

Yuji Zhao

Associate Professor

School of Electrical, Computer & Energy Engineering
Arizona State University

Office: 551 E. Tyler Mall, ENGRC 531, Tempe, AZ 85281

Phone: (480) 727-4450 • Email: yuji.zhao@asu.edu • Web: faculty.engineering.asu.edu/zhao

BIOSKETCH SUMMARY

Yuji Zhao is an Associate Professor of Electrical Engineering and Chair of the ASU NanoFab Governance Committee at Arizona State University, where he joined the faculty in 2014. He received the Ph.D. degree from University of California Santa Barbara (UCSB) in 2012 under the supervision of Nobel Laureate Professor Shuji Nakamura, and was an Assistant Research Scientist at UCSB from 2013 to 2014. His awards include the 2019 PECASE Award from the White House, which is the highest honor given by the US government to early-career scientists and engineers. He is also a receipt of 2019 MIT TR 35 – China Award, 2019 DoD ARO DURIP Award, 2017 ASU Fulton Outstanding Assistant Professor Award, 2016 DTRA Young Investigator Award, 2015 NASA Early Career Faculty Award, 2015 SFAz Bisgrove Scholar Faculty Award, 2010–2013 UCSB SSLEC Outstanding Research Award, and several best paper awards.

Yuji Zhao's research and teaching interests are in the area of electronic materials, advanced devices, and nanotechnologies. His current research projects involve the materials science and device engineering of wide bandgap semiconductors for energy efficiency, RF and power electronics, and quantum photonics applications. He has co-authored 4 book chapters, over 80 journal papers, over 90 conference proceedings and presentations, and over 20 patents. He currently advises a group of 10 Ph.D. students and postdoctoral researchers. He has graduated 4 Ph.D. students, 3 M.S. students, and 1 undergraduate student. Among them, one Ph.D. student joined Iowa State University as an Assistant Professor, and two other Ph.D. students are holding academic positions in research institutes in Germany and China. Since August 2014, he has been awarded over \$18.65 million in collaborative research funding, of which \$5.8 million was obtained as principal investigator.

RESEARCH INTERESTS

Materials science and device engineering of *wide bandgap* materials (e.g., GaN and nitride alloys, Ga₂O₃, and diamond) for applications in both *applied electronics* (e.g., energy efficiency, power electronics, RF and power ICs) and *quantum information* (e.g., novel quantum nano/hetero structures, quantum photonics, and quantum sensing).

EDUCATION

University of California, Santa Barbara	Ph.D. in Electrical Engineering	2008–2012
Advisor: Prof. Shuji Nakamura (Nobel Prize in Physics 2014)		

Fudan University	B.S. in Microelectronics	2004–2008
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APPOINTMENTS

Arizona State University

- Chair ASU NanoFab Governance Committee 08/2020–Present
- Associate Professor Electrical, Computer and Energy Engineering 08/2020–Present
- Assistant Professor Electrical, Computer and Energy Engineering 08/2014–07/2020

University of California, Santa Barbara

- Assistant Project Scientist Materials Department and SSLEC 01/2013–08/2014
- Graduate Student Researcher Electrical and Computer Engineering 09/2008–12/2012

SELECTED HONORS AND AWARDS

- 2019 Presidential Early Career Award in Science and Engineering (PECASE)**
nominated by ARO and DoD, the highest honor given by the US government to early-career scientists and engineers
- 2019 MIT Technology Review Innovators Under 35 (TR 35) – China Award**
- 2019 DoD ARO DURIP Award**
- 2017 Selected by NASA as Honorable Faculty Scientist to Showcase Space Technology to Congress at Capitol Hill**
presented to U.S. Representative Lamar Smith, chairman of the Committee on Science, Space, and Technology
- 2017 ASU Fulton Outstanding Assistant Professor Award**
- 2016 DoD DTRA Young Investigator Program (YIP) Award**
- 2015 NASA Early Career Faculty (ECF) Award**
- 2015 Bisgrove Scholar Tenure Track Faculty Award**
- 2013 UCSB SSLEC Outstanding Postdoctoral Research Achievement Award
- 2012 Applied Physics Letters Editor's Picks of the Year Award
- 2012 Applied Physics Express Most Cited Article of the Year Award
- 2012 Semi-Finalist, CLEO Theodore Maiman Student Paper Competition (ranked 1st in Energy and Environment)
- 2012 UCSB SSLEC Outstanding Graduate Student Research Achievement Award
- 2011 UCSB SSLEC Outstanding Graduate Student Research Achievement Award
- 2010 UCSB SSLEC Outstanding Graduate Student Research Achievement Award
- 2004 Fudan University Scholarship for Excellency in Undergraduate Study

