

Micro- and Nanostructure Research: Cleanroom Linz

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The micro- and nanostructure research in the cleanrooms of the Institut für Halbleiter- und Festkörperphysik and the Institut für Mikroelektronik is supported by the Society for Microelectronics (GMe). In the field of Si/SiGe heterobipolar transistors, compatibility issues with conventional Si technology were investigated. Silicon/Germanium structures were also used for the investigation of strain distributions in nanostructures and for the investigation of the metal-insulator phase transition at low temperatures. In GaAs technology, a hot electron injection field effect transistor in 0.5 μm technology with a transit frequency of 32 GHz was realized. Also Nanostructures were prepared in AlGaAs layers by use of electron beam lithography. In the field of optoelectronics, silicon light emitting diodes were achieved by doping with erbium and oxygen. Furthermore, in IV-VI semiconductor compounds, optically pumped surface emitting lasers were realized. Growth processes of semiconductor II-VI compounds were in-situ measured by Reflection Difference Spectroscopy and magnetic properties of iron layers on GaAs were investigated with respect to spin electronics.

The funding of the activities in the two cleanrooms at the University of Linz which are jointly used by three groups is of vital importance for our micro- and nanostructure research activities. This basic funding allows for investigations which are made possible through additional funding coming from the FWF, the FFF, the European Commission, as well as through cooperations with industrial groups as listed in the report.

A short overview is given in the following on the achievements made in the year 2000 in the cleanrooms in Linz. The basic equipment which is available in these clean rooms allows for MBE growth of Si-based heterostructures, of II-VI and IV-VI heterostructures, for the deposition of ferromagnetic layers like Fe on II-VI as well as III-V compounds, as well as for MOCVD growth of III-V compounds like GaAs/GaAlAs and GaAs/GaInAs. Apart from *in situ* and *ex situ* structural characterization, lateral patterning is made possible through equipment like optical, holographic, and electron beam lithography. Processing includes also facilities for the deposition on insulating as well as contact layers. The transmission electron microscope, purchased through funds of the Federal Ministry of Education, Science and Culture, became operational this year.

The research efforts were concentrated on high frequency electronic and optoelectronic devices as described in the following.

Si-SiGe heterobipolar transistors are now widely introduced in the production for high speed bipolar and BiCMOS circuits, offering a great speed advantage over standard Silicon technologies. In Linz steps towards the optimization of the of doping and composition profiles for the SiGeC HBT technology were made in a collaboration with Austria Microsystems, Unterpremstätten. In the production process, incompatibilities due to the

insertion of Ge become an important issue. For example, a transient enhanced diffusion (TED) of boron out of the SiGe base layer upon thermal activation of the poly-emitter implant occurs. As a remedy, the use of a carbon co-doped base has been proposed, in order to suppress the diffusivity. On the other hand, C-complexes may introduce electrically active states in the band gap and thus degrade the electrical properties of the devices. Thus quantitative measurements of substitutional carbon and SiC were performed on MBE grown $\text{Si}_{1-y}\text{C}_y$ layers. In the IR transmission spectra, optical absorption from coherent and incoherent β -SiC was observed. The precipitation behavior of C to β -SiC in $\text{Si}_{1-y}\text{C}_y$ layers was then studied with the FTIR technique. In addition, the impact of carbon in a SiGeC HBT structure with a poly-Si emitter was studied. Complete suppression of TED of B was obtained by carbon doping of the base with 0.2% substitutional carbon.

Silicon and Si/Ge structures were also used in the investigation of strain distributions by x-ray methods. The strain in Si substrates underneath laterally patterned periodic SiO_2 stripes was measured by the grazing incidence diffraction technique. This method enhances the sensitivity in the near interface regions compared to conventional x-ray methods. A tensile and two compressively strained regions were found below and close to the edges of the stripes, respectively. These data have relevance for electronic transport. In Si/Ge islands, the strain and composition distribution was investigated. It turned out that although pure Ge has been deposited during island growth, the Ge composition varies due to intermixing processes between 0.5 and 1.

