Zhaoyang Fan

Assistant Professor
Texas Tech University
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Experience

Assistant Professor, 01/2008 – present
Texas Tech University, Department of Electrical and Computer Engineering
Lubbock, Texas, USA

V.P. for Research, 01/2006 – 12/2007
III-N Technology Inc.
Manhattan, Kansas, USA

Senior Scientist, 09/2003 – 12/2005
III-N Technology Inc.
Manhattan, Kansas, USA

Postdoctoral Research Associate, 09/2001 – 08/2003
Kansas State University, Department of Physics
Manhattan, Kansas, USA

Research Scientist, 04/1994 – 07/1996
Tsinghua University, Institute of Nuclear and New Energy Technology
Beijing, China

Education

Ph.D in Electrical Engineering, 2001
Department of Electrical and Computer Engineering
Northwestern University, Evanston, Illinois, USA
Advisor: Prof. Nathan Newman
Thesis: Development of aluminum nitride and gallium nitride for practical applications

M.E in Nuclear Engineering, 1994
Institute of Nuclear and New Energy Technology
Tsinghua University, Beijing, China
Advisor: Prof. Liangju Zhang
Thesis: Dual-computer switching technology for the reactor monitoring and control system

B.E in Engineering Physics, 1991
Department of Engineering Physics
Tsinghua University, Beijing, China

Current and previous group members

Postdoctoral Researcher:

Yahya Alivov, 08/2008 – 07/2009, (University of California, Irvine)
Changhong Chen, 09/2009 – 07/2011, (Huazhong University of Science and Technology, China)

Ph.D. students

Xuan Pan: Nanostructured oxides for renewable energy
Yong Zhao: Metal-insulator transition and applications

Master students

Vahini Yerraguntla, "Simulation and experiments towards ferroelectric-gate heterojunction field effect transistors". Graduated in October 2010. (Intel)

Ahmed Wajid, "Dispersion and processing of pristine graphene for high-performance materials". Graduated in July 2011. (TTU)

Funded Projects

As PI or co-PO, I have been involved in projects with a total funding of ~ $6M.

1. PI, "Electrically Controlled Metal-Insulator Transition and Its Terahertz Applications", NSF, 09/2011-08/2014, $390,000
2. Co-PI, "Nanophotonics Devices Research", US-Army, 09/2010-08/2011, $1,402,000
3. Senior Investor, "MRI - Acquisition of a Transmission Electron Microscope for Materials Research and Education" NSF, 10/2009-09/2012, $533,500
4. Co-PI, "MRI: Acquisition of a Molecular Beam Epitaxy System for Nano-Engineered AlGaInN Optoelectronic Devices: Research, Training, and Education" NSF, 09/2009-08/2012, $646,520
5. Co-PI, "Nanophotonics Devices Research" US-Army, 09/2009-08/2010, $1,358,460
6. PI, "AlGaN/GaN Heterostructure Based DNA Field-Effect Transistor (DNA-FET)" TTU, 09/2008-08/2009, $35,000
7. Co-PI, "Nanophotonics Devices Research" US-Army, 09/2008-08/2009, $1,420,000
8. Co-PI, "Pillips X'Pert Four-Crystal X-ray Diffractormeter" TTU, 06/2008-05/2009, $14,700
9. PI, "3D Integrated Microdisplays Based on InGaN/AlGaInP Semiconductor Micro-emitters" US-Army, 01/2007-06/2007, $70,000
10. PI, "Rare Earth Doped III-Nitrides for Optical Communications" ARO, 05/2006 – 04/2008, $661,125

11. PI, “SBIR II: Microdisplays Based on III-Nitride Wide Band Gap Semiconductors” NSF, 02/2004-01/2007, $480,000
12. PI, “REU: III-Nitride Micro-Emitter Array for Medical Applications” NSF, 06/2005-01/2007, $12,000
13. PI, “SBIR I: Microdisplays Based on III-Nitride Wide Band Gap Semiconductors” NSF, 01/2004-06/2004, $100,000