SELECTED HONORS WITH SUPERVISED STUDENTS

- 2019 ASU Joseph Palais Outstanding Doctoral Award (Houqiang Fu)**
the highest honor for ASU ECEE Ph.D gradates, 1 awardee in 2019
**Houqiang Fu joined Iowa State University as an Assistant Professor in Fall 2020*
- 2019 Chinese Government Award for Outstanding Self-Financed Students Abroad (Xuanqi Huang)**
top honor for self-financed Chinese students studying overseas

- 2019 ASU University Graduate Fellowship (Xin Qi)**
top honor for incoming or graduation ASU Ph.D students, 10 awardees in ECEE for 2019 Fall
- 2018 ASU GPSA Outstanding Research Award (Houqiang Fu)**
the Outstanding Research Award is given every year to students who demonstrate commitment, originality, and impact in their research efforts, 16 awardees university-wide in 2018
- 2018 ASU University Graduate Fellowship (Jinan Zhou)**
top honor for incoming or graduation ASU Ph.D students, 9 awardees in ECEE for 2018 Fall
- 2017 ASU University Graduate Fellowship (Zhijian Lu)**
top honor for incoming or graduation ASU Ph.D students, 6 awardees in ECEE for 2017 Spring
- 2017 ASU University Graduate Fellowship (Jossue Montes)**
top honor for incoming or graduation ASU Ph.D students, 6 awardees in ECEE for 2017 Spring

PROFESSIONAL SERVICE

Conference Service:

- 2021 The 240th Electrochemical Society Meeting (ECS Meeting), Subprogram Committee
- 2021 CLEO Semiconductor Lasers (S&I-3), Subprogram Committee
- 2020 Pacific Rim Meeting on Electrochemical and Solid State Science (PRiME 2020), Subprogram Committee
- 2020 CLEO Semiconductor Lasers (S&I-3), Subprogram Committee
- 2019 The 236th Electrochemical Society Meeting (ECS Meeting), Subprogram Committee
- 2019 ASME International Technical Conference on Packaging and Integration of Electronic and Photonic Microsystems (InterPack 2019), Subprogram Committee and Session co-Chair
- 2019 The 19th International Conference on Crystal Growth and Epitaxy (ICCGE-19) and the 19th Workshop on Organometallic Vapor Phase Epitaxy (OMVPE-19), Subprogram Committee Chair and Session Chair
- 2017 The 18th US Workshop on Organometallic Vapor Phase Epitaxy (OMVPE-18), Program Committee
- 2017 International Symposium on Semiconductor Light Emitting Devices (ISSLED 2017), Program Committee
- 2016 International Workshop on Nitride Semiconductors (IWN 2016), Session Chair
- 2015 ASU Center for Photonic Innovation (CPhI) Review Conference, Organizer
- 2014 Lester Eastman Conference on High Performance Devices (LEC 2014), Technical Committee

Journal Reviewer:

Nature Publishing: Light Science & Applications, Nature Communications, Scientific Reports; ACS Publishing: ACS Energy Letters, ACS Applied Materials & Interfaces, ACS Photonics, ACS Applied Electronic Materials; OSA Publishing: Optica, Optic Express, Optic Letters, Optical Material Express; AIP Publishing: Applied Physics Letters, Journal of Applied Physics; IEEE Publishing: IEEE Electron Device Letters, IEEE Transactions on Electron Devices, IEEE Transactions on Power Electronics, IEEE Journal of Selected Topics in Quantum Electronics, IEEE Journal of Lightwave Technology, IEEE Journal of the Electron Devices Society, IEEE Electronic Letters; Elsevier Publishing: Journal of Crystal Growth, Journal of Alloys and Compounds, Solid-State Electronics; Springer Publishing: Journal of Electronic Materials, Applied Physics A; Wiley Publishing: Physica Status Solidi series; IOPscience Publishing: Applied Physics Express, Semiconductor Science and Technology.

Proposal Reviewer:

NASA NSTRF proposal, NSF regular/SBIR/STTR proposal, ARO regular and YIP proposal, AFOSR regular proposal

IEEE Service:

IEEE EDS Optoelectronic Devices Committee, 2020–present

ASU Service:

ASU NanoFab Governance Board, Chair, 2020–present, member 2018–present

ASU MTW Core Facility Planning Committee, 2019

ASU ECEE Faculty Search Committee, 2019

ASU ECEE Faculty Search Committee, 2018

NASA Service:

Subgroup leader for NASA HOTTech Program “MicroElectronics and Sensors” Subgroup, 2017–present

**Coordinate 12 research groups from NASA centers, academic institutes, and industry within the NASA HOTTech program for strategic activities, e.g., collaborations, meetings, reporting, and future project planning*