Silicon/Germanium quantum well structures were further used to investigate a basic physical problem, the behavior of potential fluctuations near the metal-insulator transition at low temperatures. For this purpose, the free electrons were detected by electron spin resonance (ESR). From the ESR signal, the potential fluctuations and the Thomas-Fermi screening efficiency were deduced. At the critical density of the metal-insulator transition, the potential fluctuations diverge leading to a strong increase in resistivity.

Hot electron injection field effect transistors (HEIFET) were realized in GaAs technology. In such a device the usual ohmic source contact is replaced by an injection limiting contact in order to inject fast electrons into the channel region. Consequently, the electron transit time through the channel is reduced and the transistors upper frequency limits are raised. As a result, a 0.5 μm device with a transit frequency of 32 GHz could be realized.

Different types of nanostructures were fabricated in AlGaAs layers. Narrow lateral regions were defined in a two-dimensional electron gas by deep groove etching or by top gate structures with the help of electron beam lithography. In such structures the lateral quantization of electron waves was observed. The investigation and understanding of quantum effects in nanostructures is important as the continuing miniaturization will lead to similar effects in future semiconductor devices.

In the field of optoelectronics, silicon light emitting diodes (LED) were achieved by co-doping of erbium (Er) and oxygen (O). The LED's emit at room temperature at a wavelength of 1.54 μm . The doping profile and electrical activity were investigated in order to optimize the structure for room temperature luminescence.

Optically pumped vertical-cavity surface emitting lasers were fabricated from narrow band gap IV-VI semiconductor compounds. High reflectivity PbEuTe/EuTe multilayers are used as mirrors for the laser cavity. The stimulated emission occurs between 3 and

4.5 μm and is generated either in PbTe quantum wells or in self-organized PbSe quantum dots. PbTe on PbSe was also used for nano-scale dislocation patterning studied by a scanning tunneling microscope.

Furthermore, surface processes in molecular beam epitaxy were investigated *in situ* during growth by the Reflection Difference Spectroscopy method on II-VI semiconductor compounds in order to develop an all-optical feed-back system for controlling the growth. In this method, the measured signal is the difference between the near normal incidence reflectance of light linearly polarized along the two principal axes. The signal is recorded as a function of time, photon energy and/or surface conditions. In CdTe/ZnTe the *in situ* stress relaxation during growth was observed for the first time.

Finally, thin iron films were deposited on GaAs substrates and ZnSe epilayers in order to investigate their magnetic properties in the initial surface reconstruction process. The incorporation of magnetic layers in semiconductor heterostructures is an increasingly active area of study for spin electronics. The magnetization versus magnetic field hysteresis curve for iron on GaAs shows a single irreversible jump whereas the iron films on ZnSe exhibit two such jumps if the thickness is between 60 and 120 nm.

Project Information

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Giant tunability of excitonic photoluminescence transitions in antiferromagnetic EuTe epilayers induced by magnetic polarons
Physica E, in print
26. G. Springholz, T. Schwarzl, W. Heiss, M. Aigle, H. Pascher
Molecular beam epitaxy of lead-salt based vertical cavity surface emitting lasers for the 4-6 μm spectral region
J. Cryst. Growth, in print
27. M. Aigle, H. Pascher, M. Pinczolits, G. Springholz, T. Schwarzl, W. Heiss, G. Bauer
Optical characterization of self-organized PbSe/Pb_{1-x}Eu_xTe quantum dot superlattices
Phys. Stat. Solidi, in print
28. W. Jantsch, Z. Wilamowski, N. Sandersfeld, F. Schäffler
Evidence for Screenign Breakdown Near the Metal-to-Insulator Transition in Two Dimensions
World Scientific, in print
29. Z. Wilamowski, W. Jantsch
Antiferromagnetic Phase of the Two-Dimensional Electron Gas
World Scientific, in print
30. W. Jantsch, G. Kocher, L. Palmetshofer, H. Przybylinska, M. Stepikhova, H. Preier
Optimization of Er Centres in Si for Reverse Biased Light Emitting Diodes
Mat. Sci. and Eng. B, in print
31. H. Przybylinska, W. Jantsch, A. Kozanecki
Site Selective Excitation of Er-Implanted GaN
Mat. Sci. and Eng. B, in print