Teaching

- EE 4360/5360 – Fiber Optic Systems (S’08, S’09, S’10, S’11)
- EE 4314/5314 – Solid State Devices (F’08, F’09, F’10)
- EE 5332 – Topics In Electrical Engineering: Advanced Semiconductor Devices (F’10)
- EE 5120 – Electrical Engineering Graduate Seminar (S’11)
- EE 3341 –Electromagnetic theory I (F’11)

Membership in Professional Societies

- Material Research Society (MRS) (1999 – present)
- Institute of Electrical and Electronics Engineers (IEEE) (2001– present)
- American Physical Society (APS) (2002 – present)

Services

Department Committees

- Graduate Studies Committee, 01/2008 – present
- Curriculum Subcommittees: Basic Sciences, 09/2008 – 08/2009
- Curriculum Subcommittees: Communications and Controls, 09/2009 – present
- Faculty Search Committee: Power and Energy Systems, 08/2008 – 05/2009

Journal Reviews

- Applied Physics Letters (Since 1999)
- Superconductor Science and Technology (Since 2003)
- Journal of Physics: Condensed Matter (Since 2004)
- Journal of Physics D: Applied Physics (Since 2005)
- Journal of Optics A: Pure and Applied Optics (Since 2006)
- Semiconductor Science and Technology (Since 2006)
- Nanotechnology (Since 2007)
- Journal of Applied Physics (Since 2009)
- Physica Status Solidi (Since 2011)

Professional Services

- MRS Fall Meeting Conference Session Chair (2006)
- NSF proposal panel review (03/2008, 05/2010, 12/2010)
- DOE Solid-State Light Program proposals review (05/2005)

- DOE Basic Energy Sciences proposal review (05/2010)
- DOE Solid-State Light Program Planning Workshops: San Diego (02/2005)
- DOE Solid-State Light Program Planning Workshops: Orlando (02/2006)

Patents

1. Zhaoyang Fan, Jingyu Lin, and Hongxing Jiang, "Heterogeneous Integrated High Voltage DC/AC Light Emitter", US 7,221,044.
2. Zhaoyang Fan, "Light Emitting Diode Lamp", US 7,525,248.
3. Zhaoyang Fan, Jingyu Lin, and Hongxing Jiang, "Micro-LED Based High Voltage AC/DC Indicator Lamp", US 7,535,028.
4. Jing Li, Zhaoyang Fan, Jingyu Lin, and Hongxing Jiang, "Extreme Ultraviolet (EUV) Detectors Based upon Aluminum Nitride (AIN) Wide Bandgap Semiconductors", US 7,498,645.
5. Zhaoyang Fan, Jing Li, Jingyu Lin, and Hongxing Jiang, "AC/DC Light Emitting Diodes with Integrated Protection Mechanism", US 7714348.
6. Frank Yue Jiang and Zhaoyang Fan, "Biological Sensors System", US 12/210,287, in pending.
7. Zhaoyang Fan, Jing Li, Jingyu Lin, and Hongxing Jiang, "Micro-Emitter Array Based Full-Color Microdisplay", US 12/238,642, in pending.
8. Zhaoyang Fan, Jingyu Lin, and Hongxing Jiang, "The Encapsulation and Packaging of Ultraviolet and Deep-Ultraviolet Light Emitting Diodes", US 11/020,762, Pending.
9. Zhaoyang Fan, Jingyu Lin, and Hongxing Jiang, "High Brightness LED Lamps for High Voltage AC/DC Operation", US 11/144,982, in pending.
10. Zhaoyang Fan, Jingyu Lin, and Hongxing Jiang, "III-Nitride Quantum-Well Field Effect Transistors", US 10/741,268, in pending.

