

NANYANG TECHNOLOGICAL UNIVERSITY
CV Form for Academic Staff (Part-I)

Name: ZHANG Dao Hua

Present Appointment: A/Professor

School: Electrical and Electronic Engineering

Division: Microelectronics

Date of 1st Appointment: 2 May 1991

Academic Qualifications:(State Name of University, year of award & class of honors)

BSc – Shandong University – 1978

MSc – Shandong University – 1983

PhD – University of New South Wales – 1989

Professional Qualification/Membership: (State date of membership)

FELLOW of the Institute of Physics (UK) – Since Sep. 2006.

SrMIEEE (USA) – Since 1997.

Summary of Working Experience:

Aug. 1978 – Aug. 1979: Teaching assistant, Shandong University, P. R. China.

Jan. 1982 – Dec. 1982: Teaching assistant, Shandong University, P. R. China.

Jan. 1983 – Oct. 1984: Lecturer, Shandong University, P. R. China.

Oct. 1984 – Mar. 1986: Visiting Scholar, University of New South Wales, Australia.

2 May. 1991 – 31 Dec. 1994: Lecturer, Nanyang Technological University (NTU).

1 Jan. 1995 – 31 Dec. 1998: Senior Lecturer, NTU

1 Jan. 1999 – now: Associate Professor, NTU

NANYANG TECHNOLOGICAL UNIVERSITY
CV Form for Academic Staff (Part-II)

Name: Zhang Dao Hua

School: Electrical and Electronic Engineering

A. Teaching

(1) Courses taught

- Semiconductor devices
- Advanced topics in semiconductor physics
- Microelectronic devices
- Modern semiconductor devices
- Power supply design
- Introduction to semiconductor engineering
- Semiconductor fundamentals
- Analog and digital electronics
- Electrical circuits
- Engineering mathematics (I)
- Engineering mathematics (II)

(2) Development of teaching materials
MSc courses

- Heterojunction electronic and photonic devices
- Semiconductor memories
- Recent development and future trends in semiconductor devices (every year).
- Modern semiconductor devices (NYU-TUM MSc program)

Undergraduate courses

- Microelectronic devices
- Heterojunction devices.
- Power supply design

(3) Short course conducted

- “Semiconductor devices” for staff in Applied Materials South East Asia Pte Ltd in 1999.
- “Inside the electronic devices” for students in Singapore Institute of Management from 2000 – 2002.
- “Microelectronic devices” for part-time students, 2006.
- “Modern semiconductor devices” for NTU-TUM M.Sc candidates, 2008.

(4) **Teaching feedback**

My average teaching indexes for lecture and tutorial for the last 9 years are 84.95 and 84.54, respectively, which are higher than the average mean of 79.97 and 82.53 in the School of EEE.

(5) **Ph.D, M.Eng and M.Sc candidates supervised (25)**

PhD

- Mr. Han Zhiyong (co-supervised with YSF), “Sequential tunneling in GaAs/AlGaAs superlattices grown by MBE” 1997.
- Mr. Shi Wei, “Characterization of GaInAs/AlGaAs quantum well structures for long wavelength infrared detection”, 2000.
- Mr. Li Chaoyong, “Copper metallization for deep submicron integrated circuits”, 2005.
- Mr. Loh Seow Wee, “Study of Copper Diffusion in Tantalum Based Barrier Materials”, 2004.
- Mr. Sun Lu, “Study of InGaAsP/InP quantum well structures grown by solid source MBE and their application for long wavelength infrared detection”, 2005.
- Mr. Yang Lieyong, “Copper and ultra low-k porous SiLK for multilevel interconnects”, 2005.

