gap with a gap/midgap ratio of up to 20.5%.

[1] M. Hermatschweiler et al., submitted (2006).

HL 18.6 Tue 12:00 H13

Strong Circular Dichroism from Chiral 3D Photonic Crystals — •Michael Thiel[1], Manuel Decker[2], Martin Wegener[1], Stefan Linden[2], and Georg v. Freymann[2] — [1]Institut für Angewandte Physik, Universität Karlsruhe (TH), Wolfgang-Gaede-Straße 1, D-76131 Karlsruhe — [2]Institut für Nanotechnologie, Forschungszentrum Karlsruhe in der Helmholtz-Gemeinschaft, D-76021 Karlsruhe

Chiral photonic crystals allow for photonic stop bands for circularly polarized light connected with pronounced circular dichroism[1] which can potentially be used for applications, e.g., as compact *thin-film* optical diodes[2]. We have fabricated high-quality polymeric 3D spiral photonic crystals[3] via direct laser writing[4]. The measured transmittance spectra of these low-index contrast structures reveal spectral regions where the transmittance is below 5 % for one circular polarization and larger than 95 % for the other – for just eight lattice constants along the propagation direction[1]. These polarization stop bands occur if the pitch of the light spiral matches the pitch of the dielectric spiral. As expected from the symmetry, the transmittance spectra are closely similar if both the sense of rotation of the dielectric spirals and that of the incident light field are changed simultaneously. Our experimental results agree well with theory. Additionally, we present a novel chiral 3D layer-by-layer structure as an alternative to the discussed circular dichroitic 3D spiral photonic crystals.

[1]*M. Thiel et. al., Adv. Mater., in press (2006). [2]*J. Hwang et. al., Nature Mater., 4, 383 (2005). [3]*K. K. Seet et. al., Adv. Mater., 17, 541 (2005). [4]*M. Deubel et. al., Nature Mater., 3, 444 (2004).

HL 18.7 Tue 12:15 H13

Silicon-based Photonic Crystal Gas Sensors — •Stefan Schweizer[1], Torsten Geppert[1], Andreas von Rhein[1], Susanne Hartwig[2], Jürgen Wöllenstein[2], Armin Lambrecht[2], and Ralf Wehrspohn[1] — [1]Institut für Physik, Universität Halle-Wittenberg, 06099 Halle — [2]Fraunhofer Institut Physikalische Messtechnik, Heidenhofstr. 8, 79110 Freiburg

The bandstructure of photonic crystals offers intriguing possibilities for the manipulation of electromagnetic waves. We suggest utilization of photonic crystals as an optical sensor in the infrared spectral region for qualitative and quantitative gas analysis. Taking advantage of the low group velocity and certain mode distributions for some k-points in the bandstructure of a photonic crystal should enable the realization of very compact sensor devices for mobile applications. We prepared sensing elements based on macroporous silicon photonic crystals consisting of up to 1000 of pore rows and measured the transmission with and without gas through the porous sensing element. We observed an enhancement in sensitivity of about 3 to 4 compared to a gas cell without a photonic crystal. Limitations of this technology being based on low group velocity modes inside photonic crystals are discussed.

HL 18.8 Tue 12:30 H13

GaAs pyramids as alternative micro-cavities — •Matthias Karl[1], Frank M. Weber[1], Jaime Lupaca-Schomber[1], Wolfgang Löffler[1], Shunfeng Li[1], Thorsten Passow[1], Jacques Hawecker[2], Dagmar Gerthsen[2], Heinz Kalt[1], and Michael Hetterich[1] — [1]Institut für Angewandte Physik and Center for Functional Nanostructures (CFN), Universität Karlsruhe (TH), 76128 Karlsruhe, Germany — [2]Laboratorium für Elektronenmikroskopie and CFN, Universität Karlsruhe (TH), 76128 Karlsruhe, Germany

Pyramidal resonators are promising optical micro-cavities since they have great potential as small-mode volume resonators to enhance light-matter interaction.

Our resonators are fabricated from a molecular-beam epitaxy-grown layer structure containing an AlAs/GaAs distributed Bragg reflector as the bottom mirror. The pyramidal resonators on top are achieved by a combination of electron-beam lithography and wet chemical etching utilizing an AlAs sacrificial layer. The pyramids contain In(Ga)As quantum dots which – excited by a 532 nm cw laser – serve as a broad-band light source in the spectral range from 900 nm to 1000 nm. Optical cavity modes in these pyramids are identified and investigated using temperature-dependent measurements in a confocal micro-photoluminescence set-up.

