

Jin Seo Im

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EDUCATION

Doctorate of Philosophy, Physics, November 2000
Technical University of Braunschweig, Braunschweig, Germany
Dissertation: *Spontaneous recombination in group-III nitride quantum wells*
Adviser: Professor Dr. Andreas Hangleiter

Master of Science, Physics, June 1996
University of Stuttgart, Stuttgart, Germany
Thesis: *Time-resolved study on recombination of charge carriers in (AlGaIn)N heterostructures*

Bachelor of Science, Physics, February 1992
Seoul National University, Seoul, South Korea

SKILLS

Experimental optics and optical design

- Large-scale high-precision optical setup in the spectral range from UV to NIR requiring a laser beam focused in the micrometer range using various laser systems (Ti:sapphire fs laser, dye laser, Nd:YAG laser, argon ion laser).
- High-frequency modulation and shot-noise-limited detection system capable of measuring signal change on the order of 10^{-6} using a self-made high-sensitive resonant balanced detector.
- High-speed photon detection system utilizing microchannel plate photomultiplier tubes (MCP PMT) with a time response of picosecond, short-pulse electronics, and data requisition technique (constant fraction discriminator, time-to-amplitude converter, high-frequency amplifier, multichannel pulse height analyzer).
- Optical imaging system monitoring optical alignment.
- Typical optical experiments performed are listed as below:
Ultrafast time-resolved optical pump-probe experiment, amplified spontaneous emission (ASE) experiment, time-correlated single-photon counting experiment, two-photon absorption measurement.

Semiconductor devices and fabrication

- Electrical/optical characterization and analysis of optoelectronic devices.
- Semiconductor processing and fabrication: e-beam lithography, reactive ion etching (RIE), electron-beam deposition.

Computer-related skills

- Modeling and numerical calculation of electronic band structure of semiconductor heterostuctures solving Poisson and Schrödinger equations self-consistently with the aid of programming languages, such as C, Fortran, and Pascal in Linux and Window.
- Data analysis and computer interfacing/equipment control.

RESEARCH EXPERIENCE

Postdoctoral Research Associate

Division of Chemistry, Argonne National Laboratory, Argonne, Illinois, September 2001 – present

- Ongoing research: fabrication of subwavelength optical waveguide utilizing plasmon coupling to generate a confined source of light that can excite nanoscopic objects.

Postdoctoral Research Associate

Division of Engineering, Brown University, Providence, Rhode Island, September 2000 – August 2001

- Designed and conducted optical experiments for generation and detection of Thz-Ghz coherent acoustic phonons in GaN/AlGaN superlattice structures.
- Nanofabrication of nitride semiconductor, such as a nanoscale periodic array of posts and characterization of their light emission property.

Research Assistant/Ph.D. Research

Institute of Technical Physics, Technical University of Braunschweig, Germany, July 1999 – August 2000

- Initialized and built experimental environment of the new startup laboratory.
- Studied asymmetric double GaN/AlGaN quantum well, observing inter- and intrawell transitions separately due to the strain-induced piezoelectric field.

Research Assistant/Ph.D. Research

Physics Department, 4th Institute, University of Stuttgart, Germany, June 1995 – June 1999

- Performed optical experiments, identifying recombination mechanisms in group-III nitride quantum wells crucial to understanding light emitting processes of optoelectronic devices based on group-III nitride.
- Verified piezoelectric field effects on optical properties of GaN/AlGaN and InGaN/GaN quantum wells.
- Designed and studied asymmetric group-III nitride quantum well structures consisting of either a quantum well sandwiched by asymmetric barriers or asymmetrically doped barriers.
- Demonstrated how to manipulate and control the electron confinement of the quantum well and screening of strain-induced piezoelectric fields in the quantum well, leading to a key solution to improve performance of optoelectronic devices.

Teaching Assistant

Physics Department, 4th Institute, University of Stuttgart, Germany, October 1993 – September 1998

- Taught and supervised undergraduate and graduate students in laboratory courses.
- Guided a master thesis of a junior graduate student yielding 5 publications.

HONORS

Scholarship of Deutscher Akademischer Austauschdienst (**DAAD**), October 1997 – September 2000

PUBLICATIONS

1. Lu Chen, A. Jin, J. S. Im, A.V. Nurmikko, J. M. Xu, J. Han, “Fabrication Of 50-100 nm patterned InGaN blue light emitting heterostructures”, to be published in phys. stat. sol (b).
2. J. S. Im, J. Off, F. Scholz, A. Hangleiter, “Sign of the piezoelectric field in asymmetric GaInN/AlGaN/GaN single and double quantum wells on sapphire and SiC”, Fall Meeting of Material Research Society, Boston, 1999.
3. O. Gfrörer, C. Gemmer, J. Off, J. S. Im, F. Scholz, A. Hangleiter, “[Direct observation of pyroelectric fields in InGaN/GaN and AlGaN/GaN heterostructures](#)”, phys. stat. sol. (b) **216**, 405 (1999).

