temperature field-effect transistors — •Hauke Lehmann, Svenja Willing, Mirjam Volkmann, and Christian Klinke — Institut für Physikalische Chemie, Universität Hamburg, Grindelallee 117, 20146 Hamburg, Germany

To tackle the need for electrical devices with reduced power-

consumption, a limited charge-carrier concentration is advantageous. Single-electron transistors use the Coulomb repulsion that hinders the addition of electrons onto a small island. Due to this Coulomb-blockade effect, the energy levels inside such a small island are quantized. They can be tuned with an electric field which influences the possible transport across the structure. The resulting current oscillations allow for the definition of a conducting and non-conducting state and, thus, the application as transistor with unique periodic transfer characteristics. Colloidally synthesized CoPt nanoparticles are deposited onto substrates with predefined gold electrodes as highly ordered monolayers via the scalable Langmuir-Blodgett method. The nanoparticle array is limited to stripes by means of a resist mask. To influence the transport, a local back-gate electrode is employed underneath the channel for the first time. This enables good electrostatic control over individually addressable devices without interferences from a dielectric capping layer. This new fabrication method yields smoother and more sinusoidally shaped Coulomb oscillations. The predictable and highly reproducible behavior makes systematic investigations, high on/off-ratios and room-temperature operation possible.

HL 36.14 Tue 15:00 Poster A

Synthesis and characterization of free standing Silicene modified with organic groups — •Ravi Kumar Divakar[1], Wladmir Thiessen[1], Ihsan Amin[2], Raul David Rodriguez[3], Manuel Monecke[3], Mahfujur Rahaman[3], and Lukas M. Eng[1] — [1]Institut für Angewandte Physik, TU Dresden, Dresden, Germany — [2]Institut für Makromolekulare Chemie, TU Dresden, Dresden, Germany — [3]Institut für Physik, TU Chemnitz, Chemnitz, Germany

Silicene has attracted remarkable attention in both research and industry due to its potential application for devices such as field effect transistors [1]. Silicene usually is synthesized on Ag substrate using ultra high vacuum system [2]. We present here a novel wet-chemical synthesis route in order to prepare free-standing Silicene monolayers which are modified with organic moieties at the highly reactive Si-atoms at the edges of the sheet. These organic moieties prevent oxidation and provide stability in aqueous surfactant solution. The monolayer with surfactant has a thickness of ~2.5 nm measured by AFM [3]. Furthermore we have performed TEM measurements, showing a honeycomb lattice with the lattice constant a = (2.18 * 0.11) Å, in accordance with DFT calculations [4]. SEM measurements show a stacked morphology of Silicene sheets. The presence of silicon in the synthesized material is confirmed by XPS. In summary, we demonstrate a novel way to synthesize free standing Silicene. [1] Li Tao et al., Nature Nanotechnology 10 (2015) 227. [2] P. Vogt et al., Appl. Phys. Lett. 104 (2014) 021602. [3] M. Ait Ali et al., J. Physics: Conf. Series 491 (2014) 012009. [4] L. Chen et al., Appl. Phys. Lett. 102 (2013) 081602.

HL 36.15 Tue 15:00 Poster A

Investigation of Prussian blue type redox catalysts for artificial photosynthesis — •Franziska Simone Hegner, Núria López, and José-Ramon Galán-Mascarós — Institute of Chemical Research of Catalonia (ICIQ), Av. Països Catalans 16, 43007 Tarragona (Spain)

The development of an efficient, cheap and robust water-splitting catalyst remains the bottleneck step to realizing artificial photosynthesis. Materials based on Prussian blue (iron(III)hexacyanoferrate(II)), which fulfill all those criteria, have shown high catalytic activities with exceeding long-term stabilities. Notwithstanding, the detailed catalytic mechanisms remain unclear. Combining experimental methods with theoretical calculations we shed light on the underlying physics of Prussian blue and its derivatives

Catalytic systems were prepared by coating oxide semiconductors with Co[Fe(CN)6], which has shown to be the highest efficient water-oxidation catalyst. Their electrochemical behaviour and the oxygen evolution were studied under light conditions.

Due to their mixed-valence character, multiple spin configurations and various charge transfer states, Prussian blue and its analogues exhibit a high degree of complexity, which challenges theoretical calculations. We developed a computational approach to investigate these systems. Moreover, we found out new insights about the electronic and magnetic structure.

