

SETH ROBERT BANK

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Research Interests

Developing novel solid-state hetero- and nano-structures for integrated (opto)electronic devices and sensors

Citizenship

United States of America

Education

Stanford University (9/00 – 4/06)

Doctor of Philosophy in Electrical Engineering, 4/6/06

Thesis: *High-Performance 1.55- μ m GaAs-Based Dilute-Nitride Lasers*

Master of Science in Electrical Engineering, 7/03

University of Illinois at Urbana-Champaign (8/95 – 8/00)

Bachelor of Science in Electrical Engineering, 8/99

Coursework Pursuant to Master of Science in Electrical Engineering

Experience

University of Texas, Austin, TX (1/07 – Present)

Assistant Professor – Department of Electrical and Computer Engineering

- Molecular beam epitaxy (MBE) growth of compound semiconductor materials and devices
 - Dilute-nitride semiconductors (e.g. mid-IR lasers and detectors)
 - Silicon photonic materials (e.g. Er₂O₃/Si superlattices and 3-D nanostructures)
 - Semiconductor/metal nanocomposites (e.g. THz generation/sensing and solar cells)
 - Graphene growth and devices (e.g. pseudospinronic bilayer devices and photonics)
- Teaching:
 - Semiconductor Optoelectronics (graduate) – Spring 2007, 2008, 2009, 2010
 - Lasers and Optical Engineering (undergraduate) – Fall 2007, 2008, 2009

University of California, Santa Barbara, CA (2/06 – 12/06)

Post-Doctoral Scholar – Departments of Materials and Electrical and Computer Engineering

Supervisors – **Professors Arthur Gossard and Mark Rodwell**

- MBE growth and application of semiconductor/metal nanocomposites
 - Semimetallic nanoparticles (e.g. ErAs) embedded in semiconductors
 - Applications to HBTs, tunnel junctions, and THz generation/detection
 - Electrically injected erbium-oxygen light emitters on silicon
- MBE growth of high-mobility channel materials for SRC Center on Si-based III-V MOSFETs
- Teaching:
 - Characterization of Electronic Materials – Co-developed and taught new graduate course

Stanford University, Stanford, CA (9/00 – 1/06)

Graduate Research Assistant – Solid State and Photonics Laboratory

Advisor – **Professor James Harris**

- MBE growth and fabrication of GaAs-based lasers from 1.3 to 1.55 μ m
 - Demonstrated first continuous-wave (cw) 1.45–1.55 μ m lasers grown on GaAs
 - Holds all GaAs-based laser performance records emitting $>1.4 \mu$ m
 - Co-demonstrated first GaAs-based vertical-cavity surface-emitting laser $>1.31 \mu$ m
 - Improved MBE growth of GaInNAs and GaInNAsSb films on GaAs
 - Co-enhanced luminescence efficiency ~ 10 fold and reduced linewidth $>25\%$
 - Contributed to understanding of basic physical properties and growth kinetics
 - Developed new metric for evaluating laser active regions

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- Investigated physics governing temperature stability of lasers
- Growth of GaInNAsSb on InP for sensing applications $>2.0\ \mu\text{m}$
- Growth of $1.55\ \mu\text{m}$ absorption samples with strong and well-defined excitonic features
- External collaborations on novel GaAs-based device structures
 - First GaAs-based distributed feedback laser at $1.5\ \mu\text{m}$ (w/Forchel at Würzburg)
 - GaInNAs-based avalanche photodiodes (w/Campbell at UT-Austin)
 - Modelocked lasers at $1.55\ \mu\text{m}$ (w/Lester at U-New Mexico)
 - Hybrid MBE/MOCVD buried heterostructure lasers at $1.55\ \mu\text{m}$ (w/Sumitomo)
- Preparation of AlGaAs/GaAs quantum wells for spin injection experiments (w/Parkin at IBM)
- Investigated luminescence mechanisms of boron implanted silicon (w/Patel at SLAC)

University of Illinois, Urbana, IL (6/00 – 8/00)

Teaching Assistant – ECE 344 Silicon IC Fabrication Laboratory

- Fabrication of MOSFETs and BJTs in silicon
- Taught one lab section, graded papers, wrote quizzes, maintained lab
- Students in section received seven of the nine A's awarded over three sections (~30 students total)

University of Illinois, Urbana, IL (5/99 – 8/00)