Journal Publications:

1. M. Nazari, Changhong Chen, A. A. Bernussi, Z. Y. Fan, and M. Holtz, "Effect of free-carrier concentration on the phase transition and vibrational properties of VO_2", *Appl. Phys. Lett*.**99**, 071902 (2011).
2. Changhong Chen, Yong Zhao, Xuan Pan, V. Kuryatkov, A. Bernussi, M. Holtz, and Zhaoyang Fan, " Influence of defects on structural and electrical properties of VO_2 thin films", *J. Appl. Phys.* **110**, 023707 (2011).
3. Xuan Pan, Changhong Chen, Kai Zhu, Zhaoyang Fan, "TiO_2 Nanotubes Infiltrated with Nanoparticles for Dye Sensitized Solar Cells", *Nanotechnology* **22**, 235402, 2011.
4. C. Chen, Y. Zhu, Y. Zhao, J. H. Lee, H.Y. Wang, A. Bernussi, M. Holtz, and Zhaoyang Fan, " VO_2 multidomain heteroepitaxial growth and terahertz transmission modulation", *Appl. Phys. Lett*. **97**, 211905 (2010).

5. Sandeep Sohal, Yahya Alivov, Zhaoyang Fan, and Mark Holtz, "Role of Phonons in the Optical Properties of Magnetron Sputtered ZnO Studied by Resonance Raman and Photoluminescence", *J. Appl. Phys*. **108**, 053507, (2010).
6. Y. Alivov and Z. Y. Fan, "Dye-sensitized solar cells using TiO_2 nanoparticles transformed from nanotube arrays", *J. Mater. Sci*. **45**, 2902–2906 (2010).
7. C. Chen and Z. Y. Fan, "Changes in VO_2 band structure induced by charge localization and surface segregation", *Appl. Phys. Lett.* **95**, 262106 (2009).
8. Y. Alivov and Z. Y. Fan, "Efficiency of dye sensitized solar cells based on TiO_2 nanotubes filled with nanoparticles", *Appl. Phys. Lett*. **95**, 063504 (2009).
9. Y. Alivov and Z. Y. Fan, "TiO_2 nanostructure transformation: from ordered nanotubes to nanoparticles", *Nanotechnology* **20**, 405610 (2009).
10. Y. Alivov, Z. Y. Fan, and D. Johnstone, "Titanium nanotubes grown by titanium anodization", *J. Appl. Phys*. **106**, 034314 (2009).
11. Y. Alivov and Z. Y. Fan, "A Method for Fabrication of Pyramid-Shaped TiO_2 Nanoparticles with a High {001} Facet Percentage", *J. Phys. Chem. C*, **113**, 12954 (2009).
12. Y. Alivov, M. Pandikunta, S. Nikishin, and Z. Y. Fan, "The anodization voltage influence on the properties of TiO_2 nanotubes grown by electrochemical oxidation", *Nanotechnology* **20**, 225602(2009).
13. Z. Y. Fan, J. Y. Lin, and H. X. Jiang, "III-nitride micro-emitter arrays: development and applications", *J. Phys. D: Appl. Phys.* **41**, 094001(2008). Invited.
14. R.Dahal, T.M. Al Tahtamouni, Z. Y. Fan, J. Y. Lin, and H. X. Jiang, "Hybrid AlN–SiC deep ultraviolet Schottky barrier photodetectors", *Appl. Phys. Lett.*, **90**, 263505 (2007).
15. J. Li, Z.Y. Fan, R. Dahal, M. L Nakarmi, J. Y. Lin, and H. X. Jiang, "200 nm deep ultraviolet photodetectors based on AlN", *Appl. Phys. Lett*. **89**, 213510 (2006).
16. Z. Y. Fan, J. Li M. L. Nakarmi J. Y. Lin, and H. X. Jiang**, "**AlGaN/GaN/AlN quantum-well field-effect transistors with highly resistive AlN epilayers," *Appl. Phys. Lett.* **88**, 073513 (2006).
17. M. Khizar, Z. Y. Fan, K. H. Kim, J. Y. Lin, and H. X. Jiang, "Nitride deep-ultraviolet light-emitting diodes with microlens array," *Appl. Phys. Lett.* **86**, 173504 (2005).
18. M. L. Nakarmi, K. H. Kim, M. Khizar, Z. Y. Fan, J. Y. Lin and H. X. Jiang, "Electrical and optical properties of Mg-doped $Al_{0.7}Ga_{0.3}N$ alloys," *Appl. Phys. Lett.* **86**, 092108 (2005).
19. K. H. Kim, Z. Y. Fan, M. Khizar, M. L. Nakarmi, J. Y. Lin, and H. X. Jiang, "AlGaN-based ultraviolet light-emitting diodes grown on AlN epilayers," *Appl. Phys. Lett.* **85**, 4777 (2004).
20. J. J. Diao, G. D. Chen, Xi Cong, Song Yan, Z. Y. Fan, and Jing Xuan, "Optical resonant of metal-coated nanoshell", *Chinese Phys.* **12**, 100 (2003).