HL 36.16 Tue 15:00 Poster A

Impact of the nuclear spin bath on the carrier spin noise in InGaAs/GaAs self-assembled quantum dots — •Philipp Glasenapp[1], Dmitri Smirnov[2], Mikhail Glazov[2], Alex Greilich[1], Johannes Hackmann[1], Frithjof Anders[1], and Manfred Bayer[1] — [1]Technische Universität Dortmund, 44227 Dortmund, Germany — [2]Ioffe Physical-Technical Institute, 194021 St. Petersburg, Russia

Spin noise of self-assembled InGaAs/GaAs quantum dots doped with single electron or hole spins, and grown under identical conditions, is measured optically in the limit of low probe laser intensity. This allows to reveal fundamental properties of carrier spin dynamics due to interaction with surrounding nuclei on a level close to thermal equilibrium. These dynamics include for example Overhauser precession of electron spins due to isotropic hyperfine interaction. The most remarkable result is the decoupling of the carrier spins from the nuclei under longitudinal magnetic fields, leading to a crossover to 1/log (t) spin dynamics. This happens regardless of the type of carrier spin, and we find that under these conditions both electrons and holes obey comparable timescales of dephasing - an observation that can be seen as an evidence of nuclear quadrupolar effects in the quantum dots that do not depend on carrier spin doping, and which provide additional channels of spin dephasing beyond hyperfine interaction. We compare our results to existing theoretical models and find good agreement.

HL 36.17 Tue 15:00 Poster A

Electronic and magnetic properties of the ideal Fe/GaAs(110) interface — •Tim Iffländer[1], Steffen Rolf-Pissarczyk[1], Lars Winking[1], Rainer G. Ulbrich[1], Ali Al-Zubi[2], Stefan Blügel[2], and Martin Wenderoth[1] — [1]IV. Physikalisches Institut - Solids and Nanostructures, Georg-August-Universität Göttingen — [2]Peter Grünberg Institut (PGI-1) & Institute for Advanced Simulation (IAS-1), Forschungszentrum Jülich and JARA, 52425 Jülich, Germany

By means of scanning tunneling microscopy (STM) and spectroscopy (STS) in cross-sectional geometry we investigate the electronic properties of the ideal Fe/GaAs(110) interface. Highly-resolved STS measurements at the metal-semiconductor contact exhibit a continuum of metal-induced gap states (MIGS) in the first few atomic layers at the interface. Three-dimensional finite element calculations yield a precise value for the Schottky barrier height and additional information on the local density of states inside the valence and conduction band at the interface. Our density functional theory (DFT) calculations are in excellent agreement with the STS data showing that our experimental approach serves as an excellent probe to study the process of Schottky barrier formation on the atomic scale [1]. Furthermore, we investigate the magnetic properties of the ideal Fe/GaAs(110) interface by means of in situ magneto-optical Kerr effect measurements. We find a unidirectional magnetic anisotropy for 2-3 ML thin Fe films. Our results indicate that this anisotropy is the manifestation of a more complex spin structure. This work was supported by the DFG SPP 1285.

[1] T. Iffländer et al., Phys. Rev. Lett. 114, 146804 (2015).

HL 36.18 Tue 15:00 Poster A

Terahertz spectroscopy and ultrafast electron dynamics of a broad single GaAs/AlGaAs quantum well — •Johannes Schmidt[1,2], Stephan Winnerl[1], Martin Teich[1], Aaron M. Andrews[3], Gottfired Strasser[3], Harald Schneider[1], and Manfred Helm[1,2] — [1]Helmholtz-Zentrum Dresden-Rossendorf, 01314 Dresden, Germany — [2]Technische Universität Dresden, 01062 Dresden, Germany — [3]Technische Universität Wien, A-1040 Vienna, Austria

Ultrafast electron dynamics in quantum well (QW) structures is investigated by applying a strong terahertz (THz) field with a photon energy resonant to an intersubband transition. In particular, if the THz field is in resonance with the transition between the second and third subband, so-called Autler-Townes (or AC Stark) splitting could be observed when probing the 1-2 transition. This effect has been observed previously at mid-infrared wavelengths in an n-type multiple QW [1]. Our efforts aim at investigating the AC-Stark effect in the THz regime using a broad, 36 nm wide single QW where the carrier density can be tuned electrically. We will present our first results indicating absorption by an intersubband transition in the QW, where the electron population can be controlled by an electrical modulation technique. Furthermore, ultrafast electron dynamics in the ps-regime is investigated by narrowband single-color pump-probe measurements performed using a THz free-electron laser.

