

BO ZHAO

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Assistant Professor in Mechanical Engineering
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EDUCATION

Georgia Institute of Technology (Georgia Tech), Atlanta, GA 12/2016
Ph.D. in *Mechanical Engineering* Advisor: Prof. Zhuomin Zhang

University of Science and Technology of China (USTC), Hefei, China 07/2011
B.S. in *Mechanical Engineering*

EMPLOYMENT AND TRAINING

09/2021 – Present	Tenure-track Assistant Professor	University of Houston (UH)
02/2017 – 08/2021	Postdoctoral Fellow Mentor: Prof. Shanhui Fan	Stanford University
08/2014 – 12/2016	Lead Graduate Teaching Assistant	Georgia Tech
08/2011 – 12/2016	Graduate Research Assistant	Georgia Tech

HONORS AND AWARDS

2022	50-in-5 Scholars from UH
2018	Scientific Contribution Award from the Heat Transfer Society of Japan
2015	Georgia Tech Travel Grant Award
2013	Best Poster Award from ASME Micro and Nano Technology Forum
2011	Best Bachelor's Thesis Award, USTC
2009	China National Encouragement Scholarship
2009	1st Prize National Zhou Pei-Yuan Competition in Mechanics

PROFESSIONAL SERVICES

- Conference Session Chairs/co-Chairs: *International Mechanical Engineering Congress & Exposition (2018; 2019; 2022)*; *International Technical Conference and Exhibition on Packaging and Integration of Electronic and Photonic Microsystems (2022)*; *SPIE Defense & Commercial Sensing (2022)*
- Society Committee Member: ASME K-9 Nanoscale Thermal Transport; ASME Nano Technology Group (Nano TG)
- Journal Reviewer: *Nature Communications*, *Physical Review Letters*, *Scientific Reports*, *Applied Physics Letters*, *Physical Review B*, *Physical Review Applied*, *Optics Express*, *Optics Letters*, *Journal of Quantitative Spectroscopy and Radiative Transfer*, *International Journal of Heat and Mass Transfer*, *Journal of Heat Transfer*, etc.

STUDENT SUPERVISION AND MENTORSHIP

- Ph.D. students: Mr. Sina Jafari Ghalekohneh (2011-present), Mr. Changkang Du (2022-present)
- Master students: Ms. Manal Taroua (recipient of Provost's Undergraduate Research Scholarship or PURS), Mr. Jaydipkumar Baria, Mr. Soumyasis Nandan

- Undergraduate students: Ms. Leena Basaria (*recipient of NSF REU support*), Ms. Jennifer Ocuane, Mr. Benjamin Ilboudo (*recipient of PURS*), Mr. Alexander Wright (*recipient of William Brookshire scholarship and PURS*), Mr. Nicholas Tijerina (*recipient of PURS and NSF REU support*)

