Quantum confinement effect in pristine and oxygen covered silicon nanocrystals with surface states — and the linewidth broadening of the emission as well as the high stokes within the band gap. This model explains the s-like temperature shift hopping processes in an exponential distribution of localised states. Temperature, we observe a large stokes shift originating from deep traps and emission characteristics of the system from 10K up to room temperatur e, we examine these features in pseudomorphically grown multiple-quantum-well heterostructures of the dilute nitride Ga(NAsP)/GaP material. We consider and results are correlated to actual scan equations are solved to model the optical properties of crystalline black papers have been published in one of the hottest topics. However, many of their photoluminescence (PL) properties are still unclear. Combining the confocal microscopy, spectroscopy, and cylindrical vector beams (also known as higher order laser modes) we reveal new details of fundamental PL properties of Si/SiO2 core-shell systems and hollow SiO2 shells. We show that the emission from both systems may originate from defects of the SiO2 structure or at the Si-SiO2 interface. This result demonstrates the effect of "break-down" of the quantum confinement in small Si/SiO2 nanoparticles, which limits the PL tunability and thus, applications in Si optical nanostructures, especially in the short wavelength range. Using the technique of cylindrical vector beams we demonstrate that SiO2 nanoparticles and Si/Si nanocrystals where the PL originates from defects, a linear transition dipole moment (TDM). Moreover, we precisely determine the 3-dimensional orientation of single nanoparticle TDM and show such dynamical effects as TDM sudden flipping.

Disorder in Ga(N,As,P)/GaP MQW structures — Confocal microscopy with cylindrical vector beams and spectroscopy of single silicon nanoparticles — Confocal microscopy with cylindrical vector beams and spectroscopy of single silicon nanoparticles — Confocal microscopy with cylindrical vector beams and spectroscopy of single silicon nanoparticles — Confocal microscopy with cylindrical vector beams and spectroscopy of single silicon nanoparticles — Confocal microscopy with cylindrical vector beams and spectroscopy of single silicon nanoparticles — Confocal microscopy with cylindrical vector beams and spectroscopy of single silicon nanoparticles — Confocal microscopy with cylindrical vector beams and spectroscopy of single silicon nanoparticles — Confocal microscopy with cylindrical vector beams and spectroscopy of single silicon nanoparticles — Confocal microscopy with cylindrical vector beams and spectroscopy of single silicon nanoparticles — Confocal microscopy with cylindrical vector beams and spectroscopy of single silicon nanoparticles — Confocal microscopy with cylindrical vector beams and spectroscopy of single silicon nanoparticles —

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Confocal microscopy with cylindrical vector beams and spectroscopy of single silicon nanoparticles —

Disorder in Ga(N,As,P)/GaP MQW structures —

Confocal microscopy with cylindrical vector beams and spectroscopy of single silicon nanoparticles —

Disorder in Ga(N,As,P)/GaP MQW structures —
from electroluminescence (EL) measurement which proves the single dot characteristics of our device. The EL spectra consist of sharp emission lines and their dependence on injection current shows linear behavior for exciton and quadratic behavior for biexciton recombination. Furthermore, estimation of built-in dipole moment in InAs quantum dot due to Stark shift in EL spectra will be given. Financial support by the BMBF via the NanoFutur grant 03X5509-NanoPhox and the NanoQit program.

15 Min. Coffee Break

HL 49.7 Thu 11:15 H4

Optical and electrical properties of metal-insulator-semiconductor devices with stepped insulator layer — 1Wolfgang Brezna1, Jörgen Smoliner1, Kevin Stell2, Domocos Kovacs2, and Detlef Diesing3 — 1Institut für Festkörperelektronik, Technische Universität Wien 2Institut für Physikalische Chemie, Universität Duisburg Essen

A preparation procedure based on localized electrochemical oxidation unites multiple metal-insulator-semiconductor (MIS) junctions (also arrays) in a single device. The “stepped-MIS” enables a comparative study of several MIS junctions of different oxide thicknesses on one silicon wafer. We present a Si(n-type)-SiO2-Au four-step device with oxide thicknesses of 0, 1, 2, 5, and 4 nm. Each step is partially covered with a 20 nm thick Au-electrode. The samples are characterized by internal photoemission using variable wavelengths (300—1600 nm) and capacitance—voltage experiments. The “0 nm” junction shows an increased photo-sensitivity compared to the “0 nm” junction (MS system). The internal photoemission drops by two orders of magnitude when increasing the oxide thickness from 1 to 4 nm. The photoemission is increased by two orders of magnitude, when the sample is biased by 1 Volts in the depletion region (reverse voltage direction).