[1] J. F. Dynes, M. D. Frogley, M. Beck, J. Faist, and C. C. Phillips, Phys. Rev. Lett. 94, 157403 (2005)

HL 36.19 Tue 15:00 Poster A

Atomic Layer Deposition of high-k dielectrics on III-V sub-

strates — •Soraya Karimzadah[1,2,3], Torsten Rieger[1,2], Ullrich Pietsch[3], Detlev Grützmacher[1,2], and Mihail Ion Lepsa[1,2] — [1]Peter Grünberg Institute (PGI-9), Forschungszentrum Jülich GmbH, 52425 Jülich — [2]JARA-FIT — [3]Festkörperphysik, Universität Siegen, 57072 Siegen

Deposition of high-k dielectrics on III-V substrates by atomic layer deposition (ALD) is considered as a novel generation of gate oxide for nanodevices and surface passivation of nanowires (NWs). The thin film layers deposited by ALD are extremely uniform and conformal which is highly important for high aspect ratio structures such as NWs. We have investigated the in-situ ALD deposition of Al2O3 on MBE grown GaAs layers using TMA and H2O as ALD precursors. Experiments were carried out in a state of the art multi-material nanocluster tool composed of UHV growth and deposition systems. The window for the thermal ALD deposition of Al2O3 on Si substrate is determined. Later on, the in situ process of deposition of Al2O3 on GaAs substrate has been performed. The GaAs layers were grown by MBE and transferred to the ALD chamber without exposing the sample to air. In this way, the formation of the native oxide and any other contamination on the GaAs surface is avoided improving the quality of the oxide-semiconductor interface. The samples were characterized by ellipsometry, XRR, AFM, TEM, XPS and CV measurements. High-k dielectrics on III-V substrates with high quality as well as in-situ formed interfaces open the way to nanoscale devices with improved characteristics.

HL 36.20 Tue 15:00 Poster A

Electrical and topological analysis of silicon after laser pulse irradiation in a sulfur-containing atmosphere — Julian Sickel and •Michael Seibt — Georg August Universität IV. Physikalisches Institut, Göttingen, Deutschland

Enhanced infrared absorption of sulfur hyperdoped crystalline silicon has drawn attention to fs laser irradiation in SF6 atmosphere [1]. Such treatments lead to highly S doped surface-near regions and buried pn-junctions if p-type substrates are used. Furthermore, depending on the number of pulses per spot different surface topologies have been observed as well as the formation of extended defects such as twins and dislocations [2]. Here we focus on so called gray silicon which is named after its appearance due to a five double fs pulse laser treatment per spot with a wavelength of 800 nm. Using atomic force microscopy (AFM) the topology of the samples was characterized. Electrically sensitive techniques such as Kelvin-Probe atomic force microscopy (KFM) and electron beam induced current (EBIC) have been used on the same areas in order to study correlations between electrical properties like work-function or excess carrier recombination and the surface micro structure. The results of this work show special structural formation of hillocks and valleys at the surface as well as lower excess carrier recombination rates and higher work-functions within the hillocks. In addition, experimental results indicate a special distribution of work-functions inside the hillocks. [1] A.L. Baumann, et al., Energy Procedia 27 (2012) 480-484 [2] P. Saring, et al., Appl. Phys. 103, 061904 (2013)

HL 36.21 Tue 15:00 Poster A

Microscopic Theory of the Refractive Index — •Ronald Starke[1] and Giulio Schober[2] — [1]TU Bergakademie Freiberg, Inst. f. theo. Phys — [2]Uni. Heidelberg, Inst. f. theo. Phys

We re-examine the refractive index from the viewpoint of modern first-principles materials physics and find that the standard formula, $n^2 = \epsilon_r \mu_r$, is downright wrong. Even worse, the allegedly approximate Maxwell relation, $n^2 = \epsilon_r$, which is being used for most practical purposes, can only be justified in the long-wavelength limit. In order to obtain the true wave-equation in materials, one instead has to start from the fundamental, Lorentz covariant electromagnetic wave-equation in terms of the proper response tensor. From this we prove a general theorem by which the electric field in materials is restricted to the kernel of the microscopic dielectric tensor thus elucidating the analogy to the theory of plasmons.