21. Z. Y. Fan, J. Li, J. Y. Lin, and H. X. Jiang, "Delta-doped AlGaN/GaN metal oxide semiconductor heterostructure field effect transistors with high breakdown voltages," *Appl. Phys. Lett*. **81**, 4649 (2002).
22. Z. Y. Fan, D.G. Hinks, N. Newman, and J.M. Rowell, "Experimental study of MgB_2 decomposition," *Appl. Phys. Lett.,* **79**, 87 (2001).
23. Z. Y. Fan and N. Newman, "Experimental determination of the rates of decomposition and cation desorption from nitride surfaces", *Mat. Sci. and Eng.* **B87**, 244 (2001).
24. Z. Y. Fan, G. Rong, and N. Newman and David J. Smith, "Defect annihilation in AlN thin films by ultrahigh temperature processing," *Appl. Phys. Lett.* **76**, 1839 (2000).
25. Z. Y. Fan, G. Rong, J. Browning and N. Newman, "High temperature Growth of AlN by Plasma-enhanced Molecular Beam Epitaxy", *Mat. Sci. and Eng.* **B67**, 80 (1999).
26. Z. Y. Fan and N. Newman, "Precise control of atomic nitrogen production in an ECR plasma using N_2/noble gas mixtures," *Appl. Phys. Lett*. **73**, 456 (1998).
27. Z. Y. Fan and N. Newman, "Kinetic energy distribution of nitrogen ions in an electron cyclotron resonance (ECR) plasma", *J. Vac. Sci. Technol.* **A16**, 2132 (1998).
28. Z. Y. Fan and Liangju Zhang, "Multithreaded programming concepts and its applications", *Mini- and Micro Computer System (in Chinese)*, **17**, 1 (1996).
29. Z. Y. Fan, Liangju Zhang, Xu Liu, and Youhua Zhang, "I/O operation of non-standard VAX/VMS devices in VAX/VMS systems", *Mini- and Micro Computer System (in Chinese)*, **16**, 54 (1995).

Proceeding Publications

1. Changhong Chen, Yong Zhao, Xuan Pan, Mark Holtz and Zhaoyang Fan, " Twin-domain Epitaxial Growth and Metal-insulator Transition of VO_2 Thin Film on C-Plane Sapphire", MRS Proceedings 2011, 1292, mrsf10-1292-k09-10. doi:10.1557/opl.2011.153.
2. Xuan Pan, Yong Zhao, Changhong Chen and Zhaoyang Fan, "Titanium Dioxide Nanotubes Decorated with Nanoparticles for Dye Sensitized Solar Cells", MRS Proceedings 2011, 1303, mrsf10-1303-y05-06. doi:10.1557/opl.2011.404.
3. Yahya Alivov, Xuan Pan, Mahesh Pandikunta, Vladimir Kuryatkov, Sergey Nikishin, Mark Holtz, and Zhaoyang Fan, "Nanoparticle Layers Transformed from Ordered TiO_2 Nanotube Arrays and Based Dye-Sensitized Solar Cells", Mater. Res. Soc. Symp. Proc. Vol. 1211, 1211-R08-33, 2010
4. Yahya Alivov, Vladimir Kuryatkov, Mahesh Pandikunta, Gautam Rajanna, D. Johnstone, Ayrton Bernussi, Sergey Nikishin, and Z. Y. Fan, "Optical and Electrical Properties of TiO_2 Nanotubes Grown by Titanium Anodization", Mater. Res. Soc. Symp. Proc. Vol. 1178, 1178-AA09-27, 2009
5. R. Dahal, J. Li, Z. Y. Fan, M. L. Nakarmi, T. M. Al Tahtamouni, J. Y. Lin, H. X. Jiang, " AlN MSM and Schottky photodetectors", *Phys. Stat. Sol. (c)* , 5, 2148 (2008).
6. Z. Y. Fan, J. Y. Lin, and H. X. Jiang, "Achieving conductive high Al-content AlGaN alloys for deep UV photonics", *Proc. SPIE* 6479, 64791I (2007), invited.