Graduate Research Assistant – Semiconductor Research Group

Advisors – **Professors Gregory Stillman and Kuang-Chien Hsieh**

- Fabrication and testing of dc and microwave InGaP/GaAs and InGaAs/InP HBTs
- Characterization of PIN photodetectors integrated into standard HBT process for smart pixel arrays

Honors and Awards

- AFOSR Young Investigator Program (YIP) (2009)
- Presidential Early Career Award for Scientists and Engineers (PECASE) (2009)
- Young Scientist Award from the International Conf. on Compound Semiconductors (ISCS) (2009)
- ARO Young Investigator Program (YIP) (2008) – *superseded by PECASE*
- DARPA Young Faculty Award (YFA) (2008)
- Young Investigator Award from North American Conf. on Molecular Beam Epitaxy (NAMBE) (2008)
- The Rank Prize Funds Dilute-Nitride Mini-Symposium – Best Contributed Paper Award (2006)
- North American Conference on Molecular Beam Epitaxy (NAMBE) Student Paper Award (2005)
- Ross N. Tucker Award – Contributions to electronic materials (Stanford/UC-Berkeley, 2005)
- Electronic Materials Conference (EMC) Student Paper Award (2004)
- Gerald L. Pearson Graduate Fellowship – Fellowship in solid-state electronics (Stanford, 2000)
- John Bardeen Scholarship – Achievement and research potential in physical electronics (UIUC, 1999)
- Who'sWho in the World (Since 2007), Science and Engineering (Since 2006), and Among Executives and Professionals (Since 2008)

Administrative Service

- Solid-State Electronics Faculty Search Committee (2007, 2008, 2009)
- Undergraduate Curriculum Reform Committee (2008)
- Unified Qualifying Procedure Committee (2008)
- Eta Kappa Nu: Fireside host (2007, 2008), Smoker (2008), Tech Area Night (2007)
- Women in Engineering Program: Lunch with an Engineer (2008), Dinner with an Engineer (2008)

Professional Societies and Activities

- Program Chair: 2010 North American Conference on MBE (NAMBE)
- Program Committees: IEEE LEOS (Optical Materials and Processing), CLEO (Semiconductor Lasers), EMC (Epitaxial Materials)
- Journal Reviewer: Applied Physics Letters, J. of Applied Physics, Electronics Letters, J. of Lightwave Technology, J. of Crystal Growth, Semic. Sci. Technol.

CURRICULUM VITAE – SETH ROBERT BANK

- Proposal Reviewer: Army Research Office (ARO), Department of Energy (DOE), National Science Foundation (NSF)
- Panels: NSF Graduate Research Fellowship Review (2008), NSF “Solar Cells, Microelectronics, Organics” Panel (2008)
- Member: IEEE (1995 – Present), MRS (2001 – Present), Eta Kappa Nu, Tau Beta Pi

Consulting

- Solar Junction Corporation, San Jose, CA (7/07 – Present)
 - Member of Technical Advisory Board (8/07 – Present)
- TT electronics / OPTEK Technology, Carrollton, TX (10/07 – 8/08)
- EpiWorks, Champaign, IL (8/00 – 9/00)

Publication List (>140 total, >1000 citations, Hirsch Index = 18)