JOURNAL PUBLICATIONS

* for corresponding author; ^ for equal contribution

1. Guo, C.^, Asadchy, V.^, **Zhao, B.**^, and Fan, S., "Light Control with Weyl Semimetals," *eLight*, Vol. 3, p. 2 (2023).
2. Jafari Ghalekohneh, S. and **Zhao, B.***, "Nonreciprocal Solar Thermophotovoltaics," *Physical Review Applied*, Vol. 18, p. 034083 (2022). [[Priority application number US 63/330,426](#)] [[Reported by over 30 international news media including UH news, Science Daily, The Science Times, Nasdaq, Aljazeera.net, and Optics.org](#)]
3. Shayegan, K.J., **Zhao, B.**, Kim, Y., Fan, S., and Atwater, H.A., "Kirchhoff Thermal Radiation Law Violation via Resonant Magneto-optical Coupling to InAs," *Science Advances*, Vol. 8, p. eabm4308 (2022).
4. Guo, C., **Zhao, B.**, and Fan, S., "Adjoint Kirchhoff's Law and General Symmetry Constraints of All Thermal Emitters," *Physical Review X*, Vol. 12, p. 021023 (2022).
5. Audhkhazi, R., **Zhao, B.**, Fan, S., Yu, Z., and Povinelli, M., 2022, "Spectral Emissivity Modeling in Multi-Resonant Systems using Coupled-Mode Theory," *Optics Express*, Vol. 30, pp. 9463-9472.
6. Chorsi, H., Cheng, B., **Zhao, B.**, Toudert, J., Asadchy, V., Shoron, O.F., Fan, S., and Matsunaga, R., 2022, "Topological Materials for Functional Optoelectronic Devices," *Advanced Functional Materials*, p. 2110655.
7. Yang, C., **Zhao, B.**, Cai, W., and Zhang, Z.M., 2022, "Mid-Infrared Broadband Circular Polarizer Based on Weyl Semimetals," *Optics Express*, Vol. 30, p. 3035.
8. Park, Y., **Zhao, B.**, and Fan, S., 2022, "Reaching the Ultimate Efficiency of Solar Energy Harvesting with a Nonreciprocal Multijunction Solar Cell," *Nano Letters*, Vol. 22, p. 448.
9. **Zhao, B.**, Wang, J., Zhao, Z., Guo, C., Yu, Z., and Fan, S., 2021, "Nonreciprocal Thermal Emitters using Metasurfaces with Multiple Diffraction Channels," *Physical Review Applied*, Vol. 16, p. 064001.
10. **Zhao, B.**^, Assaworrorarit, S.^, Santhanam, P., Orenstein, M., and Fan, S., 2021, "High-Performance Photonic Transformers for DC Voltage Conversion," *Nature Communications*, Vol. 12, p. 4684. ^Equal contribution. [[US Patent App. 17/541,521](#)]
11. **Zhao, B.**, Song J., Brongersma, M., and Fan, S., 2021, "Atomic-Scale Control of Coherent Thermal Radiation," *ACS Photonics*, Vol. 8, p. 872.
12. Park, Y., Asadchy, V., **Zhao, B.**, Guo, C., Wang, J., and Fan, S., 2021, "Violating Kirchhoff's Law of Thermal Radiation in Semitransparent Structures," *ACS Photonics*, Vol. 8, p. 2417.
13. **Zhao, B.**^, Guo, C.^, Garcia, C., Narang, P., and Fan, S., 2020, "Axion-Field-Enabled Nonreciprocal Thermal Radiation in Weyl Semimetals," *Nano Letters*, Vol. 20, pp. 1923–1927.
14. Bhatt, G., **Zhao, B.**, Roberts, S., Lin, T., Datta, I., Mohanty, A., Hartmann J., St-Gelais R., Fan, S., Lipson, M., 2020, "Integrated Near-Field Thermo-Photovoltaics for On-Demand Heat Recycling," *Nature Communications*, Vol. 11, p. 2545.
15. Guo, C., **Zhao, B.**, Huang, D., and Fan, S., 2020, "Radiative Thermal Router Based on Tunable Magnetic Weyl Semimetals," *ACS Photonics*, Vol. 7, p. 3257.
16. Asadchy, V., Guo, C., **Zhao, B.**, and Fan, S., 2020, "Sub-Wavelength Passive Optical Isolators Using Photonic Structures Based on Weyl Semimetals," *Advanced Optical Materials*, Vol. 8, p.2000100.
17. Santhanam, P., Li, W., **Zhao, B.**, Rogers, C., Gray, D., Jahelka, P., Atwater, H., and Fan, S., 2020, "Controlling the Dopant Profile for SRH Suppression at Low Current Densities in $\lambda \approx 1330$ nm GaInAsP Light-Emitting Diodes," *Applied Physics Letters*, Vol. 116, p. 203503.
18. Fan, L., Guo, Y., Papadakis, G., **Zhao, B.**, Zhao, Z., Buddhiraju, S., Orenstein, M., and Fan, S., 2020, "Nonreciprocal Radiative Heat Transfer Between Two Planar Bodies," *Physical Review B*, Vol. 101, pp. 085407.

