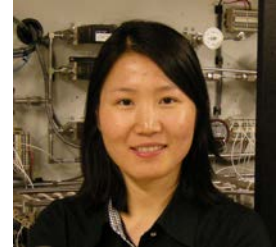


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### Education

**Spring 2007 – Fall 2010, Lehigh University (Bethlehem, Pennsylvania, USA)**

**Doctor of Philosophy (Ph.D.)** in Electrical Engineering

- Ph.D. Advisor: Prof. Nelson Tansu
- Ph.D. Dissertation Title: Enhancement of Internal Quantum Efficiency and Optical Gain for Nitride Light-Emitting Diodes and Laser Diodes
- Ph.D. Committee Members: Prof. Nelson Tansu (Chair); Prof. Filbert J. Bartoli; Prof. Volkmar Dierolf; Prof. Yujie Ding; Prof. Helen Chan; and Prof. Sushil Kumar

**Fall 2003 – Fall 2006, Southeast University (Nanjing, China)**

**Master of Sciences (M.S.)** in Electrical Engineering

- Research Assistant, Advisor: Prof. Wei Lei and Prof. Xiaohua Li
- Master Thesis Title: Study on cathode emission and structure design of high-frequency devices

**Fall 1999 – Summer 2003, Nanjing Normal University (Nanjing, China)**

**Bachelor of Science (B.S.)** in Physics

### Professional Experiences

**June 2011 – present, Case Western Reserve University (Cleveland, OH, USA)**

**Assistant Professor (Tenure-Track)**

Department of Electrical Engineering and Computer Sciences  
Case School of Engineering

**Fall 2010 – May 2011, Lehigh University (Bethlehem, PA, USA)**

**Postdoctoral Research Associate**

Center for Optical Technologies  
Department of Electrical and Computer Engineering  
P. C. Rossin College of Engineering and Applied Science

**Spring 2007 – Fall 2010, Lehigh University (Bethlehem, PA, USA)**

**Ph.D. Candidate and Research Assistant**

Center for Optical Technologies  
Department of Electrical and Computer Engineering  
P. C. Rossin College of Engineering and Applied Science

**Spring 2010, 2011 Lehigh University (Bethlehem, PA, USA)**

**Substitute Lecturer**

Department of Electrical and Computer Engineering  
P. C. Rossin College of Engineering and Applied Science

**Fall 2003 – Fall 2006**

**Southeast University (Nanjing, China)**

**Master Graduate Student and Research Assistant**

JinDongFei Display Technical Center

School of Electronic Science and Engineering

### **Awards & Honors Received**

- **Feng Ruer Scholarship** (2002), Nanjing Normal University
- **Leadership Awards** (2002-2003), Nanjing Normal University
- **Best Student Awards** (2000-2003), Nanjing Normal University
- **SEU Outstanding Scholarship** (2004), Southeast University
- **Phi Beta Delta Honors** (Inducted in 2007), Lehigh University
- **Sigma Xi Research Society** (Inducted in 2008), Lehigh University
- **SPIE Educational Scholarship in Optical Science and Engineering** (2008), SPIE
- **Sherman-Fairchild Fellowship for solid state studies** (2008-2009), Lehigh University
- **SPIE Educational Scholarship in Optical Science and Engineering** (2009), SPIE
- **Rossin Doctoral Fellowship Award**, 2010-2011, Rossin College of Engineering and Applied Science, Lehigh University

### **Professional Affiliations**

2007 – present, Member, Institute of Electrical and Electronics Engineers (IEEE)

2007 – present, Member, IEEE Laser and Electro-Optics Society

2007 – present, Member, International Society for Optical Engineering (SPIE)

2007 – present, Member, Optical Society of America (OSA)

### **Research Interests**

Dr. Zhao's research works cover both the theoretical and experimental aspects of the physics of semiconductor optoelectronics materials and devices, the physics of low-dimensional semiconductor (nanostructure), metalorganic chemical vapor deposition (MOCVD) and device fabrications of III-Nitride semiconductor optoelectronics devices on GaN substrate.

### **Refereed Journal and Conference Publications**

**Publication Search in ISI Web of Knowledge:** Authors: Zhao hp ; Address: (Case and Elect) or (Lehigh and Elect) or (Southeast and Elect)

1. X. Zhong, [H. Zhao](#), W. Lei, X. Zhang, H. Yin, W. van der Poel, D. den Engelsen, "Numerical study of the electron and ion trajectories in HOPFEDs", *Journal of the Society for Information Display*, 12(4), 483-488, December 2004.
2. [H. Zhao](#), W. Lei, X. Zhang, W. Gu, and Y. Zhang, "Simulation of the distribution of carbon nanotube-based cathodes for microwave tubes", *The 18th Vacuum Nanoelectronics Conference IVNC 2005*, Oxford UK, January 2005.
3. [H. Zhao](#), W. Lei, X. Zhang, X. Li, and Q. Wang. "Simulation of the cathode surface damages in a HOPFED during ion bombardment", *Journal of Vacuum Science & Technology B*, 23(6), 3148-3152, Nov. 2005.
4. W. Lei, X. Zhang, X. Zhou, Z. Zhu, C. Lou, and [H. Zhao](#), "Characteristics of a cold cathode electron source combined with secondary electron emission in a FED", *Applied Surface Science*, 251, 170-176, 2005.
5. M. Liu, X. Zhang, W. Lei, [H. Zhao](#), and B. Wang, "Transverse energy distribution analysis in a field emission element with an insulator funnel", *Nuclear Instruments and Methods in Physics Research Section B*, 234(3), 210-218, 2005.
6. [H. Zhao](#), W. Lei, X. Zhang, and G. Yang, "Numerical Analysis of the Performance of Field Emission Display with Secondary Electrons Emission", *The Seventh IEEE International Vacuum Electronics Conference and Sixth IEEE International Vacuum Electron Sources Conference*, California, USA, April 2006.
7. C. Li, W. Lei, X. Zhang, [H. Zhao](#), and G. Yang, "A New Structure to Improve the Luminance Efficiency of a FED Panel", *The Seventh IEEE International Vacuum Electronics Conference and Sixth IEEE International Vacuum Electron Sources Conference*, California, USA, April 2006.