M.Eng

- Mr. Li Heming (co-supervised with YSF), “Photoluminescence studies of compound semiconductor structures grown by molecular beam epitaxy”, 1993.
- Mr. Li Chaoyong, Growth of GaAs/AlGaAs quantum well lasers and GaAs/InGaAs vertical cavity surface emitting lasers by MBE”, 1996.
- Ms. Gao Ying, “Characterization of amorphous silicon carbide”, 1999.
- Mr. Zhang Wei Min, Characterization of InGaAlAs/InAlAs/InP heterostructures grown by MBE”, 2000.
- Mr. Wang Xiaozhen, “Electrical and optical properties of GaInAsP/GaAs grown by solid source MBE”, 1999.
- Mr. Loh Soon Ann Stephen, “Electrochemical plated copper for interconnect applications”, 2003.

MSc by courses plus dissertation

- Mr. Ja Guojun, “Texture and stress study of barrier layers on various low-k materials in copper technology, 2004.
- Ms, Tan Ai Kiam, “Resolving p-type transistor drain saturation current(I_{Dsat}) off-target issue for 0.3 μm logic devices”, 2002.
- Ms. Saxena Shweta, “Nano scale Si/SiGe based QWIPs”, 2007.

MSc by courses plus independent study module

- Mr. Nay Lin Aung, “SiGe quantum dot and its applications for infrared detection”, 2005.
- Mr. Soh Eng Hwa, “A novel nitrogen containing III-V compound and its application”, 2006

- Ms. Sridharan Aparna, “Quantum wire and their application in infrared detectors”, 2006
- Mr. Tan Song Teck, “Nanoscale Room Temperature Infra-red Photo-detectors”, 2006.
- Mr. Toh Yeow Teck, “A new InSbN alloy” 2006.
- Mr. Ang Hwee Khai (G0500802C), “Study of metamaterials”, 2007
- Mr. Liu Jinwei (G0500814F), “SiGe related materials and infrared photodetectors for room temperature detection”, 2007.
- Mr. Liu Donghua, “Nonvolatile Memory”, 2007.
- Mr. Jeyaprakash Seenivasan, “Application of Aluminum anodizing for quantum wire devices”, 2008.
- Mr. Li Chao, “InSb based high temperature infrared photodetectors”, 2008.
- Ms. Fan Hejie, “Semiconductor metamaterials”, 2008.

Among them, one is **Vice President** of a big wafer company, one is a **Senior Director**, one is a University **Associate Professor**, one is a **Senior Manager**, four are **Manager** and five are senior technical staff in semiconductor companies.

(6) **Students under supervision currently**

- PhD, Mr. Liu Wei, “Study of InGaAsN based structures for infrared photodetection
- PhD, Ms. Chen Xizi, “Study of optical properties and band structure of InSbN alloys for infrared photodetection”
- PhD, Mr. Jin Yunjiang, “Development of InAsSb alloys for Infrared photodetection”
- PhD, Mr. Li Dongdong, “Design and characterization of metamaterials for visible frequencies”
- M.Eng, Ms. Wang Yan, “InSbN infrared photodetectors”
- M.Eng, Mr. Deng Fangxin, “65 nm Back-End-Of-The-Line ECP gap-fill capability study”
- M.Sc, Ms. Fan Hejie, “Semiconductor metamaterials”

(7) **PhD (16) and M.Eng (16) Candidates examined**

Dr. Chen Yu Wen, Dr. Wang Hong, Dr. Shangguan Wangzuo, Prof. Tan Ooi Kiang, Dr. Yuan Kaihua, Dr. Yang Hong, Dr. Yu Suzhu, Dr. Chen Zhe, Dr. Neo Wah Peng, Dr. Li Hui, Dr. Liu Chongyang, Dr. Zhang Lin, Dr. Zhu Chunlin, Dr. Nie Dong, Dr. Yin Zhongyou. Dr Ding Liang

Mr. Tee Kheng Chok, Mr. Tan Kee Tchuan, Mr. Yip Kim Hong, Mr. Chan Fang Yih, Mr. Manni Lal, Mr. Edwin Goh Beng Chye, Ms. Jiang Yaoyao, Ms. Tay Shih Hwee, Mr. Huang Wenke, Mr. Tan Chong Kit, Albert, Mr. Teo Chee Hiang, Mr. Goh Tat Kean, Mr. Ong Lay Ting Mr. Liu Bo, Mr. Lu Fen, Mr Li Daosheng.
(For 5 of them, I was involved in oral examination panel only).