SEMINARS AND INVITED TALKS

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1. **2020 ASME International Technical Conference on Packaging and Integration of Electronic and Photonic Microsystems (InterPACK 2020)**, Anaheim, CA, Oct 2020
 2. **The 8th International Symposium on Growth of III-Nitrides**, San Diego, CA, May 2020 (rescheduled due to COVID-19)
 3. **2020 IEEE Workshop on Microelectronics & Electron Devices (WMED 2020)**, Boise, ID, Mar 2020 (rescheduled due to COVID-19)
 4. **University of Pennsylvania**, Department of Electrical and Systems Engineering, Philadelphia, PA, Mar 2020 (changed to online seminar due to COVID-19)
 5. **2020 Lawrence Symposium on Epitaxy**, Scottsdale, AZ, Feb 2020
 6. **2020 Workshop on Compound Semiconductor Materials and Devices (WOCSEMMAD 2020)**, Palm Spring, CA, Feb 2020
 7. **Carnegie Mellon University**, ECE Graduate Seminar, Department of Electrical and Computer Engineering, Pittsburgh, PA, Jan 2020
 8. **Duke University**, Department of Electrical and Computer Engineering, Durham, NC, Nov 2019
 9. **Rice University**, Department of Electrical and Computer Engineering, Houston, TX, Nov 2019
 10. **2019 ASME International Technical Conference on Packaging and Integration of Electronic and Photonic Microsystems (InterPACK 2019)**, Anaheim, CA, Oct 2019
 11. **University of Texas at Austin**, Department of Electrical and Computer Engineering, Austin, TX, Mar 2019
 12. **University of California, Berkeley**, Solid State Technology and Devices Seminar, Department of Electrical Engineering and Computer Sciences, Berkeley, CA, Dec 2018
 13. **University of California, Los Angeles**, Department of Materials Science and Engineering, Los Angeles, CA, Oct 2018

14. **2018 Americas International Meeting on Electrochemistry and Solid State Science (AiMES 2018) and 234th ECS Meeting**, Cancun, Mexico, Sep 2018
15. **2018 Government Microcircuit Applications and Critical Technology Conference (GOMACTech 2018)**, Miami, FL, Mar 2018
16. **2018 Workshop on Compound Semiconductor Materials and Devices (WOCSEMMAD 2018)**, San Diego, CA, Feb 2018
17. **Stanford University**, Department of Electrical Engineering, Palo Alto, CA, Nov 2017
18. **University of California, Los Angeles**, Department of Electrical and Computer Engineering, Los Angeles, CA, Nov 2017
19. **NASA Glenn Research Center**, Cleveland, OH, Nov 2017
20. **Arizona State University**, ASU Nanoscience Seminar, Tempe, AZ, Oct 2017
21. **University of Southern California**, Distinguished Lectures, Department of Chemical Engineering and Materials Science, Los Angeles, CA, Oct 2017
22. **University of California, San Diego**, Department of Electrical and Computer Engineering, La Jolla, CA, Oct 2017
23. **The 60th IEEE International Midwest Symposium on Circuits and Systems**, Boston, MA, Aug 2017
24. **2017 IEEE Photonics Society Summer Topicals Meeting**, San Juan, Puerto Rico, Jul 2017
25. **2017 International Symposium on Advanced Lighting Science and Technology (ALST 2017)**, Shaoxing, China, May 2017
26. **The 24th Space Photovoltaic Research and Technology (SPRAT) Conference**, Cleveland, OH, Sep 2016
27. **Fudan University**, School of Information Science and Technology, Shanghai, China, Jul 2015
28. **Suzhou Institute of Nano-Tech and Nano-Bionics**, Suzhou, China, Jul 2015
29. **Massachusetts Institute of Technology**, Department of Electrical Engineering and Computer Science, Cambridge, MA, May 2015
30. **Soitec Phoenix Lab Inc**, Tempe, AZ, Oct 2014
31. **Arizona State University**, School of Electrical, Computer and Energy Engineering, Tempe, AZ, May 2014
32. **University of California, San Diego**, Department of Electrical and Computer Engineering, La Jolla, CA, Apr 2014
33. **University of California, San Diego**, Department of Electrical and Computer Engineering, La Jolla, CA, Aug 2013
34. **University of California, Santa Barbara**, Nitride Special Seminar, Santa Barbara, CA, Nov 2013
35. **University of Notre Dame**, Department of Electrical Engineering, Notre Dame, IN, Jul 2013
36. **University of Virginia**, Charles L. Brown Department of Electrical and Computer Engineering, Charlottesville, VA, Apr 2013
37. **Society of Information Display (SID) 50th Anniversary Conference**, Los Angeles, CA, Sep 2012
38. **Fudan University**, School of information science and Engineering, Shanghai, China, Jun 2012
39. **University of California, Santa Barbara**, Nitride Special Seminar, Santa Barbara, CA, Feb 2012
40. **Tsinghua University**, Tsinghua National Laboratory for Information Science and Technology, Beijing, China, May 2011
41. **Peking University**, State Key Laboratory for Artificial Microstructures and Mesoscopic Physics, Beijing, China, May 2011