HL 36.22 Tue 15:00 Poster A

Very slow decay of a defect related PL emission band in AlN: signatures of the Si related DX state — •Matthias Lamprecht[1], Christiane Grund[1], Benjamin Neuschl[1], Zachary Bryan[2], Ramón Collazo[2], Zlatko Sitar[2], and Klaus Thonke[1] — [1]Institute of Quantum Matter / Semiconductor Physics Group, Ulm University, 89081 Ulm, Germany — [2]Department of Materials Science and Engineering, North Carolina State University, Raleigh, North Carolina 27606, USA

We investigated the defect related PL emission band at 2.4 eV in aluminum nitride bulk crystals using different methods including time-resolved photoluminescence (TRPL) investigations. Two slow processes with decay times of 13 ms and 153 ms were found for this band in the low-temperature limit. Based on temperature dependent TRPL and PL experiments, the faster process is assigned to a donor-acceptor pair transition (involving a shallow, effective-mass like silicon donor), and the slower process is attributed to a transition between a more localized electron at a silicon DX center and the same deep acceptor.

HL 36.23 Tue 15:00 Poster A

Density functional study of structural, electronic and optical properties of point defects in 2D transition metal dichalcogenides — •Soumyajyoti Haldar[1], Hakkim Vovusha[1], Manoj Yadav[2], Olle Eriksson[1], and Biplab Sanyal[1] — [1]Div. of Materials Theory, Dept. of Physics & Astronomy, Uppsala University, Sweden — [2]Nepal Academy of Science and Technology, Nepal

Using density functional theory, we have studied structural, electronic and magnetic properties of various point defects in 2D transition metal dichalcogenides MX_2, (M = Mo, W; X = S, Se, Te). Our results shows that the X interstitial defect has the lowest formation energy ($\sim$ 1 eV) for all the systems under the X rich condition whereas for M rich condition, X vacancy has the lowest formation energy except for MTe_2 systems. At experimental growth temperatures (1000 - 1200 K), these defects have high equilibrium defect concentrations. In general, the defect states appears in the band gap, which can affect electronic and optical properties of the pure system. Calculation of optical properties show that the optical transitions occurs at $\sim$ 1.0 eV due to defect states. Our results are expected to guide the experimental nanoengineering of defects to achieve suitable properties related to band gap modifications and characterization of defect fingerprints via optical absorption measurements.

HL 36.24 Tue 15:00 Poster A

Power-dependent resonant Rayleigh scattering of exciton-polaritons — •Bernd Berger[1], Johannes Schmutzler[1], Daniel Schmidt[1], Marc Assmann[1], Martin Kamp[2], Christian Schneider[2], Sven Höfling[2], and Manfred Bayer[1] — [1]Experimentelle Physik 2, Technische Universität Dortmund, D-44221 Dortmund, Germany — [2]Technische Physik, Physikalisches Institut, Wilhelm Conrad Röntgen Research Center for Complex Material Systems, Universität Würzburg, D-97074 Würzburg, Germany

In a two dimensional DBR-microcavity a condensate of exciton-polaritons is formed by resonant excitation. Due to the non-zero in-plane momentum resulting from resonant excitation the condensate propagates inside the microcavity and undergoes Rayleigh scattering at structural defects of the sample. Characteristic scattering rings in the Fourier space image of transmitted light are identified and examined. Especially the influence of different excitation parameters on the scattering patterns is examined systematically and will be presented.

HL 36.25 Tue 15:00 Poster A

Overview of band-edge and defect related luminescence in aluminium nitride — Tristan Koppe, Hans Hofsäss, and •Ulrich Vetter — II. Physikalisches Institut der Georg-August-Universität Göttingen, Deutschland

We present a compact overview of results published in the last decades describing near band-edge as well as defect related luminescence in aluminium nitride. Especially in the case of defect related luminescences associated with oxygen or oxygen vacancy complexes, the different points of view in literature are outlined and compared to each other.

In many cases luminescence signals in the band-gap region are assigned to specific band to impurity or donor acceptor pair transitions without regarding other possible origins. One problem are the various theories describing the same transitions based on experimental observed emission or absorption signals in combination with simulations which show sometimes contradicting results too. Due to the large number of different possible sources for defect related luminescences a detailed investigation of the stoichiometric composition of samples is necessary.

Therefore, in order to provide a point of reference, more than 200 publications investigating aluminium nitride in experiments as well as in simulations were analysed and are presented in a neatly arranged manner to provide an overview of the existing assignments.