(8) **PhD (10) and Master (16) Candidates assessed for qualification**

Dr. Chen Yu Wen, Dr. Wang Hong, Dr. Shangguan Wangzuo, Dr. Yuan Kaihua, Dr. Yang Hong, Dr. Yu Suzhu, Dr. Chen Zhe, Dr. Neo Wah Peng, Dr. Li Hui, Dr. Zhu Chunlin. Mr. Tee Kheng Chok, Mr. Tan Kee Tchuang, Mr. Yip Kim Hong, Mr. Chan Fang Yih, Mr. Manni Lal, Mr. Edwin Goh Beng Chye, Ms. Jiang Yaoyao, Ms. Tay Shih Hwee, Mr. Huang Wenke, Mr. Tan Chong Kit, Albert, Mr. Teo Chee Hiang, Mr. Goh Tat Kean, Mr. Ong Lay Ting, Mr. Lu Fen, Mr. Yu Ying, Mr. Li Daosheng,

(9) **Service as an external examiner**

- PhD, Hu Guangxia, National University of Singapore (2008)
- PhD, S. Ilyas, the University of New South Wales, Australia (2007)
- PhD, Mr. Zhen Yiqiang, from Fudan University (2005)
- MSc, Mr. Zhao Boluo, from Physics Department, Fudan University (2005).

B. Research

(1) **Awards and Recognitions**

- Fellow of the Institute of Physics (UK) in Sep 2006.
- Papers were cited in a book and 8 review articles, websites and US patent in addition to journals.
- Be invited to write review articles for international journals and books.
- Research outstanding and award recognition (ROAR) (awarded 3 PhD scholarships).
- Two times Tan Chin Tuan Fellowship (2000 and 2004).
- Senior Visiting scientist, Fudan University, 2004-2006 (4 weeks per year).
- Senior member of IEEE since 1997.
- Postgraduate Scholarship, University of New South Wales, Australia (Mar 1986- Mar 1989)
- Advisor in the Research Board of Advisors, American Biographical Institute, USA, since 1998.
- World Lifetime Achievement Award by American Biographical Institute, USA, 1998.
- Who's Who in the World, Who's Who in Science and Engineering, and Dictionary of International Biography since 1997.

(2) **Citation**

As searched from web of science, my papers have been cited 405 times.

(3) **Main research contributions**

- Studied amorphous silicon based semiconductors and their applications in solar cells and display. Studied the persistent photoconductivity in n-i-p-i amorphous silicon superlattices and compensated amorphous silicon films and developed a physical model based on boron-phosphorous complexes to well explain the origin of persistent photoconductivity.

- Studied the properties and chemical structure of the SiCN alloys fabricated by sputtering and chemical vapor deposition.
- Systematically studied Ta based barrier materials (Ta and TaN), bi-layers barriers (Ta/TaN and TaN/SiC:H) and diffusion of copper in them.
- Experimentally determined the diffusion coefficient of Cu in these barrier materials. With our data, the optimal thickness of barrier layers for metal interconnects for 0.13 micron technology and beyond can be estimated and the IC pattern can be designed.
- Developed CVD technique for growth of seed Cu layer (US Patent 6872657).
- Developed a new barrier free via structure for dual damascene copper interconnects.
- Studied ultra low k porous SiLKTH, developed Cu/TaN/SiC:H/ultra low k porous SiLKTH material system for multilevel interconnects and studied the thermal stability and reliability of the structures.
- Studied compressive strained p-type InGaAs/AlGaAs QWIPs with optimized well width and Be density, which showed the very low dark current and comparable device performance to n-type QWIPs.
- Studied InGaAlAs/InAlAs multiple QWs lattice matched to InP substrate and reported the observation of strong intersubband absorption and its well width dependence.
- Successfully grew high quality InGaAsP, lattice matched to GaAs and InP substrates, using solid source molecular beam epitaxy and studied the effects of various growth conditions on the material quality.
- Fabricated InGaAsP/InP QWIPs and a photoresponsivity as high as 12 A/W at wavelengths of around 10 μm was obtained.
- Studied quantum well edge-emitting and vertical-cavity surface-emitting lasers and the effects of carbon incorporation and substrate misorientation on device performance.
- Studied sequential tunneling in tight-binding GaAs/AlGaAs superlattices with the same and different well width as well as the Schottky contact experimentally and theoretically.
- Studied QWs with symmetric and asymmetric structures with eight- and fourteen-bands k·p model.
- Studied nitride containing QWs with 10-band- and 16-band k·p model.