19. Papadakis, G., Buddhiraju, S., Zhao, Z., **Zhao, B.**, and Fan, S., 2020, "Broadening Near-Field Emission for Performance Enhancement in Thermophotovoltaics," *Nano Letters*, Vol. 20, pp. 1654–1661.
20. **Zhao, B.***, Shi, Y., Wang, J., Zhao, Z., Zhao, N., and Fan, S., 2019, "Near-Complete Violation of Kirchhoff's Law of Thermal Radiation with a 0.3 Tesla Magnetic Field," *Optics Letters*, Vol. 44, No. 17.
21. **Zhao, B.**, Buddhiraju, S., Santhanam., P., Chen, K., and Fan, S., 2019, "Self-Sustaining Thermophotonic Circuits," *Proceedings of the National Academy of Sciences*, Vol. 116, pp. 11596-11601.
22. Ono, M., Santhanam, P., Li, W., **Zhao, B.**, and Fan, S., 2019, "Experimental Demonstration of Energy Harvesting from the Sky Using the Negative Illumination Effect of a Semiconductor Photodiode," *Applied Physics Letters*, Vol. 114, p. 161102.
23. Papadakis, G., **Zhao, B.**, Buddhiraju, S., and Fan, S., 2019, "Gate-Tunable Near-Field Heat Transfer," *ACS Photonics*, Vol. 6, pp. 709-719.
24. Zhao, N., Zhao, Z., Williamson, I, Boutami, S., **Zhao, B.**, and Fan, S., 2019, "High Reflection from a One-Dimensional Array of Graphene Nanoribbons," *ACS Photonics*, Vol. 6, pp. 339-344.
25. **Zhao, B.**, Santhanam., P., Chen, K., Buddhiraju, S., and Fan, S., 2018, "Near-field Thermophotonic Systems for Low-Grade Waste Heat Recovery," *Nano Letters*, Vol. 18, pp. 5224-5230. [[Reported by Nature Photonics](#)]
26. Chen K. **Zhao, B.**, and Fan, S., 2018, "MESH: A Free Electromagnetic Solver for Far- and Near-Field Radiative Heat Transfer for Layered Periodic Structures," *Computer Physics Communications*, Vol. 231, pp. 163-172.
27. **Zhao, B.**, Chen, K., Buddhiraju, S., Bhatt G., Lipson, M., and Fan, S., 2017, "High-Performance Near-Field Thermophotovoltaics for Waste Heat Recovery," *Nano Energy*, Vol. 41, p. 344.
28. **Zhao, B.**, Guizal, B., Zhang, Z.M., Fan, S., and Antezza, M., 2017, "Near-field Heat Transfer Between Graphene/hBN Multilayers," *Physical Review B*, Vol. 95, p. 245437.
29. **Zhao, B.***, and Zhang, Z.M., 2017, "Resonance Perfect Absorption by Exciting Hyperbolic Phonon Polaritons in 1D hBN Gratings," *Optics Express*, Vol. 25, p. 7791.
30. **Zhao, B.**, and Zhang, Z.M., 2017, "Perfect Absorption with Trapezoidal Gratings Made of Natural Hyperbolic Materials," *Nanoscale and Microscale Thermophysical Engineering*, Vol. 21, p. 123. [[Selected as the cover of the issue](#)]
31. **Zhao, B.**, and Zhang, Z.M., 2017, "Perfect Mid-Infrared Absorption by Hybrid Phonon-Plasmon Polaritons in hBN/Metal-Grating Anisotropic Structures," *International Journal of Heat and Mass Transfer*, Vol. 106, p. 1025. [[ESI Highly Cited Paper](#)]
32. **Zhao, B.**, and Zhang, Z.M., 2017, "Enhanced Photon Tunneling by Surface Plasmon-Phonon Polaritons in Graphene/hBN Heterostructures," *ASME Journal of Heat Transfer*, Vol. 139, p. 022701. [[Top Six Most Cited Articles of the Journal in 2017](#)]
33. Watjen, J.I.^, **Zhao, B.**^, and Zhang, Z.M., 2016, "Near-Field Radiative Heat Transfer Between Doped-Si Parallel Plates Separated by a Spacing down to 200 nm," *Applied Physics Letters*, Vol. 109, p. 203112.
34. Watjen, J.I., Liu, X.L., **Zhao, B.**, and Zhang, Z.M., 2016, "A Computational Simulation of Using Tungsten Gratings in Near-Field Thermophotovoltaic Devices," *ASME Journal of Heat Transfer*, Vol. 139, p. 052704. [[Top Six Most Cited Articles of the Journal in 2017](#)]
35. **Zhao, B.**, Sakurai, A., and Zhang, Z.M., 2015, "Polarization Dependence of the Reflectance and Transmittance of Anisotropic Metamaterials," *Journal of Thermophysics and Heat Transfer*, Vol. 30, pp. 240-246.
36. **Zhao, B.**, and Zhang, Z.M., 2015, "Strong Plasmonic Coupling Between Graphene Ribbon Array and Metal Gratings," *ACS Photonics*, Vol. 2, pp. 1611-1618.
37. **Zhao, B.**, Zhao, J.M., and Zhang, Z.M., 2015, "Resonance Enhanced Absorption in a Graphene Monolayer by Using Deep Metal Gratings," *Journal of the Optical Society of America B*, Vol. 32, pp. 1176-1185. [[OSA Publishing Top Downloads in June 2015](#)]