HL 49.8 Thu 11:30 H4

Optical characterization of AgGaSe2 thin films grown by Chemical Close Spaced Vapor Transport (CCSVT) — 1Christoph Merschhans1, 2Bahys Kowrus1, 2Anastasia Karatzinou1, 3Thoma Scheder-Niedr1, 3, and Martha Christinab Lux-Steiner1 — 1Helmholtz-Zentrum Berlin für Materialien und Energie GmbH, Berlin, Germany — 2Scientific-Practical Materials Research Centre of NAS of Belarus, Minsk, Belarus 3National Technical University of Athens, Athens, Greece

Thin films (d ≈3 μm) of n-type chalcopyrite AgGaSe2 were successfully grown on glass and glass/molybdenum substrates using the technique of Chemical Close Spaced Vapor Transport (CCSVT). Scanning electron microscopy of the prepared layers shows a morphology typical for polycrystalline chalcopyrites. The electronic properties of the films are investigated by means of optical transmission/reflection and photoluminescence spectroscopy. While the absorption spectra of the films exhibit clear and distinct bandgaps, their photoluminescence comprises various additional absorption peaks, thus pointing to a rich intrinsic defect structure.

The results are compared to those published for single-crystalline AgGaSe2, and possible consequences for the application of this material as thin-film solar cell absorber layer are discussed in the presentation.

HL 49.9 Thu 11:45 H4

Optical properties of high-quality cubic AlN, GaN, AlGaN and AlN/GaN MQWs grown on 3C-SiC — 1Marcus Röppischer1, 2Christoph Cobet1, 2Norbert Esser1, 2Georg Rosbach1, 2Reidger Goldsmid1, 2Márton Peneberg1, 3Benjamin Neusch1, 2Klaus Thonke1, 2Thorsten Schürp1, 2Klaus Lischka1, and Donat Ass1 — 1ISAS - Institute for Analytical Sciences, 12489 Berlin — 2Institut für Festkörperelektronik, Technische Universität Berlin, 11684 Berlin — 3Institut für Halbleiterphysik, Universität Ulm, 89069 Ulm

Department Physik, Universität Paderborn, 33098 Paderborn

It was recently demonstrated, that the quality of zincblende group-III nitrides can be considerably improved if bulk 3C-SiC(001) is used as the substrate for the deposition of the films by molecular beam epitaxy. For example, phase-pure cubic GaN and AlN has been achieved, and intersubband absorption of short-period GaN/AlN MQWs in the infra-red was demonstrated. Despite this progress, fundamental optical properties of these materials have not been reported so far. In this contribution, we present a comprehensive characterization of cubic AlN, GaN, AlGaN and related MQWs. The shape of the dielectric functions (DF) from 0.56 eV up to 20 eV, as obtained by ellipsometry, as well as photoelectoreflectance (PR), photo- (PL) and cathodoluminescence (CL) spectra will be discussed in detail.

HL 49.10 Thu 12:00 H4

Longitudinal-transverse splitting of individual excitonic polaritons in ZnO derived from ellipsometry — 1Monise Cobet1, 2Christoph Cobet1, 2Markus R. Wagner1, Norbert Esser2, and Axel Hoppmann1 — 1Institut für Festkörperphysik, Technische Universität Berlin, 10623 Berlin — 2FAS- Institut for Analytical Sciences, 12489 Berlin

The complex dielectric tensor of ZnO in the regime of the excitonic transitions is determined with ellipsometry and analyzed concerning the quantization of the electromagnetic field in terms of coupled polariton-eigenmodes. Negative sections in the real part indicate the significant formation of polaritons for the dipole-allowed excitons of the three upper valence-bands Γ7, Γ9, Γ7. The transverse-longitudinal splittings which separate the upper polariton branch from the lower branch are deduced precisely for each subband and for different strain levels. Mainly for E∥c, additional absorption peaks are observed at the longitudinal B-exciton and closely above. One is considered to be a mixed-mode and the other is seen as a consequence of interference effects in an exciton free surface layer which is also visible in Raman measurements. Spectroscopy (Raman, 1.2-6.5 eV) and the observation of d-level-hybridization on valence-band-summies is evaluated by the effective number of electrons n∥f in high energy data between 3 and 32 eV. CdS polaritonic spectra were also measured as a reference and further support the inverse ordering of valence bands (negative spin-orbit splitting) in ZnO.