42. **Zhejiang University**, Center for Optical and Electromagnetic Research, Hangzhou, China, May 2011
 43. **University of California, Santa Barbara**, Nitride Special Seminar, Santa Barbara, CA, Feb 2011

PUBLICATIONS

Selective Media Highlights: over 100 media reports with over 6 languages

- President Donald J. Trump announces recipients of the Presidential Early Career Award for Scientists and Engineers (PECASE), The White House, Jul 2019
- First steps to high temperature GaN memory? Compound Semiconductor, Apr 2019
- New memory device can take the heat, IEEE Spectrum, Mar 2019
- ASU Bisgrove Scholar illuminates the future of LED lighting, ASU News, Apr 2018
- ASU engineer showcases NASA research to congress on capitol hill, ASU News, Jan 2018
- Gallium nitride processor: next-generation technology for space exploration, **Astrowatch, Phys.org, Spaceflightinsider, ECNMag, Technewsgadgets, ASU news, etc., English and Chinese, Dec 2017**
- Vertical gallium nitride Schottky diodes with single and double drift layers, Semiconductor Today, Oct 2017
- Aluminum nitride Schottky barrier diodes with breakdown more than 1kV, Silicon Valley Microelectronics, Aug 2017
- Indium gallium nitride solar cells on non-polar and semi-polar substrates, Semiconductor Today, May 2017
- Buffer and drift layer effects on vertical gallium nitride diodes, Semiconductor Today, Apr 2017
- Thermophotonics: LEDs feed on waste heat, **Nature Photonics**, Nov 2015
- Overcoming the “green gap”, **Nature Photonics**, Jul 2013
- Semipolar planes delivers stable green LEDs, Compound Semiconductor, Aug 2013
- How LED got their shine back, **Science**, May 2012
- Conquering LED efficiency droop, Optical Society of America (OSA), Apr 2012
- New LED design drops the droop, Photonics, May 2012
- LEDs más eficientes para el hogar, Sustentator, Spanish, May 2012
- Special substrates help LEDs shine brighter without losing efficiency, Daily Tech, May 2012
- Reducing LED droop at high current, Semiconductor Today, Jul 2011
- Blue semipolar LEDs now comparable to conventional c-plane devices, Laser Focus World, Nov 2010
- UCSB achieves semi-polar light extraction comparable to conventional LEDs, Semiconductor Today, Sep 2010

Legend

(underline) Yuji Zhao

(bold font) Zhao Group Ph.D. Student

(bold font with x) Zhao Group Postdoctoral Researcher

Book chapters (in review: grey; published: black)

1. **H. Chen, J. Zhou, H. Fu^x**, and Y. Zhao, “Octave-spanning supercontinuum generation in AlN waveguides”, chapter in “*Ultrawide Bandgap Semiconductors*”, ELSEVIER, 2020. Also serving as a Guest Editor with Prof. Zetian Mi.
2. **H. Fu^x, K. Fu^x**, and Y. Zhao, “Vertical GaN on GaN power devices”, chapter in “*Wide Bandgap Semiconductor-Based Electronics*”, edited by Profs. Stephen J. Pearton and Ren Fan, IOP Science, 2020.

3. **H. Fu** and **Y. Zhao**, "Efficiency droop in InGaN/GaN LEDs", chapter in "Nitride Semiconductor Light-Emitting Diodes", 2nd edition, edited by Profs. J. J. Huang, H. C. Kuo, and S. C. Shen, Woodhead Publishing, 2018.
4. Y. R. Wu, C. Y. Huang, **Y. Zhao**, and J. S. Speck, "Nonpolar and semipolar LEDs", chapter in "Nitride Semiconductor Light-Emitting Diodes (LEDs): Materials, Technologies and Applications", edited by Profs. J. J. Huang, H. C. Kuo, and S. C. Shen, Woodhead Publishing, 2014.