32. K. Hingerl et al.
In-situ observation of stress relaxation in CdTe/ZnTe heterostructures by reflectance-difference spectroscopy,
Appl. Phys. Lett (2001). Accepted (submitted 2000).
33. K. Hingerl, R.E. Balderas-Navarro, A. Bonanni, P. Tichopadek and W. G. Schmidt
On the Origin of Resonance Features in Reflectance Difference Data of Silicon
Appl. Surf. Science, in print
34. R. E. Balderas-Navarro, K. Hingerl, A. Bonanni, and H.
In situ observation of the onset of dislocations in CdTe/ZnTe heterostructures
Appl. Phys. Lett., in print

Presentations

Invited Talks:

1. G. Bauer
"Si-Ge based heterostructures for optoelectronic applications"
Conference on IV-VI Heterostructures, Université Paris Sud, Orsay, 06.-07. Juli 2000.
2. G. Bauer, V. Holy, J. Stangl, G. Springholz, A.A. Darhuber, M. Pinczolits
"Strain-induced self-organized growth of nanostructures: from step-bunching to ordering in quantum dot superlattices"
27th Conference on the Physics and Chemistry of Semiconductor Interfaces, Salt Lake City, Utah, 16.-20. Jan. 2000.
3. G. Brunthaler
"Metal-insulator Phase Transition in Two Dimensions"
Instituts Kolloquium, Ørsted Institut, Kopenhagen, Dänemark, 16. Feb. 2000.
4. G. Springholz
"Controlling of vertical and lateral ordering in self-organized PbSe quantum dot superlattices "
Fall Meeting of the Materials Research Society, 26.11.-1.12.2000, Boston, USA.
5. G. Springholz, M. Pinczolits, V. Holy. P. Mayer, G. Bauer, H. Kang, L. Salamanca-Riba
"Vertical and lateral correlations formed in self-organized quantum dot superlattices"
25th International Conference on the Physics of Semiconductors, 17.-22.9.2000, Osaka, Japan.
6. G. Springholz, M. Pinczolits, V. Holy and G. Bauer
"Lateral and vertical ordering in self-organized quantum dot superlattices "
18th General Conference of the Condensed Matter Division of the European Physical Society, 13.-17.3.2000, Montreux, Switzerland.
7. G. Springholz, M. Pinczolits, V. Holy and G. Bauer
"Vertical and lateral correlations in self-organized quantum dot superlattices"

