



Kai Shum

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Education

Ph.D. in Electrical Engineering, October 1987, City University of New York, New York
Dissertation Title: "Photo-generated Carrier Dynamics in Semiconductor Quantum Wells"
M.S. in Electrical Engineering, February 1984, City College of New York, New York
B.S. in Physics, February 1982, Suzhou University, Suzhou, China

Employment

Professor, Physics Department, Brooklyn College of CUNY, NY, 2014 - present
Associate Professor, Physics Department, Brooklyn College of CUNY, NY, 2005 - 2014
Senior Design/Validation Engineer, TriQuint Semiconductor, PA, 2003 - 2005
Distinguished member Technical Staff, Agere Systems, PA, 2002 - 2003
Distinguished member Technical Staff, Bell Labs/Lucent technologies, PA, 2000 - 2002
Professor, Electrical Engineering Department/CCNY/CUNY, NY, 1998 - 2001
Associate Professor, Electrical Engineering Department/CCNY/CUNY, NY, 1993 - 1997
Assistant Professor, Electrical Engineering Department/CCNY/CUNY, NY, 1987 - 1992

Additional Experience

Visiting Scientist, Thomas J. Watson Research Center of IBM, NY, 1996 – 2000
Visiting Scientist, AT&T Bell Laboratories, NJ, 1995 – 1996
Guest Professor, Institute of Semiconductor, Chinese Academy of Sciences, Beijing, 1993 – Present

Specialties

- Semiconductor physics and semiconductor nanodevice engineering
- Optical spectroscopy
- RF optoelectronic device/subsystem design and validation
- Design/validation of optical transmission links with high bit rates

Research Interests

- ZnO based light emitting chips
- Super-emitting excitonic states
- Polaritons
- Organic materials with high electron mobility
- Quantum entanglement
- Infrared photodetectors
- Low cost and high efficient solar cells
- High efficient mid-infrared quantum cascade lasers
- Ultrafast optoelectronic modulators
- Carbon nanotubes and related structures

Recent Professional Activities

1. "ZnO thin film deposition on sapphire substrates by chemical vapor deposition", Zhuo Chen, T. Salagaj, C. Jensen, K. Strobl, Mim Nakarmi, and Kai Shum, 2009 MRS spring meeting, San Francisco, CA, April 13-17.
2. "Two-photon absorption induced photoluminescence in a ZnO nanostructure", Zhuo Chen¹, T. Salagaj, C. Jensen, K. Strobl, V. Hongpinyo, Boon Ooi, Mim Nakarmi, and Kai Shum, 2009 MRS spring meeting, San Francisco, CA, April 13-17.
3. "Accurate and simultaneous determination of carrier density and mobility in organic semiconducting materials", Kai Shum, Zhuo Chen, C. M. Xue, and Shi Jin, 2009 MRS spring meeting, San Francisco, CA, April 13-17.
4. "ZnO nanostructures epitaxially grown on ZnO seeded Si (100) substrates by chemical vapor deposition", Zhuo Chen, T. Salagaj, C. Jensen, K. Strobl, Mim Nakarmi, and Kai Shum, 2009 MRS spring meeting, San Francisco, CA, April 13-17.
5. "Photovoltaic study of perovskite semiconductor CsSnI₃ thin film", Jian J. Wang, Zhuo Chen, Kai Shum, William Pfenninger, Nemanja Vockic, and John T. Kenney, 2009 MRS spring meeting, San Francisco, CA, April 13-17.

Selected Publications

- "Demonstration of III-V Semiconductor-based nonvolatile memory devices", Zhongwei Pan and Kai Shum, *Appl. Phys. Lett.* 76, 505 (2000).
- "Quantum indistinguishability effects of confined polyexcitons", Kai Shum, P. M. Mooney, and J. O. Chu, *Phys. Rev. B* 60, 5786 (1999).
- "Dynamics of recombination-enhanced defect reaction in a ZnCdSe single quantum well", Minxue Tang, Kai Shum, L. Zeng, and M. C. Tamargo, *Appl. Phys. Lett.* 73, 1541 (1998).
- "A concept for nonvolatile memories", Kai Shum, Jianqin Zhou, Wei Zhang, L. Zeng, and M. C. Tamargo, *Appl. Phys. Lett.* 71, 2487 (1997).
- "Room temperature differential negative resistance in an Al/Zn_{0.61}Cd_{0.39}Se/n⁺-InP device", Kai Shum, J. Zhou, W. Zhang, L. Zeng, and M. C. Tamargo, *Appl. Phys. Lett.* 71, 815 (1997).
- "Quantum confined biexcitons in SiGe grown on Si(001)", Kai Shum, P. M. Mooney, L. P. Tilly, and J. O. Chu, *Phys. Rev. B* 55, 13058 (1997).
- "Barrier potential design criteria in multiple-quantum-well-based solar cell structures", J. M. Mohaidat, Kai Shum, W. B. Wang, and R. R. Alfano, *J. Appl. Phys.* 79, 5533 (1994).
- "Electron-tunneling dynamics through a double barrier structure in the presence of phonons", J. M. Mohaidat, Kai Shum, and R. R. Alfano, *Phys. Rev. B* 48, 8809 (1993).
- "Observation of 1P excitonic state in Cd(S,Se) quantum dots", Kai Shum, W. Wang, R. R. Alfano, and K. M. Jones, *Phys. Rev. Lett.* 68, 3904 (1992).
- "Effects of valence subband structure on the energy relaxation dynamics of electrons in GaAs quantum wells grown on Si", Kai Shum, Y. Takiguchi, J. M. Mohaidat, R. R. Alfano, K. Adomi, and H. Morkoc, *Phys. Rev. B* 44, 4044 (1991).
- "Picosecond hole dynamics in GaAs grown on silicon", Kai Shum, Y. Takiguchi, J. M. Mohaidat, F. Liu, and R. R. Alfano, *Appl. Phys. Lett.* 56, 2328 (1990).
- "Photon-assisted resonant tunneling through a double barrier semiconductor", W. Cai, T. F. Zheng, P. Ho, M. Lax, Kai Shum, and R. R. Alfano, *Phys. Rev. Lett.* 65, 104 (1990).
- "Effects of nonequilibrium phonons on the energy relaxation and recombination lifetime of photogenerated carriers in undoped GaAs quantum wells", Kai Shum, M. R. Junnarkar, H. S. Chao, R. R. Alfano, and H. Morkoc, *Phys. Rev. B* 37, 8923 (1988).
- "Ultrashort spontaneous lifetimes for transitions in quasi-zero dimensional electron systems in CdS_xSe_{1-x}", Kai Shum, G. C. Tang, M. R. Junnarkar, and R. R. Alfano, *Appl. Phys. Lett.* 51, 1839 (1987).