

# Yuji Zhao

Professor

Department of Electrical and Computer Engineering

Rice University

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## BIOSKETCH SUMMARY

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Dr. Yuji Zhao is a Full Professor of Electrical and Computer Engineering and Applied Physics at Rice University. From 2014 to 2021, he was an Associate Professor of Electrical Engineering and Chair of the ASU NanoFab Governance Committee at Arizona State University. Dr. Zhao 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 Presidential Early Career 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 2023 TMS Frontiers of Materials Award, 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 GaN semiconductor devices such as power devices, HEMTs, and LEDs. **Dr. Zhao has over 10 years of experience in the R&D of GaN power electronics, where he is widely recognized as a leader in the field. He has extensive, hands-on experience with GaN power devices such as GaN HEMTs, including epitaxial growth, device fabrication, packaging, and testing.** He served as PI or co-PIs for several large-scale US research programs on GaN-based power electronics. For example, he is the leading PI for the DOE ARP Ae PN DIODES project, which is \$3M program for GaN power devices for electric vehicle applications. He is currently Co-PIs for two US national semiconductor centers, including the DOE ULTRA EFRC - a \$12M national research center focusing on power electronics, and the DARPA/SRC JUMP 2.0 CHIMES Center - a \$32.7M national center focusing on next generational 3D chips supported by Intel, TSMC, Samsung, and IBM. **Since August 2014, he has been awarded over \$50 million in collaborative research funding, with a personal share of over \$9 million.**

Dr. Zhao has co-authored 5 book chapters, over 130 journal papers, over 120 conference proceedings and presentations, and over 20 patents. Among them 2 book chapters and over 80 journal and conference publications are directly related to GaN power devices and HEMTs. Dr. Zhao has graduated 7 Ph.D. students, 3 M.S. students, and 1 undergraduate student. Among them, two Ph.D. students have received the **Joseph Palais Outstanding Doctoral Award**, the top honor for ASU ECEE Ph.D. graduates. One Ph.D. student joined Arizona State University as a tenure-track **Assistant Professor**, one Posdoc joined University of Utah as a tenure-track **Assistant Professor**, and four other students are holding academic positions in research institutes in China.

## RESEARCH INTERESTS

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Materials science, device engineering, packaging and testing of GaN devices for power electronics (e.g., HEMTs and power diodes), and optoelectronics applications (e.g., LEDs, lasers, and solar cells).

## EDUCATION

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|--------------------------------------------------------------------|---------------------------------|-----------|
| University of California, Santa Barbara                            | Ph.D. in Electrical Engineering | 2008–2012 |
| <b>Advisor: Prof. Shuji Nakamura (Nobel Prize in Physics 2014)</b> |                                 |           |
| Fudan University                                                   | B.S. in Microelectronics        | 2004–2008 |

## APPOINTMENTS

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### Rice University

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|-----------------------|-------------------------------------|-----------------|
| • Full Professor      | Electrical and Computer Engineering | 07/2023–Present |
| • Associate Professor | Electrical and Computer Engineering | 07/2021–06/2023 |

### Arizona State University

- |                       |                                             |                 |
|-----------------------|---------------------------------------------|-----------------|
| • Chair               | ASU NanoFab Governance Committee            | 08/2020–06/2021 |
| • Associate Professor | Electrical, Computer and Energy Engineering | 08/2020–06/2021 |
| • 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

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|      |                                                                                                                                                                                                                       |
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| 2023 | TMS Frontiers of Materials Award                                                                                                                                                                                      |
| 2019 | Presidential Early Career Award in Science and Engineering (PECASE)<br>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<br>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 1<sup>st</sup> 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

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- 2021 ASU Joseph Palais Outstanding Doctoral Award (Hong Chen)**  
the highest honor for ASU ECEE Ph.D graduates, 1 awardee in 2021  
*\*Zhao group students received this award twice in three years, which is a record*  
*\*Hong Chen joined Max Planck Institute as a Research Scientist in Fall 2020*
- 2019 ASU Joseph Palais Outstanding Doctoral Award (Houqiang Fu)**  
the highest honor for ASU ECEE Ph.D graduates, 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