Journal papers (in review: grey; published and accepted: black)

1. T. H. Yang, J. Brown, **K. Fu^x**, J. Zhou, K. Hatch, C. Yang, J. Montes, X. Qi, H. Fu, R. J. Nemanich, and **Y. Zhao**, "AlGaN/GaN metal-insulator-semiconductor high electron mobility transistors (MISHEMTs) using ERC-MPCVD deposited hexagonal boron nitride as gate dielectric", submitted.
2. **K. Fu^x**, X. Qi, H. Fu, P. Y. Su, H. Liu, T. H. Yang, C. Yang, J. Montes, J. Zhou, F. Ponce, and **Y. Zhao**, "Characterization of MOCVD regrown p-GaN and the interface properties for vertical GaN power devices", submitted.
3. J. Montes, C. Kopas, H. Chen, X. Huang, T. H. Yang, **K. Fu^x**, C. Yang, J. Zhou, X. Qi, H. Fu, and **Y. Zhao**, "Deep level transient spectroscopy investigation of ultra-wide bandgap (-201) and (001) β -Ga₂O₃", submitted.
4. **H. Fu^x**, **K. Fu^x**, C. Yang, H. Liu, K. A. Hatch, S. R. Alugubelli, P. Y. Su, D. C. Messina, P. Peri, B. Li, X. Deng, C. Y. Cheng, R. V. Meidanshahi, X. Huang, H. Chen, T. H. Yang, J. Zhou, E. T. Yu, A. M. Armstrong, A. A. Allerman, J. Han, S. M. Goodnick, D. J. Smith, R. J. Nemanich, F. A. Ponce, and **Y. Zhao**, "Selective area regrowth and doping for vertical GaN power devices: materials challenges and recent progress", submitted.
5. **K. Fu^x**, **H. Fu^x**, X. Deng, C. Y. Cheng, P. Y. Su, H. Liu, K. Hatch, D. Messina, R. V. Meidanshahi, P. Peri, C. Yang, X. Huang, T. H. Yang, H. Chen, J. Montes, J. Zhou, X. Qi, S. M. Goodnick, F. A. Ponce, D. J. Smith, R. J. Nemanich, and **Y. Zhao**, "Exploring the origin of Si contamination at GaN epitaxial regrowth interface and its impact for vertical GaN power devices", submitted.
6. P. Peri, **H. Fu^x**, **K. Fu^x**, **Y. Zhao**, and D. J. Smith, "Characterization of as-grown and regrown GaN-on-GaN heterostructures for vertical p-n power devices", submitted.
7. A. Caria, C. De Santi, F. Zamperetti, X. Huang, **H. Fu^x**, H. Chen, **Y. Zhao**, A. Neviani, G. Meneghesso, E. Zanoni, and M. Meneghini, "GaN-based high-periodicity multiple quantum well solar cells: degradation under optical and electrical stress", submitted.
8. P. Peri, **K. Fu^x**, **H. Fu^x**, **Y. Zhao**, and D. J. Smith, "Structural breakdown in GaN-on-GaN high power p-n diode devices stressed to failure", accepted to *J. Vac. Sci. Technol. A*.
 - Selected as "Editor's Pick" in *J. Vac. Sci. Technol. A*.
9. P. Y. Su, H. Liu, C. Yang, **K. Fu^x**, **H. Fu^x**, **Y. Zhao**, and F. A. Ponce, "Lateral and vertical growth of Mg-doped GaN on trench-patterned GaN films", *Appl. Phys. Lett.* **117**, 102110 (2020).
10. C. Yang, **H. Fu^x**, P. Y. Su, H. Liu, **K. Fu^x**, X. Huang, T. H. Yang, H. Chen, J. Zhou, X. Deng, J. Montes, X. Qi, F. A. Ponce, and **Y. Zhao**, "Demonstration of GaN-based metal-insulator-semiconductor junction by hydrogen plasma treatment", *Appl. Phys. Lett.* **117**, 052105 (2020).
11. C. Yang, **H. Fu^x**, V. N. Kumar, **K. Fu^x**, H. Liu, X. Huang, T. H. Yang, H. Chen, J. Zhou, X. Deng, J. Montes, F. A. Ponce, D. Vasileksa, and **Y. Zhao**, "GaN vertical-channel junction field-effect transistors with regrown p-GaN by MOCVD", *IEEE Trans. Electron Devices* **67**, 3972 (2020).