Semiconductor/Metal Heterostructures and Nanocomposites

1. H.P. Nair, A.M. Crook, **S.R. Bank**, “Thermal and Bias Stability of ErAs Nanoparticle-Enhanced Tunnel Junctions for Photonic Applications,” *In preparation Appl. Phys. Lett.*, 2009.
2. H.P. Nair, A.M. Crook, **S.R. Bank**, “Low-Resistance GaAs-Based Tunnel Junctions Enhanced with Semimetallic Nanoparticles,” *In preparation Appl. Phys. Lett.*, 2009.
3. A.M. Crook, H.P. Nair, **S.R. Bank**, “Investigating the Optical Quality of ErAs Nanoparticle-Enhanced Tunnel Junctions,” *Submitted to Phys. Status Solidi B*, 2009.
4. **(Invited) S.R. Bank**, “Nanoparticle-enhanced tunnel junctions for high-efficiency solar cells and mid-infrared lasers,” *216th Electrochemical Society Conference*, Oct. 2009, Vienna, Austria.
5. Y.-S. Chen, Y. Zhao, A. Hosseini, D. Kwong, W. Jiang, **S.R. Bank**, E. Tutuc, R.T. Chen, “Delay Time-Enhanced Flat-Band Photonic Crystal Waveguides with Capsule-Shaped Holes on Silicon Nanomembrane,” *IEEE J. Select. Topics Quantum Electron*, vol. 15, pp. 1510-1514, Sept. 2009.
6. A.M. Crook, H.P. Nair, **S.R. Bank**, “High-Performance Metal Nanoparticle-Enhanced Tunnel Junctions for Photonic Devices,” *International Symposium on Compound Semiconductors (ISCS)*, Sept. 2009, Santa Barbara, CA.
7. A.M. Crook, H.P. Nair, K. Vijayraghavan, M.A. Wistey, J.D. Zimmerman, J.M.O. Zide, A.C. Gossard, **S.R. Bank**, “Annealing Stability of Nanoparticle-Enhanced Tunnel Junctions for High-Efficiency Solar Cells and Mid-Infrared Lasers,” *51st Electronic Materials Conf. (EMC)*, June 2009, University Park, PA.
8. **(Invited) S.R. Bank**, “Enhancing Diode Lasers with Metallic Nanoparticles,” *IEEE Photonics Semiconductor Laser Workshop*, June 2009, Baltimore, MD.
9. M.A. Wistey, U. Singiseti, G.J. Burek, J. Cagnon, S. Stemmer, **S.R. Bank**, M.J.W. Rodwell, A.C. Gossard, “Surface Preparation and Regrowth for Self-Aligned, Low Resistance InGaAs Contacts,” To appear in *Appl. Phys. Lett.*, 2009.
10. **(Invited) M. Wistey**, U. Singiseti, G. Burek, B. Thibeault, A. Nelson, J. Cagnon, Y. Lee, **S.R. Bank**, S. Stemmer, A. Gossard, M. Rodwell “III-V/Ge Channel Engineering for Future CMOS,” *Electrochemical Society (ECS) Meeting*, May 2009, San Francisco, CA.
11. G.J. Burek, M.A. Wistey, U. Singiseti, A. Nelson, J. Thibeault, **S.R. Bank**, M.J.W. Rodwell, A.C. Gossard, “Height-selective etching for regrowth of self-aligned contacts using MBE,” *J. Cryst. Growth*, vol. 311, pp. 1984-1988, March 2009.
12. U. Singiseti, J.D. Zimmerman, M.A. Wistey, J. Cagnon, B.J. Thibeault, M.J.W. Rodwell, A.C. Gossard, S. Stemmer, **S.R. Bank**, “ErAs epitaxial Ohmic contacts to InGaAs/InP,” *Appl. Phys. Lett.*, vol. 94, pp. 083505-1-3, Feb. 2009.
13. J.S. Harris and **S.R. Bank**, “Graphene Growth by MBE”, NRI/NSF Review, Dec. 2008, Washington, DC.
14. U. Singiseti, M.A. Wistey, J.D. Zimmerman, B.J. Thibeault, M.J.W. Rodwell, A.C. Gossard, **S.R. Bank**, “Ultra Low Resistance in-situ Ohmic Contacts to InGaAs/InP,” *Appl. Phys. Lett.*, vol. 93, pp. 183502-1-3, Nov. 2008.
15. H.P. Nair, A.M. Crook, J. M. O. Zide, M.P. Hanson, A.C. Gossard, **S.R. Bank**, “Nanoparticle-enhanced tunnel junctions for high efficiency mid-infrared lasers,” *50th Electronic Materials Conf. (EMC)*, June 2008, Santa Barbara, CA.
16. M.A. Wistey, U. Singiseti, G.J. Burek, B.J. Thibeault, J. Cagnon, S. Stemmer, **S.R. Bank**, Y. Sun, E.J. Kiewra, D.K. Sadana, A.C. Gossard, M.J.W. Rodwell, “Self-aligned III-V MOSFETs for sub-22nm Nodes,” *SRC Techcon*, Sept. 2008, Austin, TX.
17. M.A. Wistey, G.J. Burek, U. Singiseti, A.M. Crook, B.J. Thibeault, **S.R. Bank**, M.J.W. Rodwell, A.C. Gossard, “Regrowth of Self-Aligned, Ultra Low Resistance Ohmic Contacts on InGaAs,” *2008 International Conf. on Molecular Beam Epitaxy (MBE)*, August 2008, Vancouver, BC.
18. A.M. Crook, E. Lind, Z. Griffith, M.J.W. Rodwell, J.D. Zimmerman, A.C. Gossard, **S.R. Bank**, “Low Resistance, Non-alloyed Ohmic Contacts to InGaAs” *Appl. Phys. Lett.*, vol. 91, p. 192114, Nov. 2007.
19. D. Shahrjerdi, D.I. Garcia-Gutierrez, T. Akyol, **S.R. Bank**, E. Tutuc, J.C. Lee, S.K. Banerjee, “GaAs metal-oxide-semiconductor capacitors using atomic layer deposition of HfO₂ gate dielectric: Fabrication and characterization,” *Appl. Phys. Lett.*, vol. 91, pp. 193505-1-3, Nov. 2007.
20. R.D. Averitt, W.J. Padilla, H.T. Chen, J.F. O'Hara, A.J. Taylor, C. Highstrete, M. Lee, J.M.O. Zide, **S.R. Bank**, A.C. Gossard, “Terahertz metamaterial devices,” *Proc. SPIE*, vol. 6772, p. 677209, Sept. 2007.