- Observed for the first time the transverse electric (TE) dominant absorption in Si-doped GaInAsN/GaAs QWs with narrow well widths.
- Fabricated InSbN alloys by multiple step ion implantations and demonstrated the (photoconductive type) infrared photodetection at the wavelength range of 6 to 12 μm for the first time. The detected wavelength can be controlled by monitoring the implanted nitrogen concentration.
- InSbN p-n junctions were formed by Mg implantation into the InSbN alloys and photovoltaic infrared photodetection at the wavelength range of 6 to 11 μm was demonstrated for the first time.
- Studied three-layer planar metamaterials which showed negative permeability of around -1.25 at 63.8 THz. A “virtual current loop” concept is proposed to account for the negative permeability.
- Designed large-area two-layer metamaterials and demonstrated the negative permeability in visible wavelength down to 620 nm.
- Designed metamaterials and demonstrated negative permeability in three UV bands.

(4) **Research staff trained**

T. Osotchan, Yang Zhiwei, Yuan Zeliang, Huang Zhiming, Ms. Wang Yan, Liu Wei, Qin Jianhuan, Zhang Bo.

(5) **Service in the editorial board of international journals, book and chapters**

- Guest Editor of *Thin Solid Films* 2003-2004
- Editorial board for *Research Letters in Materials Science*, since 2007.
- Editorial board for *Advances in Materials Science and Engineering*, since 2008.
- Associate Editor for *IES Journal B--Intelligent Devices and Systems*, since 2008.
- Editor for *International Journal of Materials Science and Simulation*, 2006-2007.
- Editor for *International Journal of Nanoelectronics and Materials*, since 2008.
- D. H. Zhang, N. Balasubramanian and S. G. Mhaisalkar, Volume 462-463, *Thin Solid Films* 2004, Elsevier.
- Chapter, W. Liu and D. H. Zhang, “Investigation of Intersubband transitions in (In,Ga)AsN based quantum wells using ten-band and sixteen-band $k\cdot p$ methods” to appear in “Quantum Wells: Theory, Fabrication and Applications.” Nova Science Publishers.

(6) **Invited talks**

- “III-V Compound quantum well infrared photodetectors”, Shanghai Jiaotong University, June 2000.

- “InGaAsP grown by solid source molecular”, National key Laboratory, Shanghai Institute of Technical Physics, Chinese Academy of Sciences, June 2000.
- “Current development in quantum well infrared photodetectors”, Fudan University, June 2005.
- “Metal-organic chemical-vapor deposited copper interconnects for new generations of integrated circuits”, Semicon. Singapore 2005 (PhD student did the talk on my behalf as I had teaching duty at that time).
- “Dilute nitride based materials for infrared photodetection”, International conference on High-Tech Materials (ICHTM-9), 11-13, February-09, IIT Kharagpur, India.

(7) Service as a reviewer

Applied Physics Letters, Journal of Applied Physics, IEEE Journal of Quantum Electrons, J. Crystal Growth, Applied Physics D, and Thin Solid Films. European Physical Journal - Applied Physics.