38. Liu, X.L., **Zhao, B.**, and Zhang, Z.M., 2015, "Enhanced Near-Field Thermal Radiation and Reduced Casimir Stiction Between Doped-Si Gratings," *Physical Review A*, Vol. 91, p. 062510.
39. Sakurai, A., **Zhao, B.**, and Zhang, Z.M., 2015, "Effect of Polarization on Dual-Band Infrared Metamaterial Emitters or Absorbers," *Journal of Quantitative Spectroscopy and Radiative Transfer*, Vol.158, pp. 111-118.
40. Liu, X.L., **Zhao, B.**, and Zhang, Z.M., 2015, "Blocking-Assisted Infrared Transmission of Subwavelength Metallic Gratings by Graphene," *Journal of Optics*, Vol. 17, p. 035004.
41. **Zhao, B.**, Zhao, J.M., and Zhang, Z.M., 2014, "Enhancement of Near-Infrared Absorption in Graphene with Metal Gratings," *Applied Physics Letters*, Vol. 105, p. 031905-1/4. [ESI Highly Cited Paper]
42. **Zhao, B.**, and Zhang, Z.M., 2014, "Study of Magnetic Polaritons in Deep Gratings for Thermal Emission Control," *Journal of Quantitative Spectroscopy and Radiative Transfer*, Vol. 135, pp. 81-89.
43. Sakurai, A., **Zhao, B.**, and Zhang, Z.M., 2014, "Resonant Frequency and Bandwidth of Metamaterial Emitters and Absorbers Predicted by an RLC Circuit Model," *Journal of Quantitative Spectroscopy and Radiative Transfer*, Vol. 149, pp. 33-40.
44. **Zhao, B.**, Wang, L.P., Shuai, Y., and Zhang, Z.M., 2013, "Thermophotovoltaic Emitters Based on a Two-Dimensional Grating/Thin-Film Nanostructure," *International Journal of Heat and Mass Transfer*, Vol. 67, pp. 637-645. [ESI Highly Cited Paper]
45. Liu, X.L., **Zhao, B.**, and Zhang, Z.M., 2013, "Wide-Angle Near-Infrared Polarizer with Extremely High Extinction Ratio," *Optics Express*, Vol. 21, pp. 10502–10510.

INVITED BOOK CHAPTERS

1. **Zhao, B.*** and Fan, S.*, 2020, "Chemical Potential of Photons and Its Implications for Controlling Radiative Heat Transfer," *Annual Review of Heat Transfer*, Vol. 23, pp. 397-431.
2. **Zhao, B.** and Zhang, Z.M., 2016, "Optical and Radiative Properties of Surfaces," *Handbook of Thermal Science and Engineering*, Radiative Heat Transfer Section, Springer, Berlin, Germany.

INVITED TALKS AND SEMINARS

1. "Control Thermal Radiation for Energy Harvesting at the Thermodynamic Limit", Department of Mechanical and Aerospace Engineering, *Ohio State University*, Columbus, OH, Nov. 04, 2022. **Host: Prof. Shang Zhai**
2. "Nonreciprocal Thermal Radiation Control and Its Applications in Solar Energy Harvesting", Department of Mechanical Engineering, *University of Rochester*, Rochester, NY, Oct. 12, 2022. **Host: Prof. Andrea D. Pickel**
3. "Nonreciprocal Thermal Radiation Control and Its Applications in Solar Energy Harvesting", *13th Asian Thermophysical Properties Conference (ATPC 2022)*, Sendai, Japan, Sept. 30, 2022. (virtual)
4. "Nanophotonic and Optoelectronic Control of Thermal Radiation for Heat Transfer and Energy Conversion", Department of Electrical and Computer Engineering, *Rice University*, Houston, TX, Oct. 26, 2021. **Host: Prof. Gururaj Naik**
5. "Nanophotonic and Optoelectronic Control of Thermal Radiation for Heat Transfer and Energy Conversion", Department of Physics, *University of Houston*, Houston, TX, Oct. 5, 2021. **Host: Prof. Shuo Chen**
6. "Nanophotonic and Optoelectronic Control of Thermal Radiation for Heat Transfer and Energy Conversion", Mechanical and Aerospace Engineering Department, *University of California, Irvine*, Irvine, CA, Mar. 15, 2021.
7. "Nanophotonic and Optoelectronic Control of Thermal Radiation for Heat Transfer and Energy Conversion", Center for Advanced Life Cycle Engineering, *University of Maryland, College Park*, MD, Feb. 24, 2020. **Host: Prof. Diganta Das**