CURRICULUM VITAE – SETH ROBERT BANK

21. U. Singiseti, A.M. Crook, E. Lind, M.A. Wistey, J.D. Zimmerman, A.C. Gossard, M.J.W. Rodwell, **S.R. Bank**, “Ultra-Low Resistance Ohmic Contacts to InGaAs/InP,” *65th Device Research Conf. (DRC)*, June 2007, South Bend, IN.
22. H.T. Chen, W.J. Padilla, J.M.O. Zide, **S.R. Bank**, A.C. Gossard, A.J. Taylor, R.D. Averitt, “Ultrafast Optical Switching of Terahertz Metamaterials Fabricated on ErAs/GaAs Nanoisland Superlattices,” *Optics Lett.*, vol. 32, p. 1620, June 2007.
23. (**Plenary**) M. Rodwell, E. Lind, Z. Griffith, **S.R. Bank**, A.M. Crook, U. Singiseti, M. Wistey, G. Burek, A.C. Gossard, “Frequency limits of InP-based integrated circuits,” *19th Int’l. IEEE Indium Phosphide and Related Materials (IPRM)*, May 2007, Matsue, Japan.
24. M.P. Hanson, **S.R. Bank**, J.M.O. Zide, J.D. Zimmerman, A.C. Gossard, “Controlling Electronic Properties of Epitaxial Nanocomposites of Dissimilar Materials,” *J. Crystal Growth*, vol. 301-302, p. 4, April 2007.
25. A.C. Gossard, M. Hanson, J. Zide, J. Zimmerman, **S.R. Bank**, E. Brown, M.J.W. Rodwell, “Metal/semiconductor Heterostructures for Terahertz Applications,” *Spring MRS*, April 2007, San Francisco, CA.
26. **S.R. Bank**, U. Singiseti, A.M. Crook, J.D. Zimmerman, J.M.O. Zide, A.C. Gossard, M.J.W. Rodwell, “MBE Growth of ErAs/In(Ga)As Epitaxial Ultra-Low Resistance Ohmic Contacts,” *2006 North American Molecular Beam Epitaxy Conf. (NAMBE)*, September 2006, Durham, NC.
27. (**Plenary**) M. Rodwell, Z. Griffith, N. Parthasarathy, E. Lind, C. Sheldon, **S.R. Bank**, U. Singiseti, M. Urteaga, K. Shinohara, R. Pierson, P. Rowell, “Developing Bipolar Transistors for Sub-mm-Wave Amplifiers and Next-Generation (300 GHz) Digital Circuits,” *64th Device Research Conf. (DRC)*, June 2006, University Park, PA.
28. (**Plenary**) A.C. Gossard, M.P. Hanson, J.M.O. Zide, J.D. Zimmerman, **S.R. Bank**, “Growth and Uses of Metal/Semiconductor Heterostructures,” *48th Electronic Materials Conf. (EMC)*, June 2006, University Park, PA.