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### Conference Service:

- 2024 The 21<sup>st</sup> International Conference on Metal Organic Vapor Phase Epitaxy (ICMOVPE XXI), Program Committee
- 2024 The 82<sup>nd</sup> Device Research Conference (DRC 2023), Program Committee
- 2023 The 244<sup>th</sup> Electrochemical Society Meeting (ECS Meeting), Program Committee
- 2023 CLEO Semiconductor Lasers (S&I-3), Program Committee
- 2023 Lester Eastman Conference on High Performance Devices (LEC 2023), Program Committee
- 2023 The 81<sup>st</sup> Device Research Conference (DRC 2023), Program Committee

2022 CLEO Semiconductor Lasers (S&I-3), Program Committee  
 2021 The 240<sup>th</sup> Electrochemical Society Meeting (ECS Meeting), Program Committee  
 2021 CLEO Semiconductor Lasers (S&I-3), Program Committee  
 2020 Pacific Rim Meeting on Electrochemical and Solid State Science (PRiME 2020), Program Committee  
 2020 CLEO Semiconductor Lasers (S&I-3), Program Committee  
 2019 The 236<sup>th</sup> Electrochemical Society Meeting (ECS Meeting), Program Committee  
 2019 ASME International Technical Conference on Packaging and Integration of Electronic and Photonic Microsystems (InterPack 2019), Program Committee  
 2019 The 19<sup>th</sup> International Conference on Crystal Growth and Epitaxy (ICCGE-19) and the 19<sup>th</sup> Workshop on Organometallic Vapor Phase Epitaxy (OMVPE-19), Program Committee Chair  
 2017 The 18<sup>th</sup> US Workshop on Organometallic Vapor Phase Epitaxy (OMVPE-18), Program Committee  
 2017 International Symposium on Semiconductor Light Emitting Devices (ISSLED 2017), Program Committee  
 2015 ASU Center for Photonic Innovation (CPhI) Review Conference, Program Chair  
 2014 Lester Eastman Conference on High Performance Devices (LEC 2014), Program Committee

#### **Journal and Book Editor:**

Editor, IEEE Transactions on Electron Devices, 2023–present,  
 Guest Editor, “Ultrawide Bandgap Semiconductors” in Semiconductors and Semimetals (vol. 107), ELSEVIER, 2021  
 Guest Editor, Special Issue “Wide Bandgap Semiconductor Materials and Devices” in Crystals, 2021

#### **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: Advanced Materials series, Physica Status Solidi series; IOPscience Publishing: Applied Physics Express, Semiconductor Science and Technology.

#### **IEEE Service:**

IEEE Electron Device Society Optoelectronic Devices Committee, 2020–present

#### **University Service:**

Chair, Rice ECE Visibility Committee, 2021–present  
 Chair, Rice ECE Faculty Search Committee, 2021–present  
 ASU NanoFab Governance Board, Chair, 2020–2021, member 2018–2021  
 ASU MTW Core Facility Planning Committee, 2019  
 ASU ECEE Faculty Search Committee, 2019  
 ASU ECEE Faculty Search Committee, 2018