7. Z. Y. Fan, J. Y. Lin, and H. X. Jiang, "III-nitride deep ultraviolet micro- and nano-photonics," *Proc. SPIE* 6127, 61271C (2006), invited.
8. Z. Y. Fan, J. Y. Lin, and H. X. Jiang, "Recent advances in III-nitride UV Materials and Devices," Proceedings of the International Symposia (State-of-the-Art Program on Compound Semiconductors XL), The Electrochemical Society, 2004-02, 24 (2004),invited.
9. Z. Y. Fan, M. L. Nakarmi, J. Y. Lin, and H. X. Jiang, "Delta-doped AlGaN/GaN Heterostructure Field-Effect Transistors with Incorporation of AlN Epilayers", *MRS Proc. 798*, Y10.23, (2003).
10. Z. Y. Fan, J. Li, J. Y. Lin, H. X. Jiang, Y. Liu, J. A. Bardwell, J. B. Webb, and H. Tang, "AlGaN/GaN metal-oxide-semiconductor heterostructure field-effect transistors (MOSHFETs) with the delta-doped barrier layer", *MRS Proc.* L9.11, (2002).
11. Z. Y. Fan, G. Rong,, N. Newman, D.J. Smith, and D. Chandrasekhar, "MBE growth and ultrahigh temperature processing of high-quality nitride films", *MRS Proc.* 587, O7.2.1 (2000).

Conference/Seminar Presentations

1. Yong Zhao, Ji Hao, Changhong Chen, and Zhaoyang Fan, "Metal-insulator transition mechanism in VO_2 under electric bias", APS March Meeting, March 21–25, 2011; Dallas, Texas.
2. Changhong Chen, Yong Zhao, and Zhaoyang Fan, "Dependence of VO_2 thin-film metal-insulator transition on its intrinsic impurities", APS March Meeting, March 21–25, 2011; Dallas, Texas.
3. Xuan Pan, Changhong Chen, and Zhaoyang Fan, "Titanium dioxide nanotubes decorated with nanoparticles for dye sensitized solar cells", MRS Fall Meeting, Nov. 29 – Dec. 3, 2010, Boston, MA. USA.
4. Changhong Chen, Yong Zhao, and Zhaoyang Fan, "Twin-domain epitaxial growth and metal-insulator transition of VO_2 thin film on c-plane sapphire", MRS Fall Meeting, Nov. 29 – Dec. 3, 2010, Boston, MA. USA.
5. Y. Alivov, X. Pan, K. Vladimir, S. Nikishin, M. Holtz, and Z. Y. Fan, "Dye-Sensitized Solar Cells Based on TiO_2 Nanoparticles Transformed from Nanotube Arrays", MRS Fall Meeting, Nov. 30 – Dec. 4, 2009, Boston, MA. USA.
6. Y. Alivov, X. Pan, and Z. Y. Fan, "Dye Sensitized Solar Cells Based on TiO_2 Nanotubes Filled with Nanoparticles", 1st IEEE Green Technology Conference, April 16-17, 2009, Lubbock, Texas, USA.
7. Y. Alivov, V. Kuryatkov, M. Pandikunta, G. Rajanna, D. Johnstone, A. Bernussi, S. Nikishin, and Z. Y. Fan, "Optical and Electrical Properties of TiO_2 Nanotubes Grown by Titanium Anodization", MRS Spring Meeting, April 13 - 17, 2009, San Francisco, CA. USA.