- Spring Meeting of the German Physical Society, 26.-31.3.2000, Regensburg, Germany.
8. G. Springholz, M. Pinczolits, V. Holy and G. Bauer
"Vertical and lateral correlations in self-organized quantum dot superlattices"
11th International Winterschool on New Developments in Solid State Physics – Low Dimensional Systems: Fundamentals and Applications, 21.-25.2.2000, Mauterndorf, Austria.
 9. G. Springholz
"Vertikale und Laterale Ordnung in selbst-organisierten Halbleiter-Quantenpunkt Übergittern"
Seminar at the Physics Department of the Ludwig-Maximilians Universität München, 25.5.2000
 10. G. Springholz (*seminar talk*)
"Molecular beam epitaxy of self-organized semiconductor nanostructures"
Institut für Festkörperphysik der Technischen Universität Graz, 14.1.2000, Graz, Austria.
 11. W. Jantsch
Towards Si optoelectronics
Physikkolloquium Universität Amsterdam, 27. 2. 2000
 12. W. Jantsch
ESR-Untersuchungen an zweidimensionalen Halbleiterstrukturen
Seminar Universität Regensburg, 9. 6. 2000
 13. W. Jantsch, G. Kocher, L. Palmethofer, H. Przybylinska, M. Stepikhova, H. Preier
Optimization of Er centres in Si for reverse biased light emitting diodes
E-MRS 2000
 14. A. Kozanecki, B.J. Sealy, K. Homewood, S. Ledain, W. Jantsch, D. Kuritsyn
Sensitization of the 1.54 μ m luminescence of Er in SiO₂ films by Yb and Si nanocrystals
E-MRS 2000
 15. W. Jantsch, Z. Wilamowski, N. Sandersfeld, F. Schäffler
Conduction electron spin resonance – a new tool to investigate the two-dimensional electron gas
Mesospin 2000, Cortona, Italy
 16. K. Hingerl
Influence of anisotropic strain on critical point resonances in reflectance interfaces
Workshop on Optical Characterization of Semiconductor Interfaces
Park City, Utah, Oct. 2000
 17. T. Schwarzl, W. Heiss, G. Springholz
IV-VI semiconductor based vertical Bragg microcavities
Seminar Universität Bayreuth, 8. 6. 2000
 18. K. Hingerl, R.E. Balderas-Navarro, A. Bonanni
Influence of Anisotropic strain on Critical Point Resonances in Reflectance Difference Data

Park City, Utah, Workshop on Optical Characterization of Semiconductor Interfaces, 15.-18.10. 2000

Conference presentations (talks and posters):

1. M. Aigle, H. Pascher, G. Springholz, M. Pinczolits, T. Schwarzl, W. Heiss, and G. Bauer
"Optical characterization of self-organized PbSe/PbEuTe quantum dot superlattices"
International Conference on Semiconductor Quantum Dots, 31.7.-3.8.2000, München, BRD.
2. A. Daniel, V. Holy, Y. Zhuang, T. Roch, J. Grenzer, Z. Bochnicek, G. Bauer
"Grazing incidence study of strain modulations in Si due to patterned SiO₂"
X-TOP, Ustron, Polen
3. A. Daniel, Y. Zhuang, T. Roch, J. Stangl, G. Bauer, C. Schelling, F. Schäffler, J. Grenzer, U. Pietsch, V. Holy
"Study of depth dependent in-plane strain relaxation on Si/SiGe and SiO₂ wires using grazing incidence diffraction" (Poster)
HASYLAB User Meeting, Hamburg, Deutschland, Januar 2000.
4. V. Holy, J. Stangl, G. Springholz, M. Pinczolits, G. Bauer
"X-ray scattering from self-organized PbSe quantum dots in PbSe/PbEuTe superlattices"
5th Biennial Conference on High Resolution X-ray Diffraction and Topography (X-TOP 2000), 13-15th September 2000, Ustron-Jaszowiec, Polen
5. A. Prinz, G. Brunthaler, G. Bauer and V.M. Pudalov
"On the borders for quantum effects in high-mobility Si-MOS structures",
25th Int. Conf. on the Physics of Semiconductors, Osaka, Japan 2000.
6. A. Raab and G. Springholz, (poster)
"Oswald Ripening of faceted self-assembled PbSe quantum dot during annealing"
International Conference on Semiconductor Quantum Dots, 31.7.-3.8.2000, München, BRD.
7. T. Roch, V. Holy, J. Stangl, E. Höflinger, A. Daniel, G. Bauer, I. Kegel, H. Metzger, J. Zhu, K. Brunner, G. Abstreiter
"Structural investigations on self-organized Si/SiGe islands by grazing incidence small angle x-ray scattering",
International Conference on Semiconductor Quantum Dots, July 31- August 3, 2000, Munich, Germany
8. T. Roch, V. Holy, A. Daniel, E. Höflinger, M. Meduna, T.H. Metzger, G. Bauer, J. Zhu, K. Brunner, G. Abstreiter
"X-ray Scattering Studies on Self-organized Wires in SiGe/Si Multilayers",
5th Biennial Conference on High Resolution X-ray Diffraction and Topography, 13-15 September 2000, Ustron-Jaszowiec, Poland,
9. T. Roch, A. Daniel, E. Höflinger, G. Bauer, J. Zhu, K. Brunner, G. Abstreiter
"X-ray reflectivity on self-organized Si/SiGe wires" (Poster)
HASYLAB User Meeting, Hamburg, Deutschland, Januar 2000.