## SEMINARS AND INVITED TALKS

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1. **University of Central Florida**, Department of Materials Science and Engineering, Orlando, FL, Mar. 2024
2. **Compound Semiconductor Week 2023 and the 49<sup>th</sup> International Symposium on Compound Semiconductors (CSW & ISCS 2023)**, Jeju, Korea, May 2023
3. **2023 TMS Annual Meeting & Exhibition**, San Diego, CA, Mar. 2023
4. **Texas Tech University**, Department of Electrical and Computer Engineering, Lubbock, TX, Sep. 2022
5. **Silicon Carbide Materials and Devices Workshop**, Cleveland, OH, 2022, Aug. 2022
6. **University of Houston**, Distinguished Mechanical Engineering Seminar, Houston, TX, Nov. 2021
7. **The 240<sup>th</sup> ECS Meeting**, Orlando, FL, Oct 2021
8. **2021 IEEE Workshop on Microelectronics & Electron Devices (WMED 2020)**, Boise, ID, Apr 2021
9. **Rice University**, Department of Materials Science and NanoEngineering, Houston, TX, Mar 2021
10. **2020 ASME International Technical Conference on Packaging and Integration of Electronic and Photonic Microsystems (InterPACK 2020)**, Anaheim, CA, Oct 2020
11. **University of Pennsylvania**, Department of Electrical and Systems Engineering, Philadelphia, PA, Mar 2020
12. **2020 Lawrence Symposium on Epitaxy**, Scottsdale, AZ, Feb 2020
13. **2020 Workshop on Compound Semiconductor Materials and Devices (WOCSEMMAD 2020)**, Palm Spring, CA, Feb 2020
14. **Carnegie Mellon University**, Department of Electrical and Computer Engineering, Pittsburgh, PA, Jan 2020
15. **Duke University**, Department of Electrical and Computer Engineering, Durham, NC, Nov 2019
16. **Rice University**, Department of Electrical and Computer Engineering, Houston, TX, Nov 2019
17. **2019 ASME International Technical Conference on Packaging and Integration of Electronic and Photonic Microsystems (InterPACK 2019)**, Anaheim, CA, Oct 2019
18. **University of Texas at Austin**, Department of Electrical and Computer Engineering, Austin, TX, Mar 2019
19. **University of California, Berkeley**, Solid State Technology and Devices Seminar, Department of Electrical Engineering and Computer Sciences, Berkeley, CA, Dec 2018
20. **University of California, Los Angeles**, Department of Materials Science and Engineering, Los Angeles, CA, Oct 2018
21. **2018 Americas International Meeting on Electrochemistry and Solid State Science (AiMES 2018) and 234<sup>th</sup> ECS Meeting**, Cancun, Mexico, Sep 2018
22. **2018 Government Microcircuit Applications and Critical Technology Conference (GOMACTech 2018)**, Miami, FL, Mar 2018
23. **2018 Workshop on Compound Semiconductor Materials and Devices (WOCSEMMAD 2018)**, San Diego, CA, Feb 2018
24. **Stanford University**, Department of Electrical Engineering, Palo Alto, CA, Nov 2017
25. **University of California, Los Angeles**, Department of Electrical and Computer Engineering, Los Angeles, CA, Nov 2017
26. **NASA Glenn Research Center**, Cleveland, OH, Nov 2017
27. **Arizona State University**, ASU Nanoscience Seminar, Tempe, AZ, Oct 2017
28. **University of Southern California**, Distinguished Lectures, Department of Chemical Engineering and Materials Science, Los Angeles, CA, Oct 2017

29. **University of California, San Diego**, Department of Electrical and Computer Engineering, La Jolla, CA, Oct 2017
30. **The 60<sup>th</sup> IEEE International Midwest Symposium on Circuits and Systems**, Boston, MA, Aug 2017
31. **2017 IEEE Photonics Society Summer Topicals Meeting**, San Juan, Puerto Rico, Jul 2017
32. **2017 International Symposium on Advanced Lighting Science and Technology (ALST 2017)**, Shaoxing, China, May 2017
33. **The 24<sup>th</sup> Space Photovoltaic Research and Technology (SPRAT) Conference**, Cleveland, OH, Sep 2016
34. **Fudan University**, School of Information Science and Technology, Shanghai, China, Jul 2015
35. **Suzhou Institute of Nano-Tech and Nano-Bionics**, Suzhou, China, Jul 2015
36. **Massachusetts Institute of Technology**, Department of Electrical Engineering and Computer Science, Cambridge, MA, May 2015
37. **Soitec Phoenix Lab Inc**, Tempe, AZ, Oct 2014
38. **Arizona State University**, School of Electrical, Computer and Energy Engineering, Tempe, AZ, May 2014
39. **University of California, San Diego**, Department of Electrical and Computer Engineering, La Jolla, CA, Apr 2014
40. **University of California, San Diego**, Department of Electrical and Computer Engineering, La Jolla, CA, Aug 2013
41. **University of California, Santa Barbara**, Nitride Special Seminar, Santa Barbara, CA, Nov 2013
42. **University of Notre Dame**, Department of Electrical Engineering, Notre Dame, IN, Jul 2013
43. **University of Virginia**, Charles L. Brown Department of Electrical and Computer Engineering, Charlottesville, VA, Apr 2013
44. **Society of Information Display (SID) 50th Anniversary Conference**, Los Angeles, CA, Sep 2012
45. **Fudan University**, School of information science and Engineering, Shanghai, China, Jun 2012
46. **University of California, Santa Barbara**, Nitride Special Seminar, Santa Barbara, CA, Feb 2012
47. **Tsinghua University**, Tsinghua National Laboratory for Information Science and Technology, Beijing, China, May 2011
48. **Peking University**, State Key Laboratory for Artificial Microstructures and Mesoscopic Physics, Beijing, China, May 2011
49. **Zhejiang University**, Center for Optical and Electromagnetic Research, Hangzhou, China, May 2011
50. **University of California, Santa Barbara**, Nitride Special Seminar, Santa Barbara, CA, Feb 2011