(8) Session Chairman/special session organizer in conferences

- International program committee in 1997 Hong Kong Electron Devices Meeting.
- Session chair in the 1999 International Symposium on Integrated Circuits (ISIC) and a member of the ISIC (1996 and 1997) organizing committee.
- Exhibition Chairman in International Symposium on Materials and Assembly (ISMA) 2000.
- Co-Chair of International Conference on Materials Applications and Technologies, Symposium L- Advances in Materials for Si Microelectronics, From processing to Packaging, held in December 2003 Singapore.
- Section Chairman and member of organizing committee of International Conference on Materials Applications and Technologies, Symposium J: III-V Semiconductors for Microelectronic and Optoelectronic Applications, July 2005, Singapore.
- Section Chairman of International Conference on Materials Applications and Technologies, July 2007, Singapore.
- International advisory committee of International conference on High-Tech Materials (ICHTM-9), 11-13, February, 2009, IIT Kharagpur, India.

(9) Research grant awarded (S\$18,6568,14.00)

- “Artificial Mesoscopic Structures for Next Generation Electronic and Photonic Technology”, NRF-G-CRP 2007-01, **S\$9,038,142.3**, (Co-PI), Nov. 2007 - Nov 2012.
- “Mesoscopic-Metamaterial-Enabled ‘SuperLens’”, **S\$951,396.67**, (PI). Nov. 2007 - Nov 2012.
- “High Efficiency Multijunction III-V Solar Cell Technology for Terrestrial Photovoltaic Application”, (CERP, **S\$1,800,000**). 2008 – 2012, Co-investigator.
- “Development of InSbN alloys for 8 to 12 micron room temperature infrared photodetectors”, A*Star, **S\$846,009.00**, Jan. 2005 – Jan. 2009 (Grant no. 042 101 0078, PI).

- “Development of InSbN alloys for 8 to 12 micron room temperature infrared photodetectors”, Supplementary equipment project, **S\$62,290.50**, 31 Mar. 2006 – 30 Mar. 2007 (PI).
- “Nano-scale Si/SiGe quantum well/dot infrared photodetector”, IME, A*Star **S\$15,000**, Oct. 2005 – Sep. 2007 (PI).
- “Simulation and fabrication of oxide-confined semiconductor quantum dot vertical cavity surface emitting lasers”, A*Star **S\$669,340**, 1 Nov. 2006 – 31 Oct. 2009 (Grant No:062 120 00115, collaborator).
- “Study of nano-scale Si/SiGe structures for photonic devices for biomedical applications”, **\$20,000** seed money from Nano Cluster, Jan. 2005 – Dec. 2006 (PI).
- “GaAs-Based GaInNAs:Sb PIN Photodiode grown by Solid Source Molecular Beam Epitaxy”, **\$190,000**, RG 09/01, Dec. 2001 – Dec. 2004 (CI).
- “High Quantum Efficiency Quantum Well Detectors”, **\$101,224**, RG 11/01, Dec. 2001 – Dec. 2004 (CI).
- “Rapid thermal processing of GaN-based and GaInAsP-based semiconductors for semiconductor laser applications”, **\$444,185**, RG 5/99, Dec. 1999 – Dec. 2002 (CI).
- “Development of lithographic source and processes for device fabrication (II)”, **\$490,000**, RGM 5/00, Aug. 2000 – Oct. 2004 (PI).
- JT ARC 1/00 “Development of copper metallization for deep sub-micron integrated circuits DSICs”, A*Star, **S\$2.2 million**, Nov. 2000 – April 2004, (CI).
- JT ARC 2/00, “Low dielectric constant materials for multilevel interconnect applications”, A*Star, **S\$941,227.00**, Nov. 2000 – Nov. 2003 (CI).
- “Fabrication and characterization of microelectronics devices, circuits and system (II)”, **\$490,000**, RGM14/99, Mar. 2000 – Mar. 2003 (PI).
- “Characterization of compound semiconductor for quantum well infrared photodetectors”, **\$192,000**, RG 27/98, Jan. 1999 – Jan. 2002 (PI).
- “Dual bandwidths quantum well infrared photodetectors”, **A\$181,000** from Australia government, Jan. 1996 – Dec. 1998 (Co-investigator, CI).
- “Measurements of electrical properties of crystalline and amorphous semiconductors, Jul. 1995 – Jul. 1996, **\$25,000**, SCEMP (PI).