8. "Nanophotonic and Optoelectronic Control of Thermal Radiation for Heat Transfer and Energy Conversion", Department of Mechanical Engineering, *Worcester Polytechnic Institute*, Worcester, MA, Feb. 22, 2020.
9. "Nanophotonic and Optoelectronic Control of Thermal Radiation for Heat Transfer and Energy Conversion", Department of Mechanical Engineering, *Southern Methodist University*, Dallas, TX, Feb. 19, 2020.
10. "Nanophotonic and Optoelectronic Control of Thermal Radiation for Heat Transfer and Energy Conversion", Department of Mechanical and Industrial Engineering, *New Jersey Institute of Technology*, Newark, NJ, Feb. 7, 2020.
11. "Nanophotonic and Optoelectronic Control of Thermal Radiation for Heat Transfer and Energy Conversion", Department of Mechanical Engineering, *University of South Carolina*, Columbia, SC, Mar. 26, 2019.
12. "Control of Far-Field Thermal Radiative Properties with Nonreciprocal Materials and Nanophotonic Designs", *MRS Fall Meeting & Exhibit*, Boston, MA, Nov. 29-Dec. 2, 2021.
13. "Nanophotonic Control of The Coherence and Reciprocity of Thermal Radiation", Online workshop on "Structures for enhancing the absorption of light", Advanced Technology Institute, *University of Surrey*, Guildford, England, Dec. 16, 2020. (virtual)
14. "Thermal Radiation for Heat Transfer and Energy Conversion", Department of Mechanical Engineering, *Carnegie Mellon University*, Pittsburgh, PA, Nov. 13, 2018. **Host: Prof. Sheng Shen**
15. "Thermal Radiation for Heat Transfer and Energy Conversion", School for Engineering of Matter, Transport, and Energy, *Arizona State University*, Tempe, AZ, Apr. 6, 2018. **Host: Prof. Liping Wang**
16. "Micro/Nanoscale Thermal Radiation Control Using Nanostructures and 2D Materials", Department of Thermal Science and Energy Engineering, University of Science and Technology of China, China, Aug. 5, 2016. **Host: Prof. Hong Ye**
17. "Micro/Nanoscale Thermal Radiation Control Using Nanostructures and 2D Materials", School of Energy Science and Engineering, Harbin Institute of Technology, China, July 16, 2016. **Host: Prof. Junming Zhao**
18. "Micro/Nanoscale Thermal Radiation Control Using Nanostructures and 2D Materials", University of Michigan-Shanghai Jiao Tong University Joint Institute, Shanghai Jiao Tong University, China, July 14, 2016. **Host: Prof. Changying Zhao**

CONFERENCE PRESENTATIONS

A total of 26 oral and poster presentations at international conferences since 2012 (# for virtual):

- ASME International Mechanical Engineering Congress and Exposition (2012, 2013, 2015, 2018, 2019, 2020#, 2022)
- ASME Micro/Nanoscale Heat & Mass Transfer International Conference (2012)
- Asian Thermophysical Properties Conference (2022#)
- SPIE Defense & Commercial Sensing (2022)
- MRS Fall/Spring Meeting & Exhibit (2018, 2021)
- APS March Meeting (2015, 2021#)
- ASME Summer Heat Transfer Conference (2017)
- Progress in Electromagnetics Research Symposium (2016)
- International Conference on Computational Methods for Thermal Problems (2016)
- Symposium on Thermophysical Properties (2015)
- International Heat Transfer Conference (2014)
- AIAA/ASME Joint Thermophysics and Heat Transfer Conference (2014)
- International Workshop on Nano-Micro Thermal Radiation (2014)