12. T. H. Yang, H. Fu^x, K. Fu^x, C. Yang, J. Montes, X. Huang, H. Chen, J. Zhou, X. Qi, X. Deng, and Y. Zhao, "Vertical GaN-on-GaN Schottky barrier diodes with multi-floating metal rings", *IEEE J. Electron Devices Soc.* **8**, 857 (2020).
13. G. Moses, X. Huang, Y. Zhao, M. Auf der Maur, E. A. Katz, and J. M. Gordon, "GaN/InGaN multi-quantum-well solar cells under high solar concentration and elevated temperatures for hybrid solar thermal-photovoltaic power plants", accepted to *Prog. Photovolt.*
14. J. He, H. Chen, J. Hu, J. Zhou, Y. Zhang, A. Kovach, C. Sideris, M. C. Harrison, Y. Zhao, and A. M. Armani, "Nonlinear nanophotonic devices in the ultraviolet to visible wavelength range", *Nanophotonics* **9**, 3781 (2020). (Invited Review).
15. X. Huang, D. Li, P. Y. Su, H. Fu^x, H. Chen, C. Yang, J. Zhou, X. Qi, T. H. Yang, J. Montes, X. Deng, K. Fu^x, S. P. DenBaars, S. Nakamura, F. A. Ponce, C. Z. Ning, and Y. Zhao, "Anomalous carrier dynamics and localization effects in nonpolar m-plane InGaN/GaN quantum wells at high temperatures", *Nano Energy* **76**, 105013 (2020).
16. K. Song, H. Zhang, H. Fu^x, C. Yang, R. Singh, Y. Zhao, H. Sun, and S. Long, "Normally-off AlN/ β -Ga₂O₃ field-effect transistors using polarization-induced doping", *J. Phys. D.* **53**, 345107 (2020).
17. B. Raghothamachar, Y. Liu, H. Peng, T. Ailiumaer, M. Dudley, F. S. Shahedipour-Sandvik, K. A. Jones, A. Armstrong, A. A. Allerman, J. Han, H. Fu^x, K. Fu^x, and Y. Zhao, "X-ray topography characterization of gallium nitride substrates for power device development", *J. Cryst. Growth* **544**, 125709 (2020).
18. H. Chen, J. Zhou, D. Li, D. Chen, A. K. Vinod, H. Fu^x, X. Huang, T. H. Yang, J. Montes, K. Fu^x, C. Yang, C. Z. Ning, C. W. Wong, A. M. Armani, and Y. Zhao, "On-chip directional octave-spanning supercontinuum generation from high order mode in near ultraviolet to infrared spectrum using AlN waveguides", arXiv: 1908.04719. Paper in review.
19. K. Fu^x, H. Fu^x, X. Huang, T. H. Yang, C. Y. Cheng, P. R. Peri, H. Chen, J. Montes, C. Yang, J. Zhou, X. Deng, X. Qi, D. J. Smith, S. M. Goodnick, and Y. Zhao, "Reverse leakage analysis for as-grown and regrown vertical GaN-on-GaN Schottky barrier diodes", *IEEE J. Electron Devices Soc.* **8**, 74 (2020).
20. H. Fu^x, K. Fu^x, S. R. Alugubelli, C. Y. Cheng, X. Huang, H. Chen, T. H. Yang, C. Yang, J. Zhou, J. Montes, X. Deng, X. Qi, S. Goodnick, F. A. Ponce, and Y. Zhao, "High voltage vertical GaN p-n diodes with hydrogen-plasma based guard rings", *IEEE Electron Device Lett.* **41**, 127 (2020).
21. J. Zhou, H. Chen, H. Fu^x, K. Fu^x, X. Deng, X. Huang, T. H. Yang, J. A. Montes, C. Yang, X. Qi, B. Zhang, X. Zhang, and Y. Zhao, "Demonstration of low loss β -Ga₂O₃ optical waveguides in the UV-NIR spectra", *Appl. Phys. Lett.* **115**, 251108 (2019).
22. S. R. Alugubelli, H. Fu^x, K. Fu^x, H. Liu, Y. Zhao, M. R. McCartney, and F. A. Ponce, "Determination of electronic band structure by electron holography of etched-and-regrown interfaces in GaN p-i-n diodes", *Appl. Phys. Lett.* **115**, 201602 (2019).
23. K. Fu^x, H. Fu^x, X. Huang, H. Chen, T. H. Yang, J. Montes, C. Yang, J. Zhou, and Y. Zhao, "Demonstration of 1.27 kV etched-then-regrown GaN-on-GaN vertical p-i-n diodes with low leakage current", *IEEE Electron Device Lett.* **40**, 1728 (2019).
 - *Most popular articles in IEEE Electron Device Lett. in November 2019*
24. X. Huang, W. Li, H. Fu, D. Li, C. Zhang, H. Chen, Y. Fang, K. Fu^x, S. DenBaars, S. Nakamura, S. Goodnick, C. Z. Ning, S. Fan, and Y. Zhao, "High temperature polarization-free III-nitride solar cells with self-cooling effects", *ACS Photonics* **6**, 2096 (2019).