## PUBLICATIONS

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

- *Rice University among 14 to join \$32.7M Center for Heterogeneous Integration of Micro Electronic Systems*, Rice News, Feb. 2023
- *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**, **Technewsngadgets**, **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 member

## Book chapters

1. H. Fu, K. Fu, D. H. Mudiyansele, **C. Chang**, I. Rahaman, and Y. Zhao, “Selective area regrowth and doping for vertical GaN power devices”, chapter in “Gallium Nitride and Related Materials – Device Processing and Materials Characterization for Power Electronics Applications”, edited by Isik C. Kizilyalli, Jung Han, James S. Speck, and Eric P. Carlson, Springer, (2024).
2. **H. Chen**, **J. Zhou**, **H. Fu**, and Y. Zhao, “Octave-spanning supercontinuum generation in AlN waveguides”, chapter in “Ultrawide Bandgap Semiconductors”, vol. 107, in Semiconductors and Semimetals series, ELSEVIER, 2021. Also serving as a Guest Editor with Prof. Zetian Mi (University of Michigan).
3. **H. Fu**, **K. Fu**, 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.
4. **H. Fu** and Y. Zhao, “Efficiency droop in InGaN/GaN LEDs”, chapter in “Nitride Semiconductor Light-Emitting Diodes”, 2<sup>nd</sup> edition, edited by Profs. J. J. Huang, H. C. Kuo, and S. C. Shen, Woodhead Publishing, 2018.
5. 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