8. Q. Wang, H. Mu, X. Zhang, W. Lei, J. Wang, [H. Zhao](#), C. Huang, and Y. Wang, "Field Emitters with Low Turn On Electric Field Based on Carbon Fibers", *The Seventh IEEE International Vacuum Electronics Conference and Sixth IEEE International Vacuum Electron Sources Conference*, California, USA, April 2006.
9. Q. Wang, H. Mu, X. Zhang, W. Lei, J. Wang, and [H. Zhao](#), "Field Emitters with Low Turn On Electric Field Based on Carbon Fibers", *Applied Surface Science*, 253(14), 5980-5984, 2007.
10. **(Invited Conference Paper)** R. A. Arif, Y. K. Ee, [H. Zhao](#), M. Jamil, and N. Tansu, "Nanostructure Engineering of InGaN-Based Active Regions for Improved III-Nitride Gain Media Emitting at 420-650 nm", in *Proc. of the European MRS (E-MRS) Spring Meeting 2007: Symposium F: Novel Gain Materials and Devices Based on III-N-V Compounds*, Strasbourg, France, May-June 2007.
11. Y. K. Ee, [H. Zhao](#), R. A. Arif, M. Jamil, and N. Tansu, "Self-Assembled InGaN Quantum Dots on GaN Grown by Metalorganic Vapor Phase Epitaxy", in *Proc. of the 13<sup>th</sup> Biennial Workshop on Organometallic Vapor Phase Epitaxy (OMVPE) 2007*, Salt Lake City, UT, August 2007.
12. [H. Zhao](#), R. A. Arif, Y. K. Ee, and N. Tansu, "Optical Gain Analysis of Strain Compensated InGaN-AlGaIn Quantum Well Active Regions for Lasers Emitting at 420-520 nm", in *Proc. of the 7<sup>th</sup> International Conference on Numerical Simulation of Optoelectronic Devices (NUSOD 2007)*, Newark, DE, September 2007.
13. [H. Zhao](#), R. A. Arif, Y. K. Ee, and N. Tansu, "Optical Gain Analysis of Staggered InGaIn Quantum Wells Active Regions for Lasers Emitting at 420-500 nm", in *Proc. of the 20<sup>th</sup> IEEE Laser and Electro-Optics Society (LEOS) Annual Meeting 2007*, Lake Buena Vista, FL, October 2007.
14. [H. Zhao](#), R. A. Arif, Y. K. Ee, and N. Tansu, "Optical Gain and Spontaneous Emission of Strain-Compensated InGaIn-AlGaIn Quantum Wells Including Carrier Screening Effect", in *Proc. of the SPIE Photonics West 2008, Physics and Simulation of Optoelectronics Devices XVI*, San Jose, CA, January 2008.
15. R. A. Arif, Y. K. Ee, [H. Zhao](#), and N. Tansu, "Radiative Efficiency and Spontaneous Recombination Rate of Staggered InGaIn Quantum Wells Light Emitting Diodes Emitting at 420-510 nm", in *Proc. of the SPIE Photonics West 2008, Light-Emitting Diodes: Research, Manufacturing, and Applications XII*, San Jose, CA, January 2008.
16. R. A. Arif, [H. Zhao](#), and N. Tansu, "Type-II InGaIn-GaNAs Quantum Wells Active Regions for Lasers Applications", *Appl. Phys. Lett.* vol. 92(1), Art. No. 062801, January 2008.
17. [H. Zhao](#), R. A. Arif, Y. K. Ee, and N. Tansu, "Optical Gain Analysis of Strain-Compensated InGaIn-AlGaIn Quantum Well Active Regions for Lasers Emitting at 420-500 nm", *Optical and Quantum Electronics*, vol. 40 (5-6), 301-306, April 2008.
18. Y. K. Ee, [H. Zhao](#), R. A. Arif, M. Jamil, and N. Tansu, "Self-Assembled InGaIn Quantum Dots on GaN Grown by Metalorganic Vapor Phase Epitaxy," *J. Cryst. Growth*, vol. 310(7-9), pp.2320-2325, April 2008.
19. [H. Zhao](#), R. A. Arif, Y. K. Ee, and N. Tansu, "Approaches for Low-Threshold 'Green' Nitride Lasers Diodes", in *IEEE Semiconductor Lasers Workshop 2008*, San Jose, CA, May 2008.
20. [H. Zhao](#), R. A. Arif, G. S. Huang, Y. K. Ee, and N. Tansu, "Self-Consistent Optical Gain Analysis and Epitaxy of Strain-Compensated InGaIn-AlGaIn Quantum Wells for Laser Applications", in *Proc. of the IEEE/OSA Conference on Lasers and Electro-Optics (CLEO) 2008*, San Jose, CA, May 2008.
21. R. A. Arif, [H. Zhao](#), and N. Tansu, "InGaIn-GaNAs Type-II 'W' Quantum Well Lasers for Emission at 450-nm", in *Proc. of the IEEE/OSA Conference on Lasers and Electro-Optics (CLEO) 2008*, San Jose, CA, May 2008.
22. R. A. Arif, [H. Zhao](#), Y. K. Ee, S. T. Penn, V. Dierolf, and N. Tansu, "Spontaneous Recombination Rate and Luminescence Efficiency of Staggered InGaIn Quantum Wells Light Emitting Diodes", in *Proc. of the IEEE/OSA Conference on Lasers and Electro-Optics (CLEO) 2008*, San Jose, CA, May 2008.
23. R. A. Arif, [H. Zhao](#), Y. K. Ee, and N. Tansu, "Spontaneous Emission and Characteristics of Staggered InGaIn Quantum Wells Light Emitting Diodes", *IEEE J. Quantum Electron.*, vol. 44(5-6), pp.573-580, May-June 2008.
24. M. Jamil, [H. Zhao](#), J. Higgins, and N. Tansu, "MOVPE Growth and Photoluminescence of Narrow-Bandgap InN Alloys on GaN / Sapphire Substrate Using Pulsed Growth Mode", in *Proc. of the 14<sup>th</sup> Int. Conf. - Metalorganic Vapor Phase Epitaxy (IC-MOVPE XIV) 2008*, Metz, France, June 2008.
25. **(Invited Conference Paper)** N. Tansu, R. A. Arif, Y. K. Ee, [H. Zhao](#), H. Tong, M. Jamil, and G. S. Huang, "Nano-Engineering of III-Nitride Semiconductor Optoelectronics and New Applications", in *Proc. of the International Conferences of Materials and Technologies (CIMTEC) 2008 - 3rd International Conference on Smart Materials, Structures and Systems*, Sicily, Italy, June 2008.