8. R. Dahal, J. Li, Z. Y. Fan, M. L. Nakarmi, T. M. Al Tahtamouni, J. Y. Lin, and H. X. Jiang, "AlN MSM and Schottky photodetectors", 7th International Conference of Nitride Semiconductors (ICNS-7), Sept. 16–21, 2007, Las Vegas, Nevada, USA.
9. Z. Y. Fan, "III-Nitride Wide Bandgap Semiconductor Devices", April 3, 2007, Rutgers University, New Brunswick, NJ.
10. B. Pantha, R. Dahal, J. Li, Z. Y. Fan, J. y. Lin, H. X. Jiang, and G. Pomrenke, "Thermoelectrical properties of InGaN", APS March Meeting, March 5–9, 2007; Denver, Colorado.
11. Z. Y. Fan, "Recent Progresses in Nitride Research", Condense Matter Physics Seminar, Kansas State University, Sept. 22, 2006, Manhattan, Kansas.
12. Z. Y. Fan, "SBIR Phase II: Microdisplays Based on III-Nitride Wide Band Gap Semiconductors", The 2006 Spring National SBIR/STTR Conference And Small Business Tech Expo, May 15-18, 2006, Louisville, KY
13. K. Knabe, J. Shakya, K. Kim, Z. Y. Fan , J. Y. Lin, and H. X. Jiang, "Polarization Properties of III-Nitride Blue and UV Light-Emitting Diodes", APS March Meeting, Mar. 21-25, 2005, Los Angeles, CA.
14. T.M. Al Tahtamouni, M. L. Nakarmi, M. Khizar, Z.Y. Fan, J.Y. Lin, H.X. Jiang, "Growth and Fabrication of III-Nitride Deep Ultraviolet Emitters", APS March Meeting, Mar. 21-25, 2005, Los Angeles, CA.
15. K. Muhammad, Z. Y. Fan, K. H. Kim, J. Y. Lin , H. X. Jiang, "Nitride Deep Ultraviolet Light-Emitting Diodes with Microlens Array", APS March Meeting, Mar. 21-25, 2005, Los Angeles, CA.
16. J. Shakya, Z.Y. Fan, K. H. Kim, T. N. Oder, J. Y. Lin and H. X. Jiang, "III-Nitride UV Photonic Crystals", MRS Fall Meeting, Nov.29 - Dec. 3, 2004, Boston, Massachusetts.
17. K. H. Kim, Z. Y. Fan, M. L. Nakarmi, J. Li, S. X. Jin, J. Y. Lin, H. X. Jiang, "III-Nitride Ultraviolet Light Emitting Diodes with Delta-Doping", APS March Meeting, 2004, Mar 22-26, Montreal, Canada.
18. Z. Y. Fan, M. L. Nakarmi, J. Li, J. Y. Lin, and H. X. Jiang, "Insulator-Gated AlGaN/GaN Heterostructure Field Effect Transistors", APS March Meeting, Mar. 3-7, 2003, Austin, Texas.
19. Z. Y. Fan, J. Li, J. Y. Lin, and H. X. Jiang, "Delta-Doped AlGaN/GaN MOSHFETs with High Breakdown Voltages", MRS Fall Meeting, Dec. 2-6, 2002, Boston, Massachusetts.
20. Z. Y. Fan, "AlGaN/GaN heterostructure field-effect transistor (HFET)", Condense Matter Physics Seminar, Kansas State University, Nov. 22, 2002, Manhattan, Kansas.
21. Z. Y. Fan, "III-N Semiconductors: from MBE growth to electronic applications", Condense Matter Physics Seminar, Kansas State University, Dec. 7, 2001, Manhattan, Kansas.
22. Z. Y. Fan, N. Newman, and D. J. Smith, "Optimizing the Quality of MBE-Grown AlN: the Role of Al Surface Lifetime and AlN Decomposition", Lawrence Symposium on Critical Issues in Epitaxy, Jan. 3-6, 2001, Scottsdale, Arizona.

23. N. Newman, Z. Y. Fan, D. J. Smith, “A Systematic Study of III-N MBE Synthesis”, High-Temperature, High-Power, High-Frequency Electronics Workshop, Nov. 17, 2000, Tempe, Arizona.

24. Z. Y. Fan, G. Rong, N. Newman, D. J. Smith, and D. Chandrasekhar, “AlN-Based Overlayers for III-N Substrates”, MRS Fall Meeting, Nov. 29 Dec. 3, 1999, Boston, Massachusetts.