HL 36.26 Tue 15:00 Poster A

Influence of growth temperature on the optical and structural

properties of Ga(N,As,P) quantum wells on silicon for laser application — •Sarah Karrenberg, Sebastian Gies, Martin Zimprich, Tatjana Wegele, Andreas Beyer, Wolfgang Stolz, Kerstin Volz, and Wolfram Heimbrodt — Faculty of Physics and Material Science Center, Philipps University Marburg, D-35032 Marburg, Germany

Realizing suitable light sources for optical data transmission on silicon is one of the major goals of optoelectronic integration nowadays. The quaternary Ga(NAsP) is a promising candidate for this. Previously, we had optimized the annealing procedure of the necessary rapid-thermal-annealing. Here, we present an analysis of the influence of growth parameters on Ga(NAsP) quantum wells (QWs) on silicon. The optical and electronic properties are revealed using photoluminescence (PL), PL excitation and Raman spectroscopy. The structural properties are analyzed by transmission electron microscopy and high resolution X-ray diffraction. The conjunction of these methods reveals the striking influence of the growth temperature on the Ga(NAsP) QW composition, interfaces and luminescence properties. An in-depth analysis of the Ga(NAsP) disorder is presented. Furthermore, the changes in disorder upon increasing the growth temperature are connected to the accompanying structural changes in the QWs morphology. This allows us to reveal the optimal growth parameters in terms of structural and electronic properties of the Ga(NAsP)/Si material system.

HL 36.27 Tue 15:00 Poster A

Optical properties of InGaN/GaN core-shell nanowires — •Florian Krause[1], Johannes Dühn[1], Jürgen Gutowski[1], Christian Tessarek[2,3], Martin Heilmann[2], Silke Christiansen[2,3], and Kathrin Sebald[1] — [1]University Bremen, Institute of solid state physics, Bremen, Germany — [2]Max-Planck-Institute for the Science of Light, Erlangen, Germany — [3]Helmholtz-Zentrum Berlin for Materials and Energy, Berlin, Germany

Nanowires (NWs) based on GaN and InGaN can be utilized to increase the efficiency of optoelectronic applications like white light sources due to the improvement of their structural quality in comparison to planar structures. Therefore we are interested in InGaN/GaN core-shell NWs which were grown on sapphire substrates by using metalorganic vapour phase epitaxy. The NWs consist of a N-polar Si-doped GaN core with mixed polarity surrounded by an InGaN/GaN multiple quantum well shell covered by non-doped GaN. The NW size varies in diameter and height within a range of a few micrometers and their aspect ratio is between 1:2 and 1:10. The GaN core has a Ga-polar column embedded in a N-polar tube. The column favours the formation of a small pyramidal tip on the top facet of the NW and it is also covered by InGaN. To investigate the optical properties of single and ensemble NWs, their micro-photoluminescence spectra are analyzed in dependence on temperature and excitation density. In particular, the optical properties of the top facets of single NWs are most interesting with respect to carrier confinement in the InGaN accumulation zones in these facets which could be employed as single photon sources.

HL 36.28 Tue 15:00 Poster A

Investigation of the impact of gold nanodots deposited in porous GaP template by Raman Spectroscopy — •Andrei Tiron[1,2], Cameliu Himcinschi[2], Jens Kortus[2], Eduard Monaico[1], and Ion Tiginyanu[1,3] — [1]Technical University of Moldova, Stefan cel Mare Avenue 168, MD-2004 Chisinau, Republic of Moldova — [2]TU Bergakademie Freiberg, Institute of Theoretical Physics, Leipziger Str. 23, D-09599 Freiberg, Germany — [3]Institute of Electronic Engineering and Nanotechnologies, Academy of Sciences of Moldova, Academy str. 3/3, Chisinau MD-2028, Republic of Moldova

Porous gallium phosphide (GaP) without and with gold deposited inside the pores were investigated by micro-Raman spectroscopy. The anodization causes a breakdown of the polarization selection rules, inherent to a (100) surface, accompanied by a downward shift of the LO-phonon frequency [1]. The appearance of two surface-related phonon modes in porous GaP templates without and covered with gold nanodots was detected. The influence of the temperature and laser annealing on the Raman spectra also were investigated. Au deposition in porous GaP templates induced an enhancement of the Raman signal.

[1] Micro-Raman-scattering study of surface-related phonon modes in porous GaP. (I. M. Tiginyanu, G. Irmer, J. Monecke, H. L. Hartnagel) Phys. Rev. B, volume 55, 6739-6742 (1997).