Nanoscience and Physics

1. M. Pelliccione, A. Sciambi, D. Goldhaber-Gordon, **S.R. Bank**, A.C. Gossard, J.L. Reno, M. Lilly, “Tunneling spectroscopy of a 2D-2D tunnel junction: Towards a local spectroscopic probe of 2D electron systems,” *2009 American Physical Society (APS) March Meeting*, March 2009, Pittsburgh, PA.
2. A. Sciambi, M. Pelliccione, D. Goldhaber-Gordon, **S.R. Bank**, A.C. Gossard, M. Lilly, J.L. Reno, “The Virtual Scanning Tunneling Microscope: Induced Tunneling in Bilayer Two-Dimensional Electron Systems,” *2009 American Physical Society (APS) March Meeting*, March 2009, Pittsburgh, PA.
3. A. Sciambi, D. Goldhaber-Gordon, **S.R. Bank**, A.C. Gossard, “The Virtual Scanning Tunneling Microscope: A Novel Probe Technique for Imaging Two-Dimensional Electron Systems,” *2008 American Physical Society (APS) March Meeting*, March 2008, New Orleans, LA.
4. Y.-C. Xin, A. Stintz, H. Cao, L. Zhang, A.L. Gray, **S.R. Bank**, M. Osinski, J. Harris, L.F. Lester, “Monolithic passively mode-locked lasers using quantum-dot or quantum-well materials grown on GaAs substrates,” *Proc. SPIE*, vol. 6468, p. 64681L-1-10, March 2007.
5. W. Yi, V. Narayanamurti, J.M.O. Zide, **S.R. Bank**, A.C. Gossard “Probing Energy Barriers and Quantum Confined States of Buried Semiconductor Heterostructures with Ballistic Carrier Injection,” *Phys. Rev. B*, vol. 75, pp. 115333, March 2007.
6. A. Sciambi, K. Todd, D. Goldhaber-Gordon, **S.R. Bank**, A.C. Gossard “The Virtual Scanning Tunneling Microscope: A Novel Technique for Imaging Two-Dimensional Electron Systems,” *2007 American Physical Society (APS) March Meeting*, March 2007, Denver, CO.
7. W. Yi, V. Narayanamurti, J.M.O. Zide, **S.R. Bank**, A.C. Gossard “Ballistic Carrier Injection Induced Electroluminescence of InAs Quantum Dots in a Hot-Electron Metal-Base Transistor,” *2007 American Physical Society (APS) March Meeting*, March 2007, Denver, CO.

Journal Publications - Dilute-Nitride Lasers and Materials (Ga,In)(N,As,Sb)

1. A.M. Mintairov, K. Sun, J.L. Merz, H. Yuen, **S.R. Bank**, M. Wistey, J.S. Harris, G. Peake, A. Egorov, V. Ustinov, R. Kudrawiec, J. Misiewicz, “Atomic arrangement and emission properties of GaAs(In, Sb)N quantum wells,” *Semicond. Sci. Technol.*, vol. 24, pp. 075013-1-8, July 2009.
2. R. Kudrawiec, P. Poloczek, J. Misiewicz, H. Bae, T. Sarmiento, **S.R. Bank**, H. Yuen, M. Wistey, J. Harris, “Contactless electroreflectance of GaInNAsSb/GaNAs/GaAs quantum wells emitting at 1.5-