25. S. R. Alugubelli, **H. Fu, K. Fu^x**, H. Liu, Y. Zhao, and F. A. Ponce, "Dopant profiling in p-i-n GaN structures using secondary electrons", *J. Appl. Phys.* **126**, 015704 (2019).
26. **H. Chen, H. Fu, J. Zhou, X. Huang, T. H. Yang, K. Fu^x, C. Yang, J. A. Montes**, and Y. Zhao, "Study of crystalline defect induced optical scattering loss inside protonic waveguides in UV-visible spectral wavelengths using volume current method", *Opt. Express* **27**, 17262 (2019).
27. **H. Fu, K. Fu^x**, H. Liu, S. Alugubelli, **X. Huang, H. Chen, J. Montes, T. H. Yang, C. Yang, J. Zhou**, F. A. Ponce, and Y. Zhao, "Implantation- and etching-free high voltage vertical GaN p-n diodes terminated by plasma-hydrogenated p-GaN: Revealing the role of thermal annealing", *Appl. Phys. Express* **12**, 051015 (2019).
 - Selected as "Spotlights 2019" in *Appl. Phys. Express*
28. **J. Montes, C. Yang, H. Fu, T. H. Yang, K. Fu^x, H. Chen, J. Zhou, X. Huang**, and Y. Zhao, "Demonstration of mechanically exfoliated β -Ga₂O₃/GaN p-n heterojunction", *Appl. Phys. Lett.* **114**, 162103 (2019).
29. H. Liu, **H. Fu, K. Fu^x**, S. R. Alugubelli, P. Y. Su, Y. Zhao, and F. A. Ponce, "Non-uniform Mg distribution in GaN epilayers grown on mesa structures for applications in GaN power electronics", *Appl. Phys. Lett.* **114**, 082102 (2019).
30. **X. Huang, R. Fang, C. Yang, K. Fu^x, H. Fu, H. Chen, T. H. Yang, J. Zhou, J. Montes**, M. Kozicki, H. Barnaby, B. Zhang, and Y. Zhao, "Steep-slope AlGaIn/GaN HEMT with oxide based threshold switching device", *Nanotechnology* **30**, 215201 (2019).
31. **K. Fu, K. Fu^x, X. Huang, T. H. Yang, H. Chen, I. Baranowski, J. Montes, C. Yang, J. Zhou**, and Y. Zhao, "Threshold switching and memory behaviors of epitaxially regrown GaN-on-GaN vertical pn diodes with high temperature stability", *IEEE Electron Device Lett.* **40**, 375 (2019).
 - Highlight on *IEEE EDL Journal Cover*.
 - Featured in *IEEE Spectrum, Compound Semiconductor, etc.*
 - Most popular articles in *IEEE Electron Device Lett.* in March 2019
32. **J. Montes, T. H. Yang, H. Fu, H. Chen, X. Huang, K. Fu^x, I. Baranowski**, and Y. Zhao, "Effect of proton radiation on ultra-wide bandgap AlN Schottky barrier diodes", *IEEE Trans. Nucl. Sci.* **66**, 91 (2019).
33. **T. H. Yang, K. Fu^x, H. Chen, X. Huang, J. Montes, I. Baranowski, K. Fu**, and Y. Zhao, "Temperature-dependent electrical properties of β -Ga₂O₃ Schottky barrier diodes on highly doped single-crystal substrates", *J. Semicond.* **40**, 012801 (2019). (Invited Paper).
34. **K. Fu^x, H. Fu, H. Liu, S. R. Alugubelli, T. H. Yang, X. Huang, H. Chen, I. Baranowski, J. Montes**, F. A. Ponce, and Y. Zhao, "Investigation of GaN-on-GaN vertical p-n diode with regrown p-GaN by metal organic chemical vapor deposition", *Appl. Phys. Lett.* **113**, 233502 (2018).
35. **H. Fu, X. Zhang, K. Fu^x, H. Liu, S. Alugubelli, X. Huang, H. Chen, I. Baranowski, T. H. Yang, K. Xu, F. A. Ponce, B. Zhang**, and Y. Zhao, "Nonpolar vertical GaN-on-GaN p-n diodes grown on free-standing (10-10) m-plane GaN substrates", *Appl. Phys. Express* **11**, 111003 (2018).
36. **Z. Lu, P. Tian, H. Fu, J. Montes, X. Huang, H. Chen, X. Zhang, X. Liu, R. Liu, L. Zheng, X. Zhou, E. Gu, Y. Liu**, and Y. Zhao, "Experimental demonstration of non-line-of-sight visible light communication using a GaN-based micro-LED and practical IEEE 802.11ac", *AIP Adv.* **8**, 105017 (2018).
37. **X. Huang, H. Chen, H. Fu, I. Baranowski, J. Montes, T. H. Yang, K. Fu^x**, B. P. Gunning, D. D. Koleske, and Y. Zhao, "Energy band engineering of InGaIn/GaN multi-quantum-well solar cells via AlGaIn electron- and hole-blocking layers", *Appl. Phys. Lett.* **113**, 043501 (2018).