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27. **(Invited Conference Paper)** N. Tansu, R. A. Arif, [H. Zhao](#), G. S. Huang, and Y. K. Ee, "Polarization Engineering of III-Nitride Nanostructures for High-Efficiency Light Emitting Diodes", in Proc. of the *SPIE Optics + Photonics 2008, The 8<sup>th</sup> International Conference on Solid State Lighting*, San Diego, CA, August 2008.
28. [H. Zhao](#), R. A. Arif, and N. Tansu, "Self Consistent Gain Analysis of Type-II 'W' InGaN-GaNAs Quantum Well Lasers", *J. Appl. Phys.*, 104 (4), Art. 043104, August 2008.
29. M. Jamil, [H. Zhao](#), J. Higgins and N. Tansu, "Influence of growth temperature and V/III ratio on the optical characteristics of narrow band gap (0.77 eV) InN grown on GaN/sapphire using pulsed MOVPE", *J. Crys. Growth*, vol. 310(23), pp. 4947-4953, November 2008.
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31. M. Jamil, [H. Zhao](#), J. Higgins, and N. Tansu, "MOVPE and Photoluminescence of Narrow Band Gap (0.77 eV) InN on GaN / Sapphire by Pulsed Growth Mode", in *Physica Stat. Solidi (a)*, vol. 205(12), pp. 2886-2891, December 2008.
32. [H. Zhao](#), R. A. Arif, Y. K. Ee, and N. Tansu, "Self-Consistent Analysis of Strain-Compensated InGaN-AlGaIn Quantum Wells for Lasers and Light Emitting Diodes", *IEEE J. Quantum Electron.*, vol. 45(1), pp. 66-78, January 2009.
33. [H. Zhao](#), M. Jamil, G. S. Huang, H. Tong, A. M. Driscoll, and N. Tansu, "Characteristics of InN Semiconductors Grown on Ga-Polar and N-Polar GaN Templates by Pulsed Metalorganic Vapor Phase Epitaxy", in Proc. of the *SPIE Photonics West 2009, Gallium Nitride Materials and Devices IV*, San Jose, CA, January 2009.
34. [H. Zhao](#), R. A. Arif, G. S. Huang, Y. K. Ee, and N. Tansu, "Growths of Staggered InGaN Quantum Wells Light Emitting Diodes at 470-480 nm Employing Graded Temperature Profile", in Proc. of the *SPIE Photonics West 2009, LEDs: Materials, Devices, and Applications for Solid State Lighting XIII*, San Jose, CA, January 2009.
35. [H. Zhao](#), R. A. Arif, and N. Tansu, "Design of Staggered InGaN Quantum Wells for Green Diode Lasers", in Proc. of the *SPIE Photonics West 2009, Novel In-Plane Semiconductor Lasers VIII*, San Jose, CA, January 2009.
36. [H. Zhao](#), R. A. Arif, and N. Tansu, "Analysis of Current Injection Efficiency and Efficiency Droop of InGaN Quantum-Wells Light-Emitting Diodes", in Proc. of the *SPIE Photonics West 2009, Physics and Simulation of Optoelectronics Devices XVII*, San Jose, CA, January 2009.
37. H. Tong, [H. Zhao](#), Y. K. Ee, V. A. Handara, J. A. Herbsommer, and N. Tansu, "Analysis of Thermoelectric Characteristics of InGaN Semiconductors", in Proc. of the *SPIE Photonics West 2009, Physics and Simulation of Optoelectronics Devices XVII*, San Jose, CA, January 2009.
38. [H. Zhao](#), M. Jamil, G. Liu, G. S. Huang, H. Tong, G. Xu, Y. J. Ding, N. Tansu, "Pulsed Metalorganic Vapor Phase Epitaxy of In-Polar and N-Polar InN Semiconductors on GaN / Sapphire Templates for Terahertz Emitters", in Proc. of the *IEEE/OSA Conference on Lasers and Electro-Optics (CLEO) 2009*, Baltimore, MD, May 2009.
39. [H. Zhao](#), G. Liu, X. Li, G. S. Huang, S. Tafon Penn, V. Dierolf, and N. Tansu, "Staggered InGaN Quantum Wells Light-Emitting Diodes at 520-nm Employing Graded Temperature Growths", in Proc. of the *IEEE/OSA Conference on Lasers and Electro-Optics (CLEO) 2009*, Baltimore, MD, May 2009.
40. G. Xu, Y. J. Ding, [H. Zhao](#), M. Jamil, N. Tansu, I. B. Zotova, C. E. Stutz, D. E. Diggs, N. Fernelius, F. K. Hopkins, C. S. Gallinat, G. Koblmüller, and J. S. Speck, "THz Generation from InN Films Based on Interference between Optical Rectification and Photocurrent Surge", in Proc. of the *IEEE/OSA Conference on Lasers and Electro-Optics (CLEO) 2009*, Baltimore, MD, May 2009.
41. G. Sun, S. K. Tripathy, Y. J. Ding, G. Liu, G. S. Huang, [H. Zhao](#), N. Tansu, and J. B. Khurgin, "Stark Effect Induced by Photogenerated Carriers in Multiple GaN/AlN Asymmetric Coupled Quantum Wells", in Proc. of the *IEEE/OSA Conference on Lasers and Electro-Optics (CLEO) 2009*, Baltimore, MD, May 2009.
42. [H. Zhao](#), G. S. Huang, G. Liu, X. Li, J. D. Poplawsky, S. Tafon Penn, V. Dierolf, and N. Tansu, "Characteristics of Staggered InGaN Quantum Wells Light-Emitting Diodes Emitting at 480-525 nm", in Proc. of the *67<sup>th</sup> IEEE Device Research Conference (DRC) 2009*, University Park, PA, June 2009.
43. [H. Zhao](#), R. A. Arif, and N. Tansu, "Design Analysis of Staggered InGaN Quantum Wells Light-Emitting Diodes at 500-540 nm", *IEEE J. Selected Topics in Quantum Electronics*, vol. 15 (4), pp. 1104-1114, July-August 2009.
44. Y. K. Ee, P. Kumnorkaew, R. A. Arif, H. Tong, [H. Zhao](#), J. F. Gilchrist, and N. Tansu, "Optimization of Light Extraction Efficiency of III-Nitride Light Emitting Diodes with Self-Assembled Colloidal-based Microlenses", *IEEE J. Selected Topics in Quantum Electronics*, vol. 15 (4), pp. 1218-1225, July-August 2009.