10. G. Springholz, V. Holy, P. Simicek, P. Mayer, M. Pinczolits, and G. Bauer
"Modeling of vertical and lateral correlations in self-organized quantum dot superlattices: Finite size effects and the influence of the elastic anisotropy"
International Conference on Semiconductor Quantum Dots, 31.7.-3.8.2000, München, BRD.
11. G. Springholz, T. Schwarzl, W. Heiss, M. Aigle, and H. Pascher
"Molecular beam epitaxy of lead salt-based vertical cavity surface emitting lasers for the 4 - 6 μm spectral region"
11th International Conference on Molecular Beam Epitaxy, 10.15.9.2000, Beijing, China
12. G. Springholz, M. Pinczolits, V. Holy, P. Mayer, G. Bauer, H. Kang, and L. Salamanca-Riba
"Phase diagram and tuning of lateral and vertical order in self-organized PbSe quantum dot superlattices"
11th International Conference on Molecular Beam Epitaxy, 10.15.9.2000, Beijing, China
13. G. Springholz, V. Holy, P. Mayer, and G. Bauer
"Modeling of vertical and lateral ordering in self-organized quantum dot superlattices: Finite size effects and the influence of the elastic anisotropy"
11th International Conference on Molecular Beam Epitaxy, 10.15.9.2000, Beijing, China
14. G. Springholz, W. Heiß, and G. Prechtl
"Giant tunability of excitonic photoluminescence transitions in antiferromagnetic EuTe epilayers"
Fall Meeting of the Materials Research Society, 26.11.-1.12.2000, Boston, USA.
15. G. Springholz, T. Schwarzl, W. Heiss, M. Aigle and H. Pascher
"Molecular beam epitaxy of vertical cavity surface emitting PbSe quantum dot lasers for the mid infrared spectral region"
Fall Meeting of the Materials Research Society, 26.11.-1.12.2000, Boston, USA.
16. G. Springholz, M. Pinczolits, V. Holy, P. Mayer, G. Bauer, H. H. Kang, L. Salamanca-Riba (Poster)
"Scaling behavior and phase diagram of lateral and vertical ordering in self-organized PbSe quantum dot superlattices"
International Conference on Semiconductor Quantum Dots, 31.7.-3.8.2000, München, BRD.
17. J. Stangl, T. Roch, A. Daniel, M. Pinczolits, G. Springholz, G. Bauer, I. Kegel, T.H. Metzger
"Investigations of quantum dot multilayers with grazing incidence small angle scattering: shape and ordering",
10th ESRF Users' Meeting, 8.-12.2.2000, Grenoble
18. J. Stangl, T. Roch, A. Daniel, M. Pinczolits, G. Bauer, I. Kegel, T.H. Metzger, D. Smilgies
"Investigation of quantum dot multilayers with grazing incidence small angle scattering: shape and ordering" (Poster)
ESRF User Meeting, Grenoble, Frankreich, Februar 2000.