1. Q. Fang, K. Yi, T. Zhai, Q. Ai, Y. Zhu, C. Lin, B. Zhang, **S. Luo**, Y. Shao, G. Gao, Y. Liu, R. Xu, Y. Wang, X. Tian, Y. Han, H. Zhu, Y. Zhao, Y. Zhong, Z. Liu, and J. Lou, "High performance 2D electronic devices enabled by strong and tough two-dimensional polymer with ultra-low dielectric constant", submitted, (2024).
2. I. Rahaman, H. D. Ellis, C. Chang, D. H. Mudiyansele, **M. Xu**, B. Da, H. Fu, Y. Zhao, and K. Fu, "Epitaxial growth of Ga<sub>2</sub>O<sub>3</sub>: a review", *Materials* **17**, 4261 (2024).
3. B. Li, I. Rahaman, H. D. Ellis, H. Fu, Y. Zhao, Y. Can, B. Zhang, and K. Fu, "Plasma treatment technologies for GaN electronics", submitted, (2024).
4. J. Niroula, Q. Xie, E. R. Borujeny, **S. Lu**, M. Taylor, Y. Zhao, and T. Palacios, "High temperature AlGa<sub>N</sub>/Ga<sub>N</sub> MISHEMT with W/AlON gate stack and  $I_{\text{max}} > 1\text{A/mm}$  at  $500^{\circ}\text{C}$ ", submitted, (2024).
5. **J. Zhou**, X. Zhao, R. Xu, **K. Fu**, **T. Li**, **M. Xu**, J. T. Robinson, H. Zhu, X. Zhang, and **Y. Zhao**, "Characterization of nonlinear optical properties of  $\epsilon$ -phase gallium oxide using second harmonic generation", submitted, (2024).
6. **J. Montes**, N. Patoary, Y. Zhao, M. Turowski, J. Young, B. Vaandrager, J. Manuel, E. Bielejec, I. Sanchez Esqueda, "Proton-induced damage in Ga<sub>2</sub>O<sub>3</sub> Schottky barrier diodes", submitted, (2024).
7. **Z. He**, X. Zhang, T. S. Pieshkov, A. Yekta, T. Terlier, D. H. Mudiyansele, D. Wang, B. Da, **M. Xu**, **S. Luo**, **C. Chang**, **T. Li**, R. Nemanich, Y. Zhao, P. Ajayan, and H. Fu, "Reduced trap state density in AlGa<sub>N</sub>/Ga<sub>N</sub> HEMTs with low-temperature CVD-grown BN gate dielectric", *Appl. Phys. Lett.* **125**, 042106 (2024).
8. **M. Xu**, **Z. He**, A. Biswas, **S. Luo**, **T. Li**, **C. Chang**, C. Li, B. Gao, R. Vajtai, P. Dai, P. M. Ajayan, and Y. Zhao, "Modulation of dielectric properties of hexagonal/cubic boron nitride composites", *Appl. Phys. Lett.* **124**, 192903 (2024).
9. **Z. He**, **K. Fu**, **M. Xu**, **J. Zhou**, **T. Li**, and Y. Zhao, "Understanding the breakdown behavior of ultrawide-bandgap boron nitride power devices using device modeling", *Phys. Status Solidi Rapid Res Lett.* **18**, 2200397 (2023).
  - *Selected as Cover Paper.*
10. C. Li, T. Pieshkov, **Z. Mei**, **M. Xu**, **T. Li**, J. Murukeshan, R. Vajtai, Y. Zhao, A. Biswas, P. Ajayan, "Top-down fabrication of diamond nanostructure", *Daim., Relat. Mater.* **148**, 111535 (2024).
11. D. H. Mudiyansele, B. Da, J. Adivarahan, D. Wang, **Z. He**, K. Fu, Y. Zhao, and H. Fu, " $\beta$ -Ga<sub>2</sub>O<sub>3</sub>-based heterostructures and heterojunctions for power electronics: A review of the recent advances", *Electronics* **13**, 1234 (2024).
12. J. Niroula, Q. Xie, N. Rajput, P. Darmawi-Iskandar, S. I. Graham, **S. Lu**, R. Palash, B. Sikder, M. Yuan, P. Yadav, G. Michael, N. Chowdhury, Y. Zhao, S. Rajan and T. Palacios, "High temperature stability of regrown and alloyed ohmic contacts to AlGa<sub>N</sub>/Ga<sub>N</sub> heterostructure up to  $500^{\circ}\text{C}$ ", *Appl. Phys. Lett.* **124**, 202103 (2024).
  - *Featured in MIT News.*
13. D. H. Mudiyansele, B. Da, J. Adivarahan, D. Wang, **Z. He**, K. Fu, Y. Zhao, and H. Fu, " $\beta$ -Ga<sub>2</sub>O<sub>3</sub>-based heterostructures and heterojunctions for power electronics: A review of the recent advances", *Electronics* **13**, 1234 (2024).
14. S. Ghosh, D. H. Mudiyansele, F. Kargar, Y. Zhao, H. Fu, and A. A. Balandin, "Temperature dependence of low-frequency noise characteristics of NiOx/  $\beta$ -Ga<sub>2</sub>O<sub>3</sub> p-n heterojunction diodes", *Adv. Electron. Matter.* **10**, 2300501 (2024).