HL 49.11 Thu 12:15 H4

Near band edge luminescence of ZnN thin layers — 1Ronny Kirste1, Jebreel M. Khoshman2, Martin E. Kordesch3, Markus R. Wagner1, 4Jan-Hendrik Schulze5, 4Gordon Callesen5, and Axel Hoppmann1 — 1Institut für Festkörperphysik, TU Berlin, Berlin, Germany — 2Al-Hussein Bin Talal University, Ma’an, Jordan 3Department of Physics and Astronomy, Ohio University, Athens, OH 45701, United States

The novel material ZnN may help to understand the nitrogen doping in ZnO. Additionally, ZnN is a possible candidate for optical devices like hot and cold mirrors. However, nearly none of the basic physical properties are known, so far. Even the band gap of ZnN is still under discussion. In this contribution we present PL measurements for 200nm thick ZnN samples grown on SiO2 via RF sputtering. The successful ZnN growth was confirmed by XRD. PL measurements in different ambient gases indicate that the low energy signal between 2.0 and 3.0 eV which sometimes is attributed to ZnN is indeed related to surface oxygen. On the other hand a high energy peak at 3.41 eV arises, which is attributed to the ZnN layer. Temperature dependent measurements were performed revealing a shift of this peak from 3.41 eV at 4.2 K to 3.44 eV at room temperature. Finally, temperature resolved measurements were performed in order to understand the origin of the high energy signal.

HL 49.12 Thu 12:30 H4

Spin induced second harmonic generation in europium chalcogenides — 1Benjamin Kaminski1, 2Marcos Lafrentz2, 3Roman V. Pisarev2, 3Dmitri R. Yakovlev1, 3, 2Victor V. Pavlov2, 3Volodya A. Lukosshkin4, 2Andre Henriques5, 2Gunther Springholz5, 2Gunther Bauer6, 2Eduardo Abramoff7, 2Paulo R. O. R. Rotta8, and Manfred Bayer9 — 1Institute of Physical Sciences and Technology, Brazil — 2Russian Academy of Sciences, Moscow, Russia — 3Faculty of Physics, California State University, Northridge, CA, USA — 4Institute for Solid State Physics, H-II, Technische Universität Dortmund, D-44221 Dortmund, Germany — 5Idole-Physico-Technical-Institute, Russian Academy of Sciences, 194021 St. Petersburg, Russia — 6Instituto de Física de Sao Paulo, 05315-970 Sao Paulo, Brazil — 7Institut für Halbleiter- und Festkörperphysik, Johannes Kepler Universität Linz, 4040 Linz, Austria — 8LAS-INPE, 12227-010 Sao José dos Campos, Brazil — 9Institut für Analytische Wissenschaften, Universität der Bundeswehr München

The second harmonic generation (SHG) in Europium chalcogenides EuX (X=O, S, Se, and Te) is forbidden in the electric dipole and for 200nm thick ZnN samples grown on SiO2 via RF sputtering. The successful ZnN growth was confirmed by XRD. PL measurements in the vicinity of the band gap of 2.2-2.4eV in EuTe and EuSe in external magnetic field. For example, at 10T EuSe exhibits a shift of this peak from 3.41 eV at 4.2 K to 3.44 eV at room temperature. Finally, temperature resolved measurements were performed in order to understand the origin of the high energy signal.

Thursday
of centrosymmetric magnetic materials by second harmonic generation spectroscopy.

**Trionic Optical Potentials for Charge Carriers in Semiconductors — Martin Schuetz, Michael G. Moore, and Carlo Piermarocchi — Michigan State University, East Lansing, Michigan, USA**

Optical trapping of neutral particles has led to remarkable advances in precision measurement, quantum information, and addressing fundamental longstanding questions in condensed matter physics. Despite recent advances in the optical and electronic control in semiconductor systems, a similar laser-induced technique to trap and manipulate charged carriers in semiconductor devices has not yet been investigated. In this talk, we will propose analogues optical trapping potentials for charge carriers embedded in a semiconductor quantum well by driving the trion resonance with intense, detuned laser light. Accordingly, the Stark energy is modified in proportion to the light intensity at the carrier location, which serves as a source of mechanical potential energy for the carrier. We show that this novel trion-mediated potential exhibits a non-local character, but can confine carriers at the lengthscale of optical wavelengths. The model is extended to the new paradigm of a spin-selective carrier lattice in a true Solid State environment which is potentially much simpler to engineer and control than similar lattices in AMO physics. Our results suggest the possibility of new single-carrier semiconductor devices with promising applications in quantum information processing, and exploring the physics of interacting electrons in the presence of a periodic potential readily controllable in space and time.