4. A. Hangleiter, J. S. Im, J. Off, F. Scholz, “[Optical properties of nitride quantum wells: how to separate fluctuation and polarization field effects](#)”, phys. stat. sol. (b) **216**, 427 (1999).
5. H. Kollmer, J. S. Im, S. Heppel, J. Off, F. Scholz, A. Hangleiter, “[Intra- and interwell transitions in GaInN/GaN multiple quantum wells with built-in piezoelectric fields](#)”, Appl. Phys. Lett. **74** 82 (1999).
6. J. S. Im, H. Kollmer, O. Gfrörer, J. Off, F. Scholz, A. Hangleiter, “[Piezoelectric field effect on optical properties of GaN/GaN/AlGaN quantum wells](#)”, MRS Internet J. Nitride Semicond. Res. **4S1**, G6.20 (1999).
7. J. S. Im, H. Kollmer, S. Heppel, J. Off, F. Scholz, A. Hangleiter, “Piezoelectric fields and optical transitions in GaInN/GaN multiple quantum wells” in Proceedings of the 2nd International Symposium on Blue Laser and Light Emitting Diodes, Chiba, 1998 (Ohmsha, Tokyo, 1998), p. 673.
8. A. Hangleiter, J. S. Im, H. Kollmer, S. Heppel, J. Off, F. Scholz, “[The role of piezoelectric fields in GaN-based quantum wells](#)”, MRS Internet J. Nitride Semicond. Res. **3**, 15 (1998).
9. J. S. Im, H. Kollmer, J. Off, A. Sohmer, F. Scholz, A. Hangleiter, “Carrier confinement in GaInN/AlGaN/GaN quantum wells with asymmetric barriers: direction of the piezoelectric field”, Mat. Sci. Eng. B **59**, 315 (1999).
10. J. S. Im, H. Kollmer, J. Off, A. Sohmer, F. Scholz, A. Hangleiter, “[Reduction of oscillator strength due to piezoelectric fields in GaN/AlGaN quantum wells](#)”, Phys. Rev. B **57**, R9435 (1998).
11. J. S. Im, A. Sohmer, F. Scholz, A. Hangleiter, “Effects of piezoelectric fields in GaInN/GaN heterostructures and quantum wells”, Fall Meeting of the Materials Research Society, Boston, 1997
12. J. S. Im, S. Heppel, H. Kollmer, A. Sohmer, J. Off, F. Scholz, A. Hangleiter, “Evidence for quantum-dot-like states in GaInN/GaN quantum wells?”, J. Crystal Growth **189-190(1-4)**, 597-600 (1998).
13. J. S. Im, J. Off, A. Sohmer, F. Scholz, A. Hangleiter, “Time-resolved spectroscopy on GaN/AlGaN double heterostructures and quantum wells”, Proceedings of the International conference on silicon carbide and III-Nitrides, Stockholm 1997.
14. F. Scholz, A. Sohmer, J. Off, J. S. Im, A. Hangleiter, “Low pressure MOVPE of GaN and GaInN/GaN heterostructures and quantum wells”, European workshop on metalorganic vapor phase epitaxy, 1997.
15. A. Sohmer, J. Off, H. Bolay, V. Härle, V. Syganow, J. S. Im, V. Wagner, F. Adler, A. Hangleiter, A. Dörnen, F. Scholz, “[GaInN/GaN-heterostructures and quantum wells grown by metalorganic vapor-phase epitaxy](#)”, MRS Internet J. Nitride Semicond. Res. **2**, 14(1997).
16. F. Scholz, A. Sohmer, J. Off, V. Syganow, A. Dörnen, J. S. Im, A. Hangleiter, H. Lakner, “In incorporation efficiency and composition fluctuations in MOVPE grown GaInN/GaN heterostructures and quantum wells”, Mat. Sci. Eng. **B50**, 238 (1997).
17. F. Scholz, V. Härle, H. Bolay, F. Steuber, B. Kaufmann, G. Reyher, A. Dörnen, O. Gfrörer, J. S. Im, A. Hangleiter, “Low pressure metalorganic vapor phase epitaxial growth of GaN/GaInN heterostructures”, Solid State Electron. **41**, 141 (1997).
18. J. S. Im, A. Moritz, F. Steuber, V. Härle, F. Scholz, A. Hangleiter, “[Radiative carrier lifetime, momentum matrix element, and hole effective mass in GaN](#)”, Appl. Phys. Lett. **70**, 631 (1997).
19. J. S. Im, V. Härle, F. Scholz, A. Hangleiter, “[Radiative lifetime of excitons in GaInN/GaN quantum wells](#)”, MRS Internet J. Nitride Semicond. Res. **1**, 37 (1996).
20. A. Hangleiter, G. Frankowsky, J. S. Im, V. Härle, F. Scholz, “Spontaneous and stimulated recombination in the nitrides”, Fall Meeting of the Materials Research Society, Boston, 1996.