15. **J. Zhou, T. Li, X. Zhao, X. Zhang, J. Doumani, M. Xu, Z. He, S. Luo, Z. Mei, J. T. Robinson, P. M. Ajayan, J. Kono, and Y. Zhao**, "Characterizations of two-photon absorption optical properties for defects in bulk aluminum nitride using z-scan method", *Semicond. Sci. Technol.* **39**, 075011 (2024).
16. K. Fu, **S. Luo**, H. Fu, K. Hatch, S. R. Alugubelli, H. Liu, **M. Xu, Z. Mei, Z. He, T. Li, J. Zhou, F. A. Ponce, R. Nemanich, and Y. Zhao**, "GaN based threshold switching behaviors at high temperatures enabled by interface engineering for harsh environment memory applications", *IEEE Trans. Electron. Devices* **71**, 1641 (2024).
17. Q. Xie, J. Niroula, N. S. Rajput, M. Yuan, **S. Luo**, K. Fu, M. F. Isamotu, R. H. Palash, B. Sikder, S. R. Eisner, A. J. Belanger, P. K. Darmawi-Iskandar, Z. Aksamija, D. G. Senesky, N. Chowdhury, **Y. Zhao**, and T. Palacios, "Device and material investigation of GaN enhancement-mode transistors for Venus and harsh environment", *Appl. Phys. Lett.* **124**, 172104 (2024).
18. M. Nicoletto, A. Caria, C. De Santi, M. Buffalo, M. G. C. Alasio, F. Mercinelli, **X. Huang, H. Fu, H. Chen, Y. Zhao**, G. Meneghesso, E. Zanoni, M. Meneghini, "TCAD modeling and simulation of dark current-voltage characteristics in high-periodicity InGaN/GaN multiple-quantum-wells (MQWs) solar cells", *IEEE J. Photovolt.* **14**, 450 (2024).
19. A. Biswas, R. Xu, G. A. Alvarez, J. Zhang, J. Christiansen-Salameh, A. B. Puthirath, K. Burns, J. A. Hachtel, **T. Li, S. A. Iyengar, T. Gray, C. Li, X. Zhang, H. Kannan, J. Elkins, T. Pieshkov, R. Vajat, A. G. Birdwell, M. R. Neipane, E. J. Garratt, T. Ivanov, B. B. Pate, Y. Zhao, H. Zhu, Z. Tian, A. Rubio, and P. M. Ajayan**, "Non-linear optics at twist interfaces in h-BN/SiC heterostructure", *Adv. Mater.* **35**, 2304624 (2023).
20. D. H. Mudiysanelage, R. Mandia, D. Wang, J. adivarahan, **Z. He, K. Fu, Y. Zhao**, M. R. McCartney, D. J. Smith, and H. Fu, "Anisotropic electronic properties of NiO<sub>x</sub>/β-Ga<sub>2</sub>O<sub>3</sub> p-n heterojunctions on (-201), (001), and (010) crystal orientations", *Appl. Phys. Express* **16**, 094002 (2023).
21. **M. Xu, A. Biswas, T. Li, Z. He, S. Luo, Z. Mei, J. Zhou, A. B. Puthirath, R. Vajtai, P. Ajayan, and Y. Zhao**, "Vertical β-Ga<sub>2</sub>O<sub>3</sub> metal-insulator-semiconductor Schottky barrier diodes with an ultrathin boron nitride interlayer", *Appl. Phys. Lett.* **123**, 232107 (2023).
22. **S. Luo, Q. Xie, M. Yuan, G. Gao, H. Gio, R. Xu, N. Giles, T. Li, Z. Mei, M. Xu, J. Zhou, Z. He, H. Zhu, T. Palacios, and Y. Zhao**, "Investigation of vertical GaN-on-GaN p-n diode with etch-then-regrow p-GaN for operation in Venus and other extreme environments", *Appl. Phys. Lett.* **123**, 243504 (2023).
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## Summary

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Dr. Yuji Zhao is currently a Full Professor at Rice University. He received the Ph.D. degree from University of California Santa Barbara (UCSB) in 2012 under the supervision of Nobel Laureate Professor Shuji Nakamura. His research and teaching interests are in the area of GaN semiconductor devices such as power devices, HEMTs, and LEDs.