HL 36.29 Tue 15:00 Poster A

Nonlinear optical excitation of a two-level system with a superoscillating field — •Daniel Berghoff, Matthias Reichelt und Torsten Meier — Department of Physics and CeOPP, University of Paderborn, Warburger Str. 100, D-33098 Paderborn, Germany

Although superoscillations are a well known phenomena [1], the impact on a nonlinearly photoexcited two-level system (TLS) was only recently investigated by Baranov et al. [2]. Here, the excitation with different electric fields is studied. Among other things we show that the TLS can be excited by off-resonant superoscillations. Furthermore, parameters are numerically obtained, for which a maximum population inversion is observed.

[1] Y. Aharonov, F. Colombo, I. Sabadini, D. C. Struppa, and J. Tollaksen, Some mathematical properties of superoscillations, J. Phys. A **44**, 365304 (2011).
[2] D. G. Baranov, A. P. Vinogradov, and A. A. Lisyansky, Abrupt Rabi oscillations in a superoscillating electric field, Optics Letters **39**, 6316 (2014).

HL 36.30 Tue 15:00 Poster A

Temporal coherence properties of a polariton condensate in a disordered environment — Martin Thunert, •Stefan Lange, Helena Franke, Chris Sturm, Tom Michalsky, Marius Grundmann, and Rüdiger Schmidt-Grund — Universität Leipzig, Inst. für Exp. Physik II, Linnestr. 5, 04103 Leipzig

We report on the temporal coherence properties of an exciton-polariton Bose-Einstein condensate (BEC) in a disordered ZnO-based bulk planar microcavity (MC). The momentum space intensity distribution of the BEC emission is strongly influenced by disorder even at high excitation powers. We found theoretically that this lack of BEC stabilization relies on the driven dissipative nature of the condensate, leading to disorder induced, density independent phase fluctuations [1]. To prove whether the observed emission arises from a temporally coherent condensate, we applied interferometry measurements with variable path length difference or rather temporal delay between both interferometer arms. With this procedure, we found a coherence time of about 24 ps for the BEC emission, which is by a factor of 150 larger than the lifetime of the uncondensed polaritons [1]. Using time-resolved, energy-momentum-space imaging, BEC emission was observed up to 100 ps after the decay of the exciting laser pulse. Consequently, the coherence of the investigated quantum system is conserved during the multiple reabsorption and reemission processes that can thus be identified as a polariton condensate.

[1] M. Thunert, A. Janot *et al.*, ArXiv (2014), arXiv:1412.8667

HL 36.31 Tue 15:00 Poster A

Photoconductivity of a new material: $K_2Hg_2Se_3$ — •Sina Lippert[1], Günther Thiele[2], Felix Fahrnbauer[3], Philipp Bron[2], Oliver Oeckler[3], Arash Rahimi-Iman[1], Bernhard Roling[2], Stefanie Dehnen[2], and Martin Koch[1] — [1]Faculty of Physics and Materials Sciences Center, Philipps-Universität Marburg, D-35037 Marburg — [2]Department of Chemistry and Materials Sciences Center, Philipps-Universität Marburg, D-35043 Marburg — [3]Faculty of Chemistry and Mineralogy, Institut of Mineralogy, Crystallography and Materials Science, D-04275 Leipzig

$K_2Hg_2Se_3$ is a new photoconducting material with a direct band gap of around 1.4 eV, identified by both absorption and photocurrent experiments, and verified by comparison with impedance spectroscopy measurements and band structure calculation [1]. The compound shows a semiconductor-type behavior with current-voltage characteristics comparable to GaAs.

The presented material is a chalcogenido-mercurate, which was obtained by means of solvothermal treatment of the corresponding solid precursors on large scales and compromises unprecedented, covalently linked selenidomercurate columns.

In our recent study, we found that presence of heavy element atoms in $K_2Hg_2Se_3$ leads to unique material properties regarding optoelectronic, photophysical and thermoelectric properties. Their functionality can be further adjusted by a variation of the elements within a family of structurally related compounds.

[1] G. Thiele et al., Chem. Mater. 27, 2015, 4114-4118.

HL 36.32 Tue 15:00 Poster A

Nonlinear Optical Response of Functionalized Chalcogenide Cluster Molecules — •Nils W. Rosemann[1], Jens Eussner[2], Ulrich Huttner[1], Andreas Beyer[1], Kerstin Volz[1], Stephan W. Koch[1], Mackillo Kira[1], Stefanie Dehnen[2], and Sangam Chatterjee[1] — [1]Faculty of Physics and Materials Science Center, Philipps-Universität Marburg, Renthof 5, D-35032 Marburg, Germany

— [2]Faculty of Chemistry and Materials Sciences Center, Philipps-Universität Marburg, Hans-Meerweinstraße, D-35043 Marburg, Germany

Chalcogenide clusters in combination with various different ligands offer a large variety of structural and physical properties. In particular, their nonlinear optical response can be tuned, e.g., enabling second harmonic generation by varying the compositions and constituents of cluster cores and ligands. Modifying the core primarily influences the band gap energy, whereas changing the ligand influences the anharmonicity of the electronic potential and thus the efficiency of nonlinear processes.