45. [H. Zhao](#), G. Liu, X. H. Li, G. S. Huang, J. D. Poplawsky, S. Tafon Penn, V. Dierolf, and N. Tansu, "Growths of Staggered InGaN Quantum Wells Light-Emitting Diodes Emitting at 520-525 nm Employing Graded-Temperature Profile", *Appl. Phys. Lett.*, vol. 95(6), Art. 061104, August 2009.
46. [H. Zhao](#), G. Liu, R. A. Arif, N. Tansu, "Effect of Current Injection Efficiency on Efficiency-Droop in InGaN Quantum Well Light-Emitting Diodes", in Proc. of the *IEEE International Semiconductor Device Research Symposium (ISDRS) 2009*, College Park, MD, November 2009.
47. **(Invited Conference Paper)** [H. Zhao](#), G. Liu, R. A. Arif, Y. K. Ee, X. H. Li, J. Zhang, H. Tong, G. S. Huang, and N. Tansu, "Novel Approaches for Efficiency Enhancement in InGaN-Based Light-Emitting Diodes", in Proc. of the *2nd International Conference on White LEDs and Solid State Lighting 2009*, Taipei, Taiwan, December 2009.
48. **(Invited Journal Paper)** [H. P. Zhao](#), G. Y. Liu, X. H. Li, R. A. Arif, G. S. Huang, J. D. Poplawsky, S. Tafon Penn, V. Dierolf, and N. Tansu, "Design and Characteristics of Staggered InGaN Quantum Wells Light-Emitting Diodes in Green Spectra Regime", *IET Optoelectron.*, vol. 3(6), pp. 283-295, December 2009.
49. [H. Zhao](#), G. Liu, and N. Tansu, "Surface Plasmon Dispersion Engineering Utilizing Double-Metallic Ag / Au Layers for InGaN Quantum Wells Light Emitting Diodes", in Proc. of the *SPIE Photonics West 2010, LEDs: Materials, Devices, and Applications for Solid State Lighting XIV*, San Francisco, CA, January 2010.
50. X. H. Li, H. Tong, [H. Zhao](#), and N. Tansu, "Band Structure Calculation of Dilute-As GaNAs by First Principle", in Proc. of the *SPIE Photonics West 2010, Physics and Simulation of Optoelectronics Devices XVIII*, San Francisco, CA, January 2010.
51. G. Liu, [H. Zhao](#), and N. Tansu, "Electron-Phonon and Electron-Photon Intersubband Scattering Rates in Asymmetric AlN / GaN Coupled Quantum Wells", in Proc. of the *SPIE Photonics West 2010, Physics and Simulation of Optoelectronics Devices XVIII*, San Francisco, CA, January 2010.
52. H. Tong, J. Zhang, [H. Zhao](#), G. Liu, V. A. Handara, J. A. Herbsommer and N. Tansu, "Thermal Conductivity Measurement of Pulsed-MOVPE InN Alloy Grown on GaN / Sapphire by 3  $\omega$  Method", in Proc. of the *SPIE Photonics West 2010, Gallium Nitride Materials and Devices V*, San Francisco, CA, January 2010.
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54. G. Liu, [H. Zhao](#), J. Zhang, G. S. Huang, and N. Tansu, "Growths of Lattice-Matched AlInN Alloys on GaN", in Proc. of the *American Physical Society (APS) Annual March Meeting 2010*, Portland, Oregon, March 2010.
55. **(Invited Review Article)** N. Tansu, [H. Zhao](#), G. Liu, X. H. Li, J. Zhang, H. Tong, and Y. K. Ee, "Breakthrough in Photonics 2009: III-Photonics", *IEEE Photonics Journal*, Vol.2, No.2, pp. 236-243, April 2010.
56. **(Invited Conference Paper)** [H. Zhao](#), G. Liu, X. H. Li, Y. K. Ee, H. Tong, J. Zhang, G. S. Huang, and N. Tansu, "Novel Growth and Device Concepts for High-Efficiency InGaN Quantum Wells Light-Emitting Diodes", in Proc. of the *IEEE/OSA Conference on Lasers and Electro-Optics (CLEO) 2010*, San Jose, CA, May 2010.
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58. G. Liu, [H. Zhao](#), J. H. Park, L. J. Mawst, and N. Tansu, "Growths of Ultra High Density InGaN-Based Quantum Dots on Self-Assembled Diblock Copolymer Nanopatterns", in Proc. of the *IEEE/OSA Conference on Lasers and Electro-Optics (CLEO) 2010*, San Jose, CA, May 2010.
59. G. Sun, S. K. Tripathy, Y. Ding, G. Liu, G. S. Huang, [H. Zhao](#), N. Tansu, and J. B. Khurgin, "Photoluminescence Emission in Deep Ultraviolet Region from GaN/AlN Asymmetric-Coupled Quantum Wells", in Proc. of the *IEEE/OSA Conference on Lasers and Electro-Optics (CLEO) 2010*, San Jose, CA, May 2010.
60. G. Sun, S. K. Tripathy, Y. Ding, G. Liu, [H. Zhao](#), G. S. Huang, N. Tansu, and J. B. Khurgin, "Photoluminescence Quenching due to Relocation of Electrons in GaN/AlN Asymmetric-Coupled Quantum Wells", in Proc. of the *OSA/APS Quantum Electronics and Laser Sciences (QELS) 2010*, San Jose, CA, May 2010.
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63. **(Invited Conference Paper)** N. Tansu, [H. Zhao](#), J. Zhang, G. Y. Liu, X. H. Li, H. Tong, T. Toma, G. S. Huang, and Y. K. Ee, " Device Physics and Epitaxy Engineering for High-Efficiency III-Nitride Light-Emitting Diodes", in