(10) **Current research activities**

- a) Development of InSbN alloys for 8 to 12 micron room temperature infrared photodetectors.
- b) Nano- and Meta- materials and applications.
- c) Dilute nitride based quantum well structures and their application for infrared photodetectors and lasers.

C. Service

(1) **Awards**

- Long service awards, NTU 2002 and 2007.
- Long service award, UniSIM 2004.

(2) **Service to the University**

- Coordinator of Laboratory I (E221) for full- and part-time students, 1997 – 1999.
- Coordinator of Laboratory II (E224), 1997 – 1998.
- Member of IHPT Committee, 1996-1998.
- Member of Orientation Committee for (second year and first year) full- and part-time students, 1996-2007.
- E447 coordinator, 1999-2002.
- E6604 coordinator in 2000, 2003 - 2007.
- Representative of EEE6 for the NTU-CSM collaboration in 2000 and 2001.
- Member of Microelectronics option course task force committee, 2001-2007.
- Member of DIP (IHPT and EID) committee, 2002- 2007.
- Organizing Divisional gathering in 1999, 2002 and 2005.
- Graduate Research Student Adviser, 2006-
- Staff training coordinator, 2004-
- Characterization laboratory deputy supervisor, 2008-
- Coordinator of EE4647, EE6604 and NM6603, 2007-.
- Program Director for MSc (Microelectronics), 2007-.
- Preparing for launching MSc (Electronics) Program, July 2007- Aug. 2008
- Program Director for MSc(Electronics), 2008-
- Program Director for MSc(Photonics), (one student only) 2008-
- Coordinators for Dissertation and Independent study module (ISM) for MSc(Microelectronics) and MSc(Photonics), 2007- 2008.
- Coordinators for Dissertation and Independent study module (ISM) for remaining MSc(Microelectronics) candidates and new intake of MSc(Electronics), 2008-.

(3) **Service to Professional bodies**

- Fellowship panel of Institute of Physics, UK, 2007-.
- IEEE Singapore section Industrial Electronics chapter as a Member (2001)
Treasurer (2002)
Chairman (2003) and
Deputy Chairman (2004).

(4) **Service to society/industry**

- Faculty Associate in the Institute of Microelectronics 2003-2007.
- Course Development Chair, UniSIM, 2005.
- Course-cum-Exam Chair, UniSIM since 2005-
- Tutor and Supervisory tutor, UniSIM, 1999-2007.

E. Publications

Journal Papers:	111
Conference papers:	134
Others:	3
Patent:	2 (one filed and one submitted for filing).

Journal papers

(Applied Physics letters (10), Physical Review B (3), Journal of Applied Physics (14), IEEE Journal of Quantum Electronics (1), Journal of Crystal Growth (12), IEEE Photonics Tech. Letters (1), Journal of Vacuum Science and Technology (4), Thin Solid Films (20). Applied Surface Science (1), Electronics Letters (2), Journal of Non-crystalline solids (1), Japanese Applied Physics Letters (2), Journal of Materials Research (2), Journal of Materials Science (1), Materials Science and Engineering (3), Microelectronics Engineering (2), IEEE Transaction on Nanotechnology (1), Surface Review letters (4), IEEE Transaction on Device and Materials Reliability (1), Superlattices and microstructures (5), Advanced materials Research (1), International Journal of Nanotechnology (2), Materials Science in Semiconductor Processing (1), International Journal of Modern Physics (2), International Journal of Nanoscience (2), Journal of Nanoparticles Research (1), Infrared Physics (1), Optical and Quantum Electronics (1), Surface Engineering (1), The EEE journal (7), International Journal of Nanoelectronics and materials (1), Journal of Shandong University (1).