- 1.65 μm : Broadening of the fundamental transition,” *Appl. Phys. Lett.*, vol. 94, pp. 031903-1-3, Jan. 2009.
3. R. Kudrawiec, H.B. Yuen, **S.R. Bank**, H.P. Bae, M.A. Wistey, J.S. Harris, M. Motyka, and J. Misiewicz, “On the Fermi level pinning in as-grown GaInNAs(Sb)/GaAs quantum wells with indium content of 8%–32%,” *J. Appl. Phys.*, vol. 104, pp. 033526-1-6, Aug. 2008.
 4. Y.-C. Xin, C.-Y. Lin, Y. Li, H.P. Bae, H.B. Yuen, M.A. Wistey, J.S. Harris, **S.R. Bank**, L.F. Lester, “Monolithic 1.55 μm GaInNAsSb quantum well passively modelocked lasers,” *Electron. Lett.*, vol. 44, p. 581-582, May 2008.
 5. M.M. Oye, T.J. Mattord, G.A. Hallock, **S.R. Bank**, M.A. Wistey, J.M. Reifsnider, A.J. Ptak, H.B. Yuen, J.S. Harris, A.L. Holmes, “Effects of different plasma species (atomic N, metastable N^*_2 , and ions) on the optical properties of dilute nitride materials grown by plasma-assisted molecular-beam epitaxy,” *Appl. Phys. Lett.*, vol. 91, pp. 191903-1-3, Nov. 2007.
 6. **S.R. Bank**, H.P. Bae, L.L. Goddard, H.B. Yuen, M.A. Wistey, R. Kudrawiec, J.S. Harris “Recent Progress on 1.55- μm Dilute-Nitride Lasers,” *J. Quantum Electron.*, vol. 43, p. 773-785, Sept. 2007.
 7. R. Kudrawiec, H.B. Yuen, **S.R. Bank**, H.P. Bae, M.A. Wistey, J.S. Harris, M. Motyka, J. Misiewicz, “Contactless electroreflectance approach to study the Fermi level position in GaInNAs/GaAs quantum wells,” *J. Appl. Phys.*, vol. 102, pp. 113501-1-5, Sept. 2007.
 8. J.S. Harris Jr., R. Kudrawiec, H.B. Yuen, **S.R. Bank**, H.P. Bae, M.A. Wistey, D. Jackrel, E.R. Pickett, T. Sarmiento, L.L. Goddard, V. Lordi, T. Gugov, “Development of GaInNAsSb alloys: Growth, band structure, optical properties and applications,” *Phys. Stat. (b)*, vol. 244, pp. 2707-2729, July 2007.
 9. D.B. Jackrel, **S.R. Bank**, H.B. Yuen, M.A. Wistey, J.S. Harris, Jr., A.J. Ptak, S.W. Johnston, D.J. Friedman, S.R. Kurtz, “Dilute nitride GaInNAs and GaInNAsSb solar cells by molecular beam epitaxy,” *J. Appl. Phys.*, vol. 101, p. 114916-1-8, June 2007.
 10. H.P. Bae, **S.R. Bank**, H.B. Yuen, T. Sarmiento, E.R. Pickett, M.A. Wistey, J.S. Harris, “Temperature dependencies of annealing behaviors of GaInNAsSb/GaNAs quantum wells for long wavelength dilute-nitride lasers,” *Appl. Phys. Lett.*, vol. 90, p. 231119-1-3, June 2007.
 11. R. Kudrawiec, **S.R. Bank**, H.B. Yuen, H. Bae, M.A. Wistey, L.L. Goddard, J.S. Harris, Jr., M. Gladysiewicz, M. Motyka, J. Misiewicz, “Conduction band offset for $\text{Ga}_{0.62}\text{In}_{0.38}\text{N}_x\text{As}_{0.991-x}\text{Sb}_{0.009}/\text{GaN}_y\text{As}_{1-y}/\text{GaAs}$ systems with the ground state transition at 1.5–1.65 μm ,” *Appl. Phys. Lett.*, vol. 90, p. 131905-1-3, March 2007.
 12. R. Kudrawiec, H.B. Yuen, **S.R. Bank**, H.P. Bae, M.A. Wistey, J.S. Harris, M. Motyka, J. Misiewicz, “Fermi level shift in GaInNAsSb/GaAs quantum wells upon annealing studied by contactless electroreflectance,” *Appl. Phys. Lett.*, vol. 90, p. 061902-1-3, Feb. 2007.
 13. **S.R. Bank**, H.B. Yuen, H.P. Bae, M.A. Wistey, A. Moto, J.S. Harris, “Enhanced Luminescence in GaInNAsSb Quantum Wells Through Variation of the Arsenic and Antimony Fluxes,” *Appl. Phys. Lett.*, vol. 88, no. 24, p. 241923, June 2006.
 14. **S.R. Bank**, H.B. Yuen, H.P. Bae, M.A. Wistey, J.S. Harris, “Over-Annealing Effects in GaInNAs(Sb) Alloys and Their Importance to Laser Applications,” *Appl. Phys. Lett.*, vol. 88, no. 22, p. 221115, May 2006.
 15. H.B. Yuen, **S.R. Bank**, H. Bae, M.A. Wistey, J.S. Harris, “Effects of Strain on the Optimal Annealing Temperature of GaInNAsSb Quantum Wells,” *Appl. Phys. Lett.*, vol. 88, no. 22, p. 221913, May 2006.
 16. R. Kudrawiec, M. Motyka, M. Gladysiewicz, J. Misiewicz, H.B. Yuen, **S.R. Bank**, H. Bae, M.A. Wistey, J.S. Harris, “Band Gap Discontinuity in $\text{Ga}_{0.9}\text{In}_{0.1}\text{N}_{0.027}\text{As}_{0.973-x}\text{Sb}_x/\text{GaAs}$ Single Quantum Wells with $0 \leq x < 0.6$ Studied by Contactless Electroreflectance Spectroscopy,” *Appl. Phys. Lett.*, vol. 88, no. 22, p. 221113, May 2006.
 17. H.B. Yuen, **S.R. Bank**, H.P. Bae, M.A. Wistey, J.S. Harris, “The Role of Antimony on Properties of Widely Varying GaInNAsSb Compositions,” *J. Appl. Phys.*, vol. 99, no. 09, p. 093504, May 2006.
 18. M.A. Wistey, **S.R. Bank**, H.P. Bae, H.B. Yuen, E.R. Pickett, L.L. Goddard, J.S. Harris, “GaInNAsSb/GaAs Vertical Cavity Surface Emitting Lasers at 1534 nm,” *Electron. Lett.*, vol. 42, no. 5, p. 282, March 2006.
 19. **S.R. Bank**, H.P. Bae, H.B. Yuen, M.A. Wistey, L.L. Goddard, J.S. Harris, “Room-Temperature Continuous-Wave 1.55- μm GaInNAsSb Laser on GaAs,” *Electron. Lett.*, vol. 42, no. 3, p. 39, Feb. 2006.
 20. **S.R. Bank**, L.L. Goddard, M.A. Wistey, H.B. Yuen, J.S. Harris, “On the Temperature Sensitivity of 1.5 μm GaInNAsSb Lasers,” *IEEE J. Select. Topics Quantum Electron.*, vol. 11, no. 5, p. 1089, Sept.-Oct. 2005.