Proc. of the International Union of Materials Research Societies - International Conference on Electronic Materials (IUMRS-ICEM) 2010, Seoul, Korea, August 2010.

64. J. Zhang, [H. Zhao](#), and N. Tansu, "Effect of Crystal-Field Split-Off Hole and Heavy-Hole Bands Crossover on Gain Characteristics of High Al-Content AlGa<sub>N</sub> Quantum Well Lasers", *Appl. Phys. Lett.* vol. 97, Art. 111105, September 2010.
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67. [H. Zhao](#), J. Zhang, T. Toma, G. Y. Liu, J. D. Poplawsky, V. Dierolf, and N. Tansu, "Cathodoluminescence Characteristics of Linearly-Shaped Staggered InGa<sub>N</sub> Quantum Wells Light-Emitting Diodes", in *Proc. of the 23rd Annual Meeting of the IEEE Photonics Society*, Paper WY4, Denver, CO, November 2010.
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84. **(Invited Journal Paper)** [H. Zhao](#), G. Liu, J. Zhang, J. D. Poplawsky, V. Dierolf, and N. Tansu, "Approaches for High Internal Quantum Efficiency Green InGaN Light-Emitting Diodes with Large Overlap Quantum Wells", *Optics Express*, 19(S4), A991-A1007, June 2011.
85. **(Invited Conference Paper)** N. Tansu, J. Zhang and [H. Zhao](#), "Physics of III-Nitride Gain Media for Visible and Deep UV Lasers", in Proc. of the *24<sup>th</sup> Annual Meeting of the IEEE Photonics Society*, Arlington, VA, October 2011.