19. J. Stangl, A. Daniel, V. Holy, G. Bauer, I. Kegel, T.H. Metzger, T. Wiebach, O.G. Schmidt, K. Eberl
"Composition and strain in freestanding Ge islands" (Poster)
MRS Boston, USA
20. J. Stangl, V. Holy, A. Daniel, T. Roch, G. Bauer, T.H. Metzger, J. Zhu, K. Brunner, G. Abstreiter
"Shape and size of buried SiGe islands"
25th International Conference on the Physics of Semiconductors, 17.-22.9.2000, Osaka, Japan.
21. K. Wiesauer and G. Springholz
"Scaling behavior in spiral growth of PbTe (111) under conditions far from thermodynamic equilibrium"
Spring Meeting of the German Physical Society, 26.-31.3.2000, Regensburg, Germany.
22. K. Wiesauer and G. Springholz
Spiral growth in molecular beam epitaxy far from thermodynamic equilibrium: Scaling behavior and growth mode transitions
11th International Conference on Molecular Beam Epitaxy, 10.15.9.2000, Beijing, China
23. H. Przybylinska, W. Jantsch, A. Kozanecki
Site selective excitation of Er-implanted GaN
E-MRS 2000
24. Z. Wilamowski, W. Jantsch
Aniferromagnetic phase of the two-dimensional electron gas
ICPS 25, Osaka, Sept. 2000
25. W. Jantsch, Z. Wilamowski, N. Sandersfeld, F. Schäffler
Evidence for screening breakdown near the metal-to-insulator transition in two dimensions
ICPS 25, Osaka, Sept. 2000
26. Z. Wilamowski, W. Jantsch
Spin resonance properties of the two-dimensional electron gas
PASPS 2000, Sendai, Sept. 2000
27. W. Jantsch, Z. Wilamowski, N. Sandersfeld, F. Schäffler
Conduction electron spin resonance – a new tool to investigate the two-dimensional electron gas
50. Jahrestagung der ÖPG, Graz, Sept. 2000
28. E. Thor, M. Mühlberger, L. Palmethofer, F. Schäffler, M. Gritsch
Capacitance-voltage profiling and deep-level transient spectroscopy on epitaxially grown Si, SiGe, SiC, SiGeC heterostructures
50. Jahrestagung der ÖPG, Graz, Sept. 2000
29. K. Hingerl, R. Balderas-Navarro, W. Hilber, A. Bonanni
A model for resonance features at critical points in reflectance difference data
ICSFS-10, Princeton University, Princeton, USA, July 2000

30. R.E. Balderas-Navarro, K. Hingerl, W. Hilber, D. Stifter, A. Bonanni, H. Sitter
In situ reflectance-difference spectroscopy of doped CdTe and ZnTe grown by molecular beam epitaxy
27th Conf. Physics and Chemistry of Semiconductor Interfaces, Salt Lake City, Utah, Jan. 2000
31. G. Springholz, T. Schwarzl, W. Heiß, M. Aigle, H. Pascher
Two-color vertical cavity surface emitting PbSe quantum dot laser for the mid infrared
Material Research Society (MRS) 2000 Fall Meeting, Boston, USA, November 27 - December 1, 2000
32. G. Springholz, T. Schwarzl, W. Heiss, M. Aigle, H. Pascher
Molecular beam epitaxy of lead-salt based vertical cavity surface emitting lasers for the 4-6 μm spectral region
11th International Conference on Molecular Beam Epitaxy (MBE-XI), Beijing, China, September 10-15, 2000
33. T. Schwarzl, G. Springholz, M. Aigle, H. Pascher, W. Heiss
4-6 μm vertical cavity surface emitting lasers based on lead salt compounds
European Conference on Lasers and Electro-Optics Europe 2000 (CLEO/Europe), Nice, France, September 10-15, 2000
34. M. Aigle, H. Pascher, M. Pinczolits, G. Springholz, T. Schwarzl, W. Heiss, G. Bauer
Optical characterization of self-organized PbSe/Pb_{1-x}Eu_xTe quantum dot superlattices
International Conference on Semiconductor Quantum Dots (QD 2000), Munich, Germany, July 31 - August 3, 2000
35. T. Schwarzl, W. Heiß, G. Springholz, M. Aigle, H. Pascher
Lead salt based vertical cavity surface emitting lasers for the 4 – 6 micron wavelength range
42nd Electronics Materials Conference 2000 (EMC), Denver, USA, June 21 – 23, 2000
36. T. Schwarzl, W. Heiss, G. Springholz, S. Gianordoli, G. Strasser, M. Aigle, H. Pascher
Strongly detuned IV-VI microcavity and microdisk resonances: mode splitting and lasing
25th International Conference on the Physics of Semiconductors (ICPS 25), Osaka, Japan, September 17 – 22, 2000
37. T. Schwarzl, W. Heiß, G. Springholz, M. Aigle, H. Pascher
Lead salt based vertical cavity surface emitting lasers for the 4 - 6 μm wavelength range
11th International Winterschool on New Developments in Solid State Physics: “Low-Dimensional Systems: Fundamentals and Applications”, Mauterndorf, February 21 – February 25, 2000
38. G. Springholz, W. Heiss, G. Pechtl
Giant tunability of excitonic photoluminescence transitions in antiferromagnetic EuTe epilayers
MRS-2000 Fall Meeting, Boston, USA, (November 27-December 1, 2000)