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17. Y. Zhao, S. Tanaka, C. Y. Huang, D. F. Feezell, J. S. Speck, S. P. DenBaars, and S. Nakamura, "High indium uptakes and high polarization ratio for group-III nitride optoelectronic devices fabricated on a semipolar {20-2-1} plane of a gallium nitride substrate", International Patent Appl. PCT/US2012/035798, UCSB Patent Pending.

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19. S. Nakamura, S. P. DenBaars, D. F. Feezell, C. C. Pan, Y. Zhao, and S. Tanaka, "High emission power and low efficiency droop semipolar blue light emitting diodes", International Patent Appl. PCT/US2012/041876, UCSB Patent Pending.

RESEARCH FUNDING

Awarded external grants (total \$18.77M, as PI \$5.8M)

1. **(Co-PI) DEMA STTR Phase I**, "Predictive device modeling for radiation effects through machine learning", 2020 to 2021 (6 month), total budget \$120,000, PI: Alphacore, Inc.
2. **(Co-PI) DOE Energy Frontier Research Center**, "Ultra materials for a resilient, smart electricity grid", 2020 to 2024 (5 years), total budget \$12,400,000, PI: Robert Nemanich (ASU), Co-PIs from Arizona State University, University of Alabama at Birmingham, University of California–Riverside, Cornell University, Michigan State University, Sandia National Laboratories, Stanford University, and University of Bristol
3. **(PI) DOE ARPA-E PNDIODES Extension**, "Effective selective area doping for GaN vertical power transistors enabled by innovative materials engineering", 2019 to 2020 (15 month), total budget \$1,000,000
4. **(PI) ARO DURIP**, "Upgrade of the III-N integrated quantum photonics laboratory instrumentation", 2019, total budget \$110,000
5. **(PI) ARO PECASE**, "On-chip frequency comb generation at visible wavelengths using III-nitride photonic integrated circuits", 2019 to 2024, total budget \$999,998
6. **(PI) DOE ARPA-E PNDIODES Collaboration Grant**, "Collaborative efforts on materials characterizations of selective area doped GaN PN DIODES", 2019 (6 month), total budget \$350,000, Co-PI: Edward Yu (UT Austin)
7. **(Co-PI) NSF EPMD Program**, "Collaborative Research: InGaN/III-V hybrid integration for high-temperature solar cells", 2018 to 2021, total budget \$450,000, PI: Minjoo Larry Lee (UIUC)
8. **(PI) DOE ARPA-E PNDIODES Program**, "Effective selective area doping for GaN vertical power transistors enabled by innovative materials engineering", 2017 to 2019, total budget \$1,500,000, Co-PIs: Robert Nemanich, David Smith, Fernando Ponce, Stephen Goodnick (ASU)
9. **(PI) NASA HOTTech Program**, "High temperature GaN Microprocessors", 2017 to 2020, total budget \$750,000, Co-PI: Tomas Palacios (MIT)
10. **(PI) DoD DTRA Young Investigator Program (YIP) Award**, "Radiation effects in ultra-wide bandgap AlN and diamond Schottky diodes", 2017 to 2020, total budget \$300,000
11. **(PI) NASA Early Career Faculty (ECF) Award**, "High temperature InGaN-based solar cells", 2015 to 2018, total budget \$595,000
12. **(PI) SFAz Bisgrove Scholar Tenure Track Faculty Award**, "Smart LEDs: from energy efficiency to Li-Fi communication, and medical applications", 2015 to 2017, total budget \$200,000

Awarded ASU internal grants (total \$163,500)

1. 2019 ASU FSE/CLAS/AMI Seed Program, "Ultra-gap quantum devices", total budget \$57,000, PI: Zachary Holman, Co-PI: Robert Nemanich, Yuji Zhao

2. 2019 ASU Fulton Engineering Research Faculty Support Program, “GaN neuron and memory for high temperature neuromorphic computing”, total budget \$7,500, PI: Kai Fu, Co-PI: Yuji Zhao
3. 2018 ASU Fulton Engineering Seed Program, “Predicting and controlling complex quantum networks”, total budget \$40,000, PI: Ying-Cheng Lai, Co-PI: Yuji Zhao
4. 2018 ASU Fulton Engineering Minor Research Infrastructure Program, “UV-IR optical spectrum analyzer”, total budget \$49,000, PI: Yuji Zhao
5. 2017 ASU Fulton Outstanding Assistant Professor Award, total budget \$10,000, PI: Yuji Zhao