HL 36.33 Tue 15:00 Poster A

Exciton polaritons in CdMgTe / CdZnTe waveguides — •Felix Spitzer[1], Ilya Akimov[1], Manfred Bayer[1], Nils Weber[2], Cedrik Meier[2], Torsten Meier[2], Régis Andre[3], and Henri Mariette[3] — [1]Experimentelle Physik II, TU Dortmund, D-44221 Dortmund, Germany — [2]Department Physik, Universität Paderborn, D-33098 Paderborn, Germany — [3]Institut Néel (Centre National de la Recherche Scientifique), 25 Avenue des Martyrs, 38042 Grenoble, Frankreich

The steady-state reflectivity of a CdMgTe / CdZnTe waveguide structure was measured using Fourier imaging spectroscopy. One dimensional metallic gratings are used to couple far field radiation with waveguiding modes. The angular and wavelength resolved reflectivity exhibits the underlying waveguide dispersion and its interaction with the excitonic resonance. The polarization resolved data shows TE- and TM-waveguiding modes. These results are consistent with angle resolved photoluminescence, where the emission is coupled out under a given angle, depending on the grating period.

The dispersion of waveguiding modes flattens strongly in the vicinity of exciton resonance. Here we demonstrate, that the group velocity can be increased by more than one order of magnitude.

HL 36.34 Tue 15:00 Poster A

Phonon dispersion by fitting effective potentials to ab initio data — •Philipp Risius, Marcel Giar, Andreas Rühl, and Christian Heiliger — Institut für theoretische Physik, Justus-Liebig-Universität, 35392 Gießen

Direct *ab initio* calculation of the forces on atoms is not feasible for materials with small defect concentrations, which have to be represented by large supercells. Effective potentials as used in molecular dynamics simulations could allow this and subsequently enable calculation of phonon dispersion curves.

Defect-free silicon is used as a model system. Effective potentials are generated by matching predicted forces to those calculated with *ab initio* methods. The resulting potentials are tested for reproduction of small and long-range forces and phonon dispersion curves are calculated from them.

It is found that a modified Embedded Atom Method [1] is best suited for reproducing the reference forces. Here, the phonon dispersion can be reproduced accurately, whereas other potential models perform worse.

[1] Lenosky et al. *Model. Simul. Mater. Sci. Eng.* **8**, 825 (2000).

HL 36.35 Tue 15:00 Poster A

Anisotropy measurement using ultrafast photocurrents — •Christian Schmidt, Shekhar Priyadarshi, and Mark Bieler — Physikalisch-Technische Bundesanstalt, Braunschweig, Germany

The linear surface magneto-photocurrent (LSMC) is based on an optically induced anisotropic carrier distribution which is scattered asymmetrically at the surface of semiconductors [1]. Here, we investigate the LSMC induced in bulk GaAs by optical femtosecond excitation on a sub-picosecond time scale. For this we detect its THz radiation via electro-optical sampling [2]. Comparing the LSMC measurements with a time-dependent model of the LSMC we are able to extract the anisotropy relaxation time from our measurements.

We found a double exponential decay of the anisotropy with the fast time constant being on the order of 10 fs and the slow time constant ranging from 100 fs to 190 fs. We attribute the fast and slow relaxation times to anisotropy relaxation of heavy holes and electrons, respectively. Variations of the photocarrier density in the range of $10^{15}\mathrm{cm}^{-3}$ to $5 \times 10^{17}\mathrm{cm}^{-3}$ indicate that phonon-carrier scattering is the major anisotropy relaxation mechanism for electrons. Our data compares well to previously reported anisotropy relaxation times ranging from 30 fs to 190 fs [3], [4] and shows that the LSMC is a novel intrinsic probe for anisotropy relaxation in semiconductors.

[1] V.L. Alperovich et al., JETP Lett. 49, 702 (1989).
[2] C.B. Schmidt et al., Appl. Phys. Lett. 106, 142108 (2015).
[3] J.L. Oudar et al., Phys. Rev. Lett. 53, 384 (1984).
[4] M.T. Portella et al., Appl. Phys. Lett. 60, 2123 (1992).