39. W. Heiss, G. Pechtl, G. Springholz
Giant tunability of excitonic photoluminescence transitions in antiferromagnetic EuTe epilayers
25th International Conference on the Physics of Semiconductors, Osaka, Japan
(September 17-22, 2000)
40. W. Heiss, G. Pechtl, G. Springholz
Giant tunability of excitonic photoluminescence transitions in antiferromagnetic EuTe epilayers induced by magnetic polarons
The Int. Conf. on the Physics and Application of Spin-Related Phenomena in Semiconductors 2000, Sendai, Japan (September 13-15, 2000)
41. W. Heiss, G. Pechtl, G. Springholz
Giant tunability of excitonic photoluminescence transitions in antiferromagnetic EuTe due to magnetic polarons
Euroconference Spin Effects in Mesoscopic Systems, Cortona, Italy (June 28 – July 2, 2000)
EuTe epilayers
25th International Conference on the Physics of Semiconductors, Osaka, Japan
(September 17-22, 2000)
42. W. Heiss, G. Pechtl, G. Springholz
Giant tunability of excitonic photoluminescence transitions in antiferromagnetic EuTe epilayers induced by magnetic polarons
The Int. Conf. on the Physics and Application of Spin-Related Phenomena in Semiconductors 2000, Sendai, Japan (September 13-15, 2000)
43. W. Heiss, G. Pechtl, G. Springholz
Giant tunability of excitonic photoluminescence transitions in antiferromagnetic EuTe due to magnetic polarons
Euroconference Spin Effects in Mesoscopic Systems, Cortona, Italy (June 28 – July 2, 2000)
44. K. Hingerl*, R. Balderas, W. Hilber and A. Bonanni
A Model for Resonance features at critical points in reflectance difference data
International conference on solid films and surfaces
Princeton University Princeton, USA, July 9 - 13, 2000 ICSFS-10
45. R. E. Balderas-Navarro, K. Hingerl, W. Hilber, D. Stifter, A. Bonanni and H. Sitter
In situ reflectance-difference spectroscopy of doped CdTe and ZnTe grown by molecular beam epitaxy
27th Conference on the Physics and Chemistry of Semiconductor Interfaces. Salt Lake City, Utah 16-20 January 2000
46. C. G. Diskus, A. Stelzer, C. Gamsjäger, E. Kolmhofer, K. Lübke und H. W. Thim,
Phasennmessungen an Mikrowellensignalen
Beiträge der Informationstagung Mikroelektronik, ME'99, Wien, Österreichischer Verband für Elektrotechnik, ÖVE-Schriftenreihe Nr. 23, S. 189–196. ISBN 3-85133-019-6
47. A. Stelzer, C. G. Diskus, A. Fischer, K. Lübke und H. W. Thim,
Direkte Frequenzmessung an Mikrowellensignalen
Beiträge der Informationstagung Mikroelektronik, ME'99, Wien, Österreichischer