- Dr. Zhao has over 10 years of experience in the R&D of GaN power electronics, where he is widely recognized as a leader in the field. He has extensive, hands-on experience with GaN power devices such as GaN HEMTs, including epitaxial growth, device fabrication, packaging, and testing.
- Dr. Zhao served as PI or co-PIs for several large-scale US research programs on GaN-based power electronics. For example, he is the leading PI for the DOE ARPAe PNDIODES project, which is \$3M program for GaN power devices for electric vehicle applications.
- Dr. Zhao has co-authored 5 book chapters, over 130 journal papers, over 120 conference proceedings and presentations, and over 20 patents. Among them 2 book chapters and over 80 journal and conference publications are directly related to GaN power devices and HEMTs.
- Dr. Zhao is well recognized for his pioneering work on GaN power electronics with many awards. For example, he received 2019 Presidential Early Career PECASE Award from the White House, which is the highest honor given by the US government to early-career scientists and engineers.
- Dr. Zhao has rich and extensive experience in working with leading GaN semiconductor companies including Intel, CREE, Qorvo, Sanan Optoelectronics, and HC SemiTek, as independent consulting or expert witness for IP cases.

## 10 Representative Expert Engagements for IP Cases in US and Chinese Courts

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(1)

Law Firm: Latham & Watkins LLP

Case Name: (US Court) Satco Products, Inc. v. Seoul Semiconductor Co., Ltd.,

U.S. Patent No. 7,646,031

Services Provided: Engaged as Expert for Seoul Semiconductor. Prepared one expert report. Deposed for one report.

Year: 2021

(2)

Law Firm: Jones Day

Case Name: (US Court) Cree, Inc. v. Document Security Systems, Inc.

U.S. Patent No. 7,524,087

Services Provided: Engaged as Expert for Cree. Prepared one expert report for IPR and one expert report for interference.

Year: 2018

(3)

Law Firm: Jones Day

Case Name: (US Court) Cree, Inc. v. Document Security Systems, Inc.

U.S. Patent No. 6,949,771

Services Provided: Engaged as Expert for Cree. Prepared one expert report for IPR.

Year: 2018

(4)

Law Firm: Jones Day

Case Name: (US Court) Cree, Inc. v. Document Security Systems, Inc.

U.S. Patent No. 7,256,486

Services Provided: Engaged as Expert for Cree. Prepared one expert report for IPR.

Year: 2018

(5)

Law Firm: Syncoda Technologies

Case Name: (US Court) Fujian Sanan Group Co., Ltd. et al., v. Epistar Corporation

U.S. Patent No. 7,489,068

Services Provided: Engaged as Expert for Fujian Sanan. Prepared one expert report for IPR.

Year: 2018

(6)

Law Firm: Jones Day

Case Name: (Chinese Court) CASIP v. Cree et. al.

Chinese Patent No. 201010235850.1

Services Provided: Engaged as Expert for CREE. Prepared one expert report for non-infringement. Testified at Shenzhen Intellectual Property Court

Year: 2019

(7)

Law Firm: Jones Day

Case Name: (Chinese Court) CASIP v. Cree et. al.

Chinese Patent No. 201010235850.1

Services Provided: Engaged as Expert for CREE. Prepared one expert report for invalidity. Testified at Shenzhen Intellectual Property Court

Year: 2018

(8)

Law Firm: Jones Day

Case Name: (Chinese Court) CASIP v. Cree et. al.

Chinese Patent No. 201210548494.8

Services Provided: Engaged as Expert for CREE. Prepared one expert report for non-infringement. Testified at Guangzhou Intellectual Property Court

Year: 2018

(9)

Law Firm: Jones Day

Case Name: (Chinese Court) CASIP v. Cree et. al.

Chinese Patent No. 201210548494.8

Services Provided: Engaged as Expert for CREE. Prepared one expert report for invalidity. Testified at Beijing Intellectual Property Court

Year: 2017

(10)

Law Firm: Jones Day

Case Name: (Chinese Court) CASIP v. Cree et. al.

Chinese Patent No. 201210548494.8

Services Provided: Engaged as Expert for CREE. Prepared one expert report for IPR. Testified at Beijing Intellectual Property Court

Year: 2017