#### **Submitted Refereed Journal and Conference Publications**

86. **(Invited Review Article)** [H. Zhao](#), R. A. Arif, Y. K. Ee, H. Tong, G. S. Huang, and N. Tansu, "Physics of III-Nitride Gain Media for Laser Applications," *Lasers and Photonics Review* (submitted).
87. G. Liu, J. Zhang, [H. Zhao](#), and N. Tansu, "Device Characteristics of InGaN Quantum Well Light-Emitting Diodes with AlInN Thin Barrier Insertion", Proc. of the *SPIE Photonics West 2012, Gallium Nitride Materials and Devices VII*, San Francisco, CA, Jan 2012. (submitted).
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91. Y. K. Ee, X. H. Li, J. Zhang, [H. Zhao](#), J. M. Biser, W. Cao, H. M. Chan, R. P. Vinci, and N. Tansu, "Time-resolved Photoluminescence Study of InGaN Quantum Well Light-Emitting Diodes Grown on Nano-patterned AGOG Substrate", *J. Appl. Phys.* (submitted).
92. **(Invited Topical Review Article)** N. Tansu, R. A. Arif, Y. K. Ee, [H. Zhao](#), G. S. Huang, H. Tong, and M. Jamil, "Recent Progress on High Efficiency InGaN Quantum Wells and Quantum Dots Light Emitting Diodes for Solid State Lighting – A Review," *J. Phys. D: Appl. Phys.* (submitted).

#### **Other Technical Publications**

1. W. Gu, M. Yang, [H. Zhao](#), X. Yang, and W. Lei, "S-correction in very slim CRT," *Journal of Southeast University*, 20(3), 272-276, 2005.
2. [H. Zhao](#), W. Lei, X. Zhang, W. Gu, and X. Li, "Structure design for electron beam controlling in microwave tube with carbon nanotube cathode," *Journal of Southeast University*, 22(2), 159-163, 2006.

#### **Patents or Invention Disclosures**

1. Nelson Tansu, Ronald A. Arif, Yik Khoon Ee, and [Hongping Zhao](#), *Novel approach using polarization engineering for achieving nitride-based gain media with significant enhancement in radiative recombination rate and optical gain for high efficiency LEDs and lasers.* (PCT Application and US Patent Pending).
2. Nelson Tansu, [Hongping Zhao](#), Jing Zhang and Guangyu Liu, *Surface Plasmon Nitride Light Emitting Diodes.* (US Patent Pending).
3. Nelson Tansu, [Hongping Zhao](#), Guangyu Liu, and Ronald A. Arif, *Methods to Suppress Efficiency-Droop for High-Power Nitride Light-Emitting Diodes Applicable for Solid State Lighting.* (US Patent Pending).
4. Nelson Tansu, [Hongping Zhao](#), Guangyu Liu, and Gensheng Huang, *Staggered InGaN Quantum Well with InN Delta-Layer.* (US Patent Pending).
5. Nelson Tansu, Guangyu Liu, and [Hongping Zhao](#), *Ultrahigh Density InGaIn-Based Quantum Dots for Optoelectronics Devices.* (Provisional Patent Application).
6. Nelson Tansu, Jing Zhang, and [Hongping Zhao](#), *High TE-Polarized Optical Gain from AlGaIn-Delta-GaN Quantum Well for Deep UV Lasers.* (Provisional Patent Application)

## Invited Seminars

1. [Hongping Zhao](#), "III-Nitride Semiconductor Photonics Device Technologies for Energy Applications," Department of Electrical Engineering and Computer Science, **Syracuse University**, Syracuse, May 2010.
2. [Hongping Zhao](#), "III-Nitride Semiconductor Photonics Device Technologies for Energy Applications," **IBM Research - T. J. Watson Research Center**, Yorktown Heights, NY, August 2010.
3. [Hongping Zhao](#), "Enhancement of Internal Quantum Efficiency for Nitride Light-Emitting Diodes," **Philips Lumileds**, San Jose, CA, August 2010.
4. [Hongping Zhao](#), "Enhancement of Internal Quantum Efficiency for Nitride Light-Emitting Diodes," **Intel Corporation**, Hillsboro, OR, November 2010.
5. [Hongping Zhao](#), "III-Nitride Semiconductor Photonics Device Technologies for Energy Applications," **Case Western Reserve University**, Cleveland, OH, December 2010.