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48. C. G. Diskus, A. Stelzer, K. Lübke, H.W. Thim,
A Ka-Band Detector Diode with High Sensitivity
Proceedings of the Seminar Current Developments of Microelectronics 1999,
organized by the Society for Microelectronics (Gesellschaft für Mikroelektronik -
GMe), 3rd–6th March 1999, Bad Hofgastein, Austria, pp. 29–33. ISBN 3-901578-
04-8
49. H. W. Thim,
MMIC Research and Development at Austrian Universities
Proceedings of the Seminar Current Developments of Microelectronics 1999,
organized by the Society for Microelectronics (Gesellschaft für Mikroelektronik -
GMe), 3rd–6th March 1999, Bad Hofgastein, Austria, pp. 25–27. ISBN 3-901578-
04-8
50. E. Kolmhofer, M. Bergmair, C. Diskus, K. Luebke, A. Stelzer, and H. Thim,
Hot Electron Injection Field Effect Transistor
Digest to the 23rd Workshop on Compound Semiconductor Devices and Integrated
Circuits (WOCSDICE '99), May 26–28, 1999, Chantilly, France, p. 145

Patents

1. H. Thim, K. Lübke,
„Feldeffekttransistor mit injektionsbegrenzendem Sourcekontakt (Hot Electron
Injection Field Effect Transistor HEIFET)“
Österreichisches Patent Nr. 407.451, erteilt am 6.12.2000

Doctor's Theses

1. Dipl.Ing. Michael Pinczoliths
“Self-Organized Epitaxial Growth of IV-VI Quantum Dots and Quantum-Dot
Crystals”
2. Dipl.Ing. Julian Stangl
“High-resolution X-ray Diffraction Studies of Self-organized SiGe(C) Islands”
3. Dipl. Phys. Christoph Schelling
„Growth and characterization of self-organized and ‚organized‘ Si and Si_{1-x}Ge_x
nanostructures“
4. Dipl.Ing. Heinz Seyringer
„Nanostrukturierung und Charakterisierung von Si/SiGe Heterostrukturen“
5. M.Sc. Yan Zhuang
“Fabrikation und Charakterisierung von lateral strukturierten Si/SiGe-
Heteroschichten”
6. Dipl.-Ing. Karin Bierleutgeb:
Herstellung und Charakterisierung ferromagnetischer Schichten

7. Dipl.-Ing. Andreas Stelzer, "Aufbau eines Mikrowellenmeßsystems mit Sub-Millimeter Genauigkeit unter Verwendung direkter Frequenzmessung und Six-Port Phasenbestimmung", Linz, 2000.

Cooperations

1. Siemens München, Dr.Heide
2. Daimler Benz Reserach Laboratories Ulm, Dr. Presting, Dr. König
3. VOEST ALPINE, Linz, Dr.Angerer,
4. INFINEON Villach,
5. AMS Unterpremstätten
6. KEBA, Linz, Ing.G.Krippner
7. Institut für Halbleiterphysik, Frankfurt/Oder
8. Sektion Physik, Ludwig-Maximilians Universität München
9. Physics Department, Cornell University
10. ETH, Zürich
11. ESRF Grenoble
12. DESY, Hasylab, Hamburg
13. FOM Institute Rijnhuizen, Niederlande
14. Walter Schottky Institut, TU München
15. IBM Research Center, Yorktown Heights
16. Institut für Festkörperelektronik, TU Wien
17. Philips Almelo, Niederlande
18. Heriot Watt University, Edinburgh, Scotland
19. University of Southampton, England
20. High Pressure Research Center, Warschau, Polen
21. Institue of Physics, Polish Academy of Sciences, Warschau
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30. University of Warwick, Coventry, England

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32. IAF Freiburg
33. CENG Grenoble
34. Universität Paderborn
35. INSA, Lyon
36. Université de Montpellier
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38. Universiteit Instelling, Antwerpen, Niederlande
39. TASC Triest
40. ENEA, Roma
41. CNRSM-PASTIS, Brindisi
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43. High Magnetic Field Lab., Grenoble
44. Siemens München, Zentrale Technik, Bereich Halbleiter
45. Fraunhofer-Institut (IAF) Freiburg (Chiptechnologie)
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47. Profactor, Steyr, Upper Austria