113. Y. Wang, **D. H. Zhang**, W. Liu, X. Z. Chen, J. H. Li, C. J. Liu, A. T. S. Wee and Sam Zhang, “behavior of nitrogen implanted into InSb”, to be published.
112. X. Z. Chen, **D. H. Zhang**, W. Liu, Y. Wang, “InSbN photodiodes for infrared photodetection”, to be published.
111. **D. H. Zhang**, W. Liu, Y. Wang, X. Z. Chen, J. H. Li, Z. M. Huang and Sam Zhang, “InSbN alloys fabricated by two-step ion implantation for infrared photodetection”, Applied Physics Letters, 93, 131107, 2008.
110. W. Liu, **D. H. Zhang**, W. J. Fan, X. Y. Hou and Z. M. Jiang, “Intersubband transitions in InGaAsN/GaAs quantum wells“, J. Appl. Phys., 104, 053119, 2008.
109. D. S. Li, W. J. Fan, Y. X. Dang, B. S. Ma, **D.H. Zhang**, and S.F. Yoon, “Investigation of Intersubband Transition in GaAs/AlGaAs Quantum Well Infrared Photodetectors”, Advanced Material Research. 31, 105-107, 2008.
108. W. Liu, **D. H. Zhang**, T-H. Loh, W. J. Fan, S. F. Yoon and N. Balasubramanian, “Study of intersubband transitions in SiGe/Si quantum wells by 14 band k.p model”, International Journal of Nanoelectronics and materials, 1, 53-64, 2008.

107. B. S. Ma, W. J. Fan, Y. X. Dang, W. K. Cheah, W. K. Loke, W. Liu, D. S. Li, S. F. Yoon, **D. H. Zhang**, and H. Wang, "GaInNAs double-barrier quantum well infrared photodetector with the photodetection at 1.24 μm ", Appl. Phys. Lett. 91, 051102, 2007.
106. F. Lu, W.J. Fan, Y.X. Dang, **D.H. Zhang**, S.F. Yoon and R. Wang, "Band structure investigation of strained Si_{1-x}Gex/Si coupled quantum wells", International J. Nanotechnol. 4(4), 431-440, 2007.
105. W. Liu, **D. H. Zhang**, Z. M. Huang, S. Z. Wang, S. F. Yoon, W. J. Fan, C. J. Liu, and A. T. S. Wee, "Interdiffusion in InGaAsN/GaAs structures with narrow well width ", J. Appl. Phys., 101, 103111, 2007.
104. W. Liu, **D. H. Zhang**, Z. M. Huang and W. J. Fan, "Theoretical study of quantum well infrared photodetectors with asymmetric well and barriers for broadband photodetection", J. Appl. Phys., 101, 03114 (1-7), 2007.
103. W. K. Cheah, W. J. Fan, S. F. Yoon, **D. H. Zhang**, B. K. Ng, W. K. Loke, R. Liu and A. T. S. Wee, "1.31 μm GaAs-based heterojunction p-i-n photodetectors using InGaAsNSb as the intrinsic layer grown by molecular beam epitaxy", Thin Solid Films, 515(10) 4441-4444, 2007.
102. Y. X. Dang, W. J. Fan, S. T. Ng, S. Wicaksono, S. F. Yoon and **D. H. Zhang**, "Interdiffusion effect on GaAsSbN/GaAs quantum well structure studied by 10-band k.p model", Thin Solid Films, 515 (10), 4435-4440, 2007.
101. T. Mei, H. Li, G. Karunasiri, W. J. Fan, **D. H. Zhang**, S. F. Yoon and K. H. Yuan, "Normal incidence silicon doped p-type GaAs/AlGaAs quantum well infrared photodetector on (111)A substrate", Infrared Physics & Technology, 50(2-3), 119-123, 2007.
100. L. Sun, **D. H. Zhang**, K. H. Yuan, S.F. Yoon and K. Radhakrishnan, "InGaAsP/InP long wavelength quantum well infrared photodetector", Thin Solid Films, 515, 4450-4453, 2007.
99. Z. Y. Yin, X. H. Tang, W. Liu, Sentosa Deny, J. H. Zhao and **D. H. Zhang**, "Study of InAs/GaAs quantum dots grown by MOVPE under the safer growth conditions", J. Nanoparticles Research, 9 (5), 877-884, 2007.
98. W. Liu, **D. H. Zhang**, and W. J. Fan, "Modeling of intersubband transitions in quantum well infrared photodetectors with complex potential profiles", Optical and Quantum Electronics, 38(12-14), 1101-1106, 2007.
97. **D. H. Zhang**, W. Liu, L. Sun, W.J. Fan, S.F. Yoon and S.Z. Wang, "Transverse electric dominant Intersubband absorption in Si-doped GaInAsN/GaAs quantum wells ", J. Appl. Phys., 99 (043514), 1-4, 2006.
96. **D. H. Zhang**, L.Y. Yang, C.Y. Li, P.W. Lu, and P.D. Foo, "Ta/SiCN bilayer for Cu-ultra low k integration", Thin Solid Films, 504, 235-238, 2006.