## Selected Research Works Featured in Magazine / Newspapers

1. "More Efficient LEDs for a Brighter Future" in NanoBriefs of **Resolve magazine**, vol.2, Fall 2007.
2. "NSF, DARPA see the light on Lehigh's wide bandgap semiconductor research" in **Lehigh News Center Highlight**, September 26<sup>th</sup> 2007.  
[http://www3.lehigh.edu/News/V2news\\_story.asp?iNewsID=2387&strBack=%2Finsidelehigh%2Fdefault%2Easp](http://www3.lehigh.edu/News/V2news_story.asp?iNewsID=2387&strBack=%2Finsidelehigh%2Fdefault%2Easp)
3. "Bridging the 'Green' LED Gap to Provide Greener Lighting" in **Lehigh News Center Highlight**, April 11<sup>th</sup> 2008.  
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4. "Finding Energy Solutions" in **Cover Story Feature** section of **Lehigh Alumni Bulletin**, Winter 2009.  
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5. "Illuminating Ideas: Innovations in Solid-State Lighting" in **US Department of Energy (DOE) – National Energy Technology Laboratory (NETL) Press Release**, February 2009.  
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6. "Optics Graduate Student Repeats as International Award Winner" in **Lehigh News Center Highlight**, June 23<sup>rd</sup> 2009.  
[http://www3.lehigh.edu/News/V2news\\_story.asp?iNewsID=3309&strBack=%2Finsidelehigh%2Fdefault%2Easp](http://www3.lehigh.edu/News/V2news_story.asp?iNewsID=3309&strBack=%2Finsidelehigh%2Fdefault%2Easp)
7. "Hongping Zhao makes a 'Case' for Lehigh doctoral studies excellence" in **Lehigh News Center Highlight**, April 18<sup>th</sup> 2011.  
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## Internal Scientific Lectures & Seminars (Non-Refereed)

1. Y. K. Ee, [H. Zhao](#), R. A. Arif, M. Jamil, and N. Tansu, "Self-Assembled InGaN Quantum Dots on GaN Emitting at 520-nm Grown by Metalorganic Vapor Phase Epitaxy," Poster in **Lehigh Center for Optical Technologies (COT) Open House 2007**, **Lehigh University**, Bethlehem, Pennsylvania, USA, October 2007.
2. [H. Zhao](#), R. A. Arif, Y. K. Ee, and N. Tansu, "Optical Gain Analysis of Strain Compensated InGaN-AlGaIn Quantum Well Active Regions for Lasers Emitting at 420-520 nm," Poster in **Lehigh Center for Optical Technologies (COT) Open House 2007**, **Lehigh University**, Bethlehem, Pennsylvania, USA, October 2007.
3. N. Tansu, R. A. Arif, Y. K. Ee, and [H. Zhao](#), "Nano-Engineered III-Nitride Materials and Devices for Solid State Lighting," Oral Presentation in **Lehigh Center for Optical Technologies (COT) Open House 2007**, COT Workshop on Nano-Photonics, **Lehigh University**, Bethlehem, Pennsylvania, USA, October 2007.
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5. [H. Zhao](#), R. A. Arif, Y. K. Ee, G. S. Huang, and N. Tansu, "Design Analysis of Staggered InGaIn Quantum Well Diode Lasers Emitting at 500-nm," Poster in **Lehigh Center for Optical Technologies (COT) Open House 2008**, **Lehigh University**, Bethlehem, Pennsylvania, USA, October 2008.



6. N. Tansu, R. A. Arif, [H. Zhao](#), Y. K. Ee, G. S. Huang, G. Liu, and X. Li, "High Efficiency III-Nitride Light-Emitting Diodes for Solid State Lighting," Oral Presentation in *Lehigh Center for Optical Technologies (COT) Open House 2008*, COT Workshop on Solid State Materials for Energy Applications, [Lehigh University](#), Bethlehem, Pennsylvania, USA, October 2008.
7. N. Tansu, M. Jamil, [H. Zhao](#), G. Liu, and G. S. Huang, "Toward InGaN-Based Solar Cells," Oral Presentation in *Lehigh Center for Optical Technologies (COT) Open House 2008*, COT Workshop on Solid State Materials for Energy Applications, [Lehigh University](#), Bethlehem, Pennsylvania, USA, October 2008.
8. [H. Zhao](#), G. Liu, X. H. Li, R. A. Arif, G. S. Huang, S. Tafon Penn, V. Dierolf, and N. Tansu, "Enhancement of Radiative Efficiency via Staggered InGaN Quantum Well Light Emitting Diodes," Invited Poster Presentation in *Transformation in Lighting 2009*, DOE R&D Workshop on Solid State Lighting 2009, San Francisco, CA, USA, February 2009.
9. [H. Zhao](#), G. Liu, X. H. Li, G. S. Huang, J. Poplawsky, V. Dierolf, and N. Tansu, "Staggered InGaN Quantum-Well Light-Emitting Diodes," Oral Presentation in *Lehigh Center for Optical Technologies (COT) Open House 2009*, COT Workshop on NanoPhotonics, [Lehigh University](#), Bethlehem, Pennsylvania, USA, October 2009.
10. Y. K. Ee, P. Kumnorkaew, X. H. Li, R. A. Arif, H. Tong, [H. Zhao](#), J. F. Gilchrist, and N. Tansu, "Light Extraction Efficiency Enhancement of III-Nitride LEDs with Colloidal-Microstructures," Oral Presentation in *Lehigh Center for Optical Technologies (COT) Open House 2009*, COT Workshop on NanoPhotonics, [Lehigh University](#), Bethlehem, Pennsylvania, USA, October 2009.
11. G. Liu, [H. Zhao](#), G. S. Huang, and N. Tansu, "Electron-Photon and Electron-Phonon Intersubband Scatterings in AlN / GaN and AlInN / GaN Quantum Wells," Poster Presentation in *Lehigh Center for Optical Technologies (COT) Open House 2009*, COT Workshop on NanoPhotonics, [Lehigh University](#), Bethlehem, Pennsylvania, USA, October 2009.
12. [H. Zhao](#), G. Liu, X. H. Li, G. S. Huang, J. Poplawsky, S. Tafon Penn, V. Dierolf, and N. Tansu, "Growths of Staggered InGaN Quantum Wells Light-Emitting Diodes Emitting at 520-525 nm Employing Graded Growth-Temperature Profile," Poster Presentation in *Lehigh Center for Optical Technologies (COT) Open House 2009*, COT Workshop on NanoPhotonics, [Lehigh University](#), Bethlehem, Pennsylvania, USA, October 2009.
13. [H. Zhao](#), G. Liu, R. A. Arif, and N. Tansu, "Current Injection Efficiency and Efficiency-Droop of InGaN Quantum Well Light-Emitting Diodes," Poster Presentation in *Lehigh Center for Optical Technologies (COT) Open House 2009*, COT Workshop on NanoPhotonics, [Lehigh University](#), Bethlehem, Pennsylvania, USA, October 2009.
14. H. Tong, [H. Zhao](#), V. A. Handara, J. Herbsommer, and N. Tansu, "Analysis of Thermoelectric Characteristics of AlGaIn and InGaIn Semiconductors," Poster Presentation in *Lehigh Center for Optical Technologies (COT) Open House 2009*, COT Workshop on NanoPhotonics, [Lehigh University](#), Bethlehem, Pennsylvania, USA, October 2009.
15. [H. Zhao](#), G. Liu, J. Zhang, T. Toma, G. S. Huang, J. D. Poplawsky, V. Dierolf, and N. Tansu, "Enhancement of Internal Quantum Efficiency with Staggered InGaN Quantum Wells Light-Emitting Diodes," Poster Presentation in *Nano-Energy Workshop 2010*, [Lehigh University](#), Bethlehem, Pennsylvania, USA, September 2010.
16. [H. Zhao](#), G. Liu, J. Zhang, T. Toma, G. S. Huang, J. D. Poplawsky, V. Dierolf, and N. Tansu, "Enhancement of Internal Quantum Efficiency with Staggered InGaN Quantum Wells Light-Emitting Diodes," Poster Presentation in *Lehigh Center for Optical Technologies (COT) Open House 2010*, COT Workshop on NanoPhotonics, [Lehigh University](#), Bethlehem, Pennsylvania, USA, October 2010.