CURRICULUM VITAE – SETH ROBERT BANK

21. **S.R. Bank**, H.B. Yuen, M.A. Wistey, V. Lordi, H.P. Bae, J.S. Harris, “Effects of Growth Temperature on the Structural and Optical Properties of 1.55 μm GaInNAsSb Quantum Wells Grown on GaAs,” *Appl. Phys. Lett.*, vol. 87, no. 2, p. 021908, June 2005.
22. **S.R. Bank**, M.A. Wistey, H.B. Yuen, V. Lordi, V. F. Gambin, J.S. Harris, “Effects of Antimony and Ion Damage on Carrier Localization in MBE-Grown GaInNAs,” *J. of Vac. Sci. Technol. B*, vol. 23, no. 3, p. 1320, May/June 2005.
23. **S.R. Bank**, M.A. Wistey, H.B. Yuen, L.L. Goddard, H.P. Bae, J.S. Harris, “Molecular Beam Epitaxy Growth of Low-Threshold CW GaInNAsSb Lasers at 1.5 μm ,” *J. of Vac. Sci. Technol. B*, vol. 23, no. 3, p. 1337, May/June 2005.
24. H.B. Yuen, M.A. Wistey, **S.R. Bank**, H.P. Bae, J.S. Harris, “Effects of N_2 Flow into a RF Plasma Cell on GaInNAs Grown by MBE,” *J. of Vac. Sci. Technol. B*, vol.23, no.3, p.1328, May/June 2005.
25. M.A. Wistey, **S.R. Bank**, H.B. Yuen, T. Gugov, J.S. Harris, “Protecting Wafer Surface During GaInNAs Plasma Ignition by Use of an Arsenic Cap,” *J. of Vac. Sci. Technol. B*, vol.23, no.3, p.1324, May/June 2005.
26. M.A. Wistey, **S.R. Bank**, H.B. Yuen, J.S. Harris, “Using Beam Flux Monitor as Langmuir Probe for Plasma-Assisted MBE,” *J. of Vac. Sci. Technol. A*, vol. 23, no. 3, p. 460, May/June 2005.
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2. **(Invited) S.R. Bank**, “Towards High Power 1.55- μm GaInNAsSb GaAs-Based Lasers on GaAs,” *IEEE/LEOS Semiconductor Laser Workshop*, May 2007, Baltimore, MD.
3. Y. Lin, L.F. Lester, **S.R. Bank**, H.P. Bae, H.B. Yuen, M.A. Wistey, J.S. Harris, “Monolithic 1.55- μm GaInNAsSb Quantum Well Mode-Locked Lasers,” *2007 Conf. on Lasers and Electro Optics (CLEO)*, May 2007, Baltimore, MD.
4. E. Pickett, **S.R. Bank**, H. Yuen, H. Bae, T. Sarmiento, A. Marshall, J.S. Harris, “Thermally Induced Relaxation in GaInNAsSb Quantum Well Structures,” *Spring 2007 Materials Research Symposium (MRS)*, April 2007, San Francisco, CA.
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