HL 36.36 Tue 15:00 Poster A

Exciton-Polariton Propagation in CdZnTe — Jan Lohrenz[1], Stephan Melzer[1], Claudia Ruppert[1], Ilya Akimov[1], Matthias Reichelt[2], •Alexander Trautmann[2], Torsten Meier[2], and Markus Betz[1] — [1]Experimentelle Physik 2, TU Dortmund, Otto-Hahn-Str. 4, 44221 Dortmund, Germany — [2]Department of Physics and CeOPP, University of Paderborn, Warburger Str. 100, D-33098 Paderborn, Germany

In bulk CdZnTe light is significantly slowed down in a spectral range close to the lower exciton-polariton (LP) branch. [1] We present different methods for modelling light pulses centered near the LP resonance, i.e., numerical and analytical approaches allowing for slow light propagation and the diffusion of the wave packet. [2] These light fields are used to interpret nonlinear optical signatures in a recently performed ultrafast pump-probe experiment. [3]

[1] T. Godde, I. A. Akimov, D. R. Yakovlev, H. Mariette, and M. Bayer, Phys. Rev. B **82**, 115332 (2010).
[2] A. Trautmann, Bachelor Thesis, University of Paderborn, submitted.
[3] J. Lohrenz, S. Melzer, C. Ruppert, I.A. Akimov, M. Reichelt, A. Trautmann, T. Meier, M. Betz, to be published.

HL 36.37 Tue 15:00 Poster A

Nonlinear Phononics and the interaction of Light and Phonons — •André Bojahr[1], Matthias Rössle[1], Wolfram Leitenberger[1,2], Peter Gaal[2], Mathias Sander[1], Matthias Reinhardt[2], Alexander von Reppert[1], Jan-Etienne Pudell[1], and Matias Bargheer[1,2] — [1]Institut für Physik und Astronomie, Universität Potsdam, Karl-Liebknecht-Str. 24-25, 14476 Potsdam, Germany — [2]Helmholtz-Zentrum Berlin, Wilhelm-Conrad-Röntgen Campus, BESSY II, Albert-Einstein-Str. 15, 12489 Berlin, Germany

Phonons are often regarded as delocalized quasiparticles with certain energy and momentum. The anharmonic interaction of phonons determines macroscopic properties of the solid, such as thermal expansion or thermal conductivity, and a detailed understanding becomes increasingly important for functional nanostructures. By the use of ultrashort laser pulses we are able to excite monochromatic phonon wave packets with a wavelength in the nanometer range. To observe the anharmonic interaction of these phonons we use time-resolved Brillouin scattering with a white light probe pulse and ultrafast X-ray diffraction. [1] With these methods we were able to observe the nonlinear mixing of a narrowband coherent phonon wave packet in strontium titanate (SrTiO3) to its second harmonic. [2] Furthermore, we present concepts to amplify monochromatic phonons by stimulated Raman scattering to overcome the limits of the maximum phonon amplitude in the excitation process mainly given by the damage threshold due to ultrafast heating above the melting temperature. [1] Opt. Express, 21, 18, 21188-21197 [2] Phys. Rev. Lett., 115, 195502

HL 36.38 Tue 15:00 Poster A

Influence of the growth temperature on LT- GaAs photoconductive antennas for THz generation — •Oday Mazin Abdulmunem[1], Norman Born[1], Martin Mikulics[2], Jan C. Balzer[1], and Martin Koch[1] — [1]Faculty of Physics and Materials Sciences Center, Philipps-Universität Marburg, D-35037, Marburg — [2]Peter Grünberg Institut (PGI-9), Forschungszentrum Jülich GmbH, D-52425, Jülich

THz technology is becoming a fully developed technology which is used for fundamental research as well as for industrial applications. There are several approaches to optically generate THz radiation. Most of them are based on femtosecond lasers whose spectrum is transformed into the low THz frequency range (0.1 THz to 10 THz). This can for example be achieved by optical rectification in a nonlinear crystal or by using a photoconductive antenna (Auston switch).

In this work we concentrate on the characterization of photoconductive antennas. They are based on a semiconductor material with a low carrier lifetime (< 1 ps). A well suited candidate for an excitation wavelength of 800 nm is low temperature grown GaAs (LT-GaAs). We characterize samples which were grown with various temperatures (between 200°C and 300°C). They are analyzed in a specially designed

setup which allows for easy switching of the antennas. We found a clear correlation between the growth temperature of the antennas and their performance in a THz time domain spectrometer.