95. Z. M. Huang, J. Q. Xue, Y. Hou, J. H. Chu and **D. H. Zhang**, "Optical magnetic response from parallel plate metamaterials", *Phys. Rev. B*, 74 (19), 193105, 2006.
94. Z. M. Huang, J. Q. Xue, S.J. Liu, Y. Hou, **D. H. Zhang** and J. H. Chu, "Bound electric charge in BaTi₃ ferroelectric thin films: evidence for spontaneous polarization", *Phys. Rev. B*, 73 (21), 212104, 2006.
93. Y. X. Dang, W. J. Fan, F. Lu, H. Wang, S. F. Yoon and **D. H. Zhang**, "Study of the interdiffusion effect on the band structures of Si_{1-x}Gex /Si quantum wells", *J. Appl. Phys*, 99, 076108, 2006.
92. H. Li, T. Mei, **D. H. Zhang**, W. J. Fan, S. F. Yoon and W. K. Loke, "Infrared absorption and current-voltage characteristic of GaAs/AlGaAs multiple quantum wells on GaAs (111)A substrate grown by solid source molecular beam epitaxy", *J. Cryst. Growth*, 288 (1), 36-39, 2006.
91. H. Li, T. Mei, G. Karunasiri , W. J. Fan , S. F. Yoon, **D. H. Zhang** and K. H. Yuan, "Growth of p-type GaAs/AlGaAs(111) quantum well infrared photodetector using solid source molecular-beam epitaxy", *J. Appl. Phys.*, 98, 054905, 2006.
90. X. H. Tang, Z. Y. Yin, W. Liu and **D. H. Zhang**, "Mid-Infrared emission from InAs quantum dots grown by metal-organic vapor phase epitaxy", *IEEE Transactions on Nanotechnology*, Vol. 5 (6) 683-686, NOV 2006.
89. Z. Y. Yin, X.H. Tang, W. Liu, **D. H. Zhang** and Anyan Du, "Effects of In_xGa_{1-x}As matrix layer on InAs quantum dots formation and their emission wavelength", *J. Appl. Phys.*, 100, 033109, 2006.
88. L.Y. Yang, **D. H. Zhang**, C.Y. Li, R. Liu, P.W Lu, P.D. Foo and A.S.T. Wee, "Comparative investigation of TaN and SiCN barrier layer for Cu/ultra low k integration", *Thin Solid Films*, 504, 265-268, 2006.
87. Z. M. Huang, J.Q. Xue, Yujian Ge, Jianhuan Qin, Yun Hou, Junhao Chu and **D. H. Zhang**, "Temperature dependence of BaTiO₃ infrared dielectric properties", *Appl. Phys. Letts*, 88 (21), 212902, 2006.
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