### **Outreach Lectures and Seminars (for Middle School and High School Students)**

1. Nelson Tansu, Ronald A. Arif, [Hongping Zhao](#), Hua Tong, Muhammad Jamil, and Yik Khoon Ee, "Semiconductor Nanotechnology for High Energy Efficient Applications," Outreach Program, OptoCamp 2007 – Center for Optical Technologies, [Lehigh University](#), Bethlehem, Pennsylvania, USA, August 13<sup>th</sup> 2007.

2. Nelson Tansu, Ronald A. Arif, [Hongping Zhao](#), Hua Tong, Yik Khoon Ee, Xiaohang Li, and Guangyu Liu, "Semiconductor Nanotechnology for High Energy Efficient Applications," Outreach Program, OptoCamp 2008 – Center for Optical Technologies, [Lehigh University](#), Bethlehem, Pennsylvania, USA, August 2008.
3. [Hongping Zhao](#), Y.-K Ee, "Color Sensors," SPIE Lehigh Student Chapter Outreach Program to teach topics in optics to middle school students, Springhouse Middle School, Allentown, Pennsylvania, USA, November 17<sup>th</sup> 2008.
4. [Hongping Zhao](#), et. al., Summer CHOICES Program, Engineering Summer Camp for Middle-School Girls, which is a popular hands-on learning experience in engineering and science for 6<sup>th</sup>, 7<sup>th</sup>, or 8<sup>th</sup> grade middle-school girls. Lehigh University, July 2009.
5. Nelson Tansu, [Hongping Zhao](#), Hua Tong, Yik Khoon Ee, Xiaohang Li, and Guangyu Liu, "Semiconductor Nanotechnology for High Energy Efficient Applications," Outreach Program, OptoCamp 2009 – Center for Optical Technologies, [Lehigh University](#), Bethlehem, Pennsylvania, USA, August 2009.

### **Professional and Synergistic Services**

1. **Conference Volunteer** at the 8<sup>th</sup> Asian Symposium on Information Display, Feb. 2004, Nanjing, China.
2. **Technical Program Committee Member** – The 10<sup>th</sup> national conference of field emission and vacuum nano electronics, Nanjing, Sep. 2006, China
3. **Technical Program Committee Member** – American Physical Society (APS) Annual March Meeting 2011, Sub Committee 2: Semiconductor Physics, Dallas, Texas, March 2011.
4. **Journal Reviewer:**
  - **Optical and Quantum Electronics** (published by Elsevier)
  - **IEEE Journal of Selected Topics in Quantum Electronics**
  - **Japanese Journal of Applied Physics**
  - **Nanoscale Research Letters**
  - **IEEE Photonics Journal**
  - **IEEE Journal of Quantum Electronics**
  - **Thin Solid Film**
  - **Optics Letters**
  - **Solid-State Electronics**
  - **Optics Express**
  - **Optical Materials Express**
  - **Journal of Applied Physics**
5. **President of the SPIE Student Chapter at Lehigh University**, May, 2010 – Feb, 2011

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