HL 19: Spin controlled transport I

Time: Tuesday 10:45–13:00 Location: H14

HL 19.1 Tue 10:45 H14

Control of electron spin and orbital resonance in quantum dots through spin-orbit interactions — •Peter Stano and Jaroslav Fabian — University of Regensburg

Dynamics of a single electron in coupled lateral quantum dots in the presence of a static and oscillating electric and magnetic fields as well as phonon-induced relaxation and decoherence is investigated. Using symmetry arguments it is shown that spin and orbital resonance can be efficiently controlled by spin-orbit couplings. The so called easy passage configuration is shown to be particularly suitable for magnetic manipulation of spin qubits, ensuring long spin relaxation time and protecting the spin qubit from electric field disturbances connected with on-chip manipulation.

HL 19.2 Tue 11:00 H14

Spin transport anisotropy in (110) GaAs — •Odilon D. D. Couto Jr[1], Fernando Iikawa[2], Jörg Rudolph[1], Rudolf Hey[1], and Paulo V. Santos[1] — [1]Paul-Drude-Institut für Festkörperelektronik, Hausvogteiplatz 5–7, 10117 Berlin, Germany — [2]Universidade Estadual de Campinas, IFGW, CP-6165, Campinas-SP, 13083-970, Brazil

Mobile piezoelectric potentials are used to coherently transport electron spins in GaAs (110) quantum wells (QW) over distances exceeding 60 μm. We demonstrate that the dynamics of mobile spins under external magnetic fields depends on the direction of motion in the QW plane. The weak piezoelectric fields impart a non-vanishing average velocity to the carriers, allowing for the direct observation of the carrier momentum dependence of the spin polarization dynamics. While transport along [001] direction presents high in-plane spin relaxation rates, transport along [$\bar{1}$10] shows a much weaker external field dependence due to the non-vanishing internal magnetic field. We show that the anisotropy is an intrinsic property of the underling GaAs matrix, associated with the bulk inversion asymmetry contribution to the SO-coupling.

HL 19.3 Tue 11:15 H14

Magnetotransport through nanoscale constrictions in ferromagnetic (001)-(Ga,Mn)As — •Markus Schlapps[1], Matthias Döppe[1], Stefan Geissler[1], Thomas Imlohn[1], Janusz Sadowski[2], Werner Wegscheider[1], and Dieter Weiss[1] — [1]Institut für Experimentelle und Angewandte Physik, Universität Regensburg, Germany — [2]Institute of Physics, Polish Academy of Sciences, Warsaw, Poland

The resistance measured across a small (Ga,Mn)As island detached by nanoconstrictions from (Ga,Mn)As input leads displays unusual magnetoresistance (MR) behavior [1,2]. As in previous studies [1] a huge magnetoresistance was found for nanoconstrictions in the tunneling regime. For slightly wider junctions (on the verge of tunneling) we observed an enhanced anisotropic magnetoresistance together with pronounced jumps as a function of the in-plane magnetic field [3]. This behavior is ascribed to in-plane switching of the magnetization into the easy axis. We investigate the angular dependence of the MR for a tunneling device and discuss the correlation to the TAMR (Tunneling Anisotropic Magneto Resistance) that has been reported previously [2]. In addition we present data of (Ga,Mn)As wires with only one nanoconstriction.

[1] C. Rüster et al.: PRL 91, 216602 (2003)

[2] A. D. Giddings et al.: PRL 94, 127202 (2005)

[3] M. Schlapps et al.: phys. stat. sol. (a) 203, No. 14, 3597 (2006)

HL 19.4 Tue 11:30 H14

Tunneling Anisotropic Magnetoresistance and Spin-Orbit Coupling in tunnel structures with single-crystal GaAs barriers — •Michael Lobenhofer[1], Jürgen Moser[1], Eva Brinkmeier[1], Alex Matos-Abiague[2], Dieter Schuh[1], Werner Wegscheider[1], Jaroslav Fabian[2], and Dieter Weiss[1] — [1]Institut für Experi-