Siyuan Dai
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PROFESSIONAL EXPERIENCE

- Assistant Professor, Auburn University, 2019–present.

EDUCATION & PREPARATION

- B. S. in Applied Physics, University of Science & Technology of China, 2011.
- Ph. D. in Physics, University of California, San Diego, 2017.
- Postdoc Fellow, The University of Texas at Austin, 2017–2018.

RESEARCH INTERESTS

Quantum and Emerging materials, Nano-optics and nano-spectroscopy; Light-matter interactions; Scanning probe microscopy; Quantum optics; Machine learning and materials design; Biophotonics;

AWARDS

- NSF CAREER Award 2023.
- ACS PRF Doctoral New Investigator Award 2023.
- Ginn Faculty Achievement Fellowship 2023.
- NSF EPSCoR Track-4 Fellowship 2021.
- UCSD Physics Chair's Challenge award 2017.

PUBLICATIONS

38 peer-reviewed papers: 1 in ***Science***, 3 in ***Nature Mater.***, 2 in ***Nature Nano.***, 2 in ***Nature Comm.***, 3 in ***Adv Mater.***, 10 in ***Nano Letters***.

At Auburn University

1. M. Chen, Y. Zhong, E. Harris, J. Li, Z. Zheng, H. Chen, J.-S. W, P. Jarillo-Herrero, Q. Ma, J. H. Edgar, X. Lin, **S. Dai**. "van der Waals isotope heterostructures for engineering phonon polariton dispersions" ***Nature Comm.*** 14, 4782 (2023).
2. **S. Dai**, Q. Ma "A twist for nanolight" ***Nature Mater.*** 22, 805 (2023).
3. X. Jiang, M. Chen, J. Li, P. Fathi-Hafshejani, J. Shen, Y. Jin, W. Cai, M. Mahjouri-Samani, J. H. Edgar, **S. Dai**. "Thickness-scaling phonon resonance: A systematic study of hexagonal boron nitride from monolayers to bulk crystals" ***J. Appl. Phys*** 10, 134302 (2022).
4. M. Chen, S. Sanders, J. Shen, J. Li, E. Harris, C. Chen, Q. Ma, J. H. Edgar, A. Manjavacas, **S. Dai**. "Altering the Reflection Phase for Nano-Polaritons: A Case Study of Hyperbolic Surface Polaritons in Hexagonal Boron Nitride" ***Adv Opt. Mater.*** 10, 2102723 (2022).
5. J. Shen, Z. Zheng, T. Dinh, C. Wang, M. Chen, P. Chen, Q. Ma, P. Jarillo-Herrero, L. Kang, **S. Dai**. "Hyperbolic phonon polaritons with positive and negative phase velocities in suspended α-MoO_3"

Appl. Phys. Lett. 120, 113101 (2022).

6. J. He, L. Zhou, G. Huang, J. Shen, W. Chen, C. Wang, A. Kim, Z. Zhang, W. Cheng, **S. Dai**, F. Ding, and P. Chen. "Enhanced Label-Free Nanoplasmonic Cytokine Detection in SARS-CoV-2 Induced Inflammation Using Rationally Designed Peptide Aptamer". ***ACS Appl. Mater. Interfaces*** 14, 48464 (2022).
7. J. Chen, X. Lin, M. Chen, T. Low, H. Chen, **S. Dai**. "A perspective of twisted photonic structures" ***Appl. Phys. Lett.*** 119, 240501 (2021).
8. C. Wang, C. Huang, Z. Gao, J. Shen, J. He, A. MacLachlan, C. Ma, Y. Chang, W. Yang, Y. Cai, Y. Lou, **S. Dai**, W. Chen, F. Li, P. Chen. "Nanoplasmonic Sandwich Immunoassay for Tumor-Derived Exosome Detection and Exosomal PD-L1 Profiling" ***ACS Sensors*** 6, 3308 (2021).
9. Z. Gao, Y. Song, T. Hsiao, J. He, C. Wang, J. Shen, A. MacLachlan, **S. Dai**, B. Singer, K. Kurabayashi, and P. Chen. "Machine-Learning-Assisted Microfluidic Nanoplasmonic Digital Immunoassay for Cytokine Storm Profiling in COVID-19 Patients" ***ACS Nano*** 15, 18023 (2021).
10. M. Chen, X. Lin, T. Dinh, Z. Zheng, J. Shen, Q. Ma, H. Chen, P. Jarillo-Herrero, **S. Dai**. "Configurable phonon polaritons in twisted α-MoO_3" ***Nature Mater.*** 19, 1307 (2020).
11. G. Hu, J. Shen, C. Qiu, A. Alu, **S. Dai**. "Phonon polaritons and hyperbolic response in van der Waals materials" ***Adv Opt. Mater.*** 8, 1901393 (2020).
12. **S. Dai**, W. Fang, N. Rivera, Y. Stehle, B. Jiang, J. Shen, R. Tay, C. Ciccarino, Q. Ma, D. Rodan-Legrain, P. Jarillo-Herrero, E. Teo, M. Fogler, P. Narang, J. Kong, D. N. Basov. "Phonon polaritons in monolayers of hexagonal boron nitride" ***Adv Mater.*** 31, 1806603 (2019).
13. **S. Dai**, J. Zhang, Q. Ma, K. Kittiwatanakul, A. S. McLeod, X. Chen, S. N. Gilbert Corder, K. Watanabe, T. Taniguchi, J. Lu, Q. Dai, P. Jarillo-Herrero, M. K. Liu & D. N. Basov. "Phase change materials for nano-polaritonics: a case study of hBN/VO2 heterostructures" ***Adv Mater.*** 31, 1900251 (2019).

Before joining Auburn University

14. **S. Dai**, J. Quan, G. Hu, C. Qiu, T. H. Tao, X. Li & A. Alu. "Hyperbolic phonon polaritons in suspended hexagonal boron nitride" ***Nano Lett.*** 19, 1009 (2019).
15. **S. Dai**, M. Tymchenko, Y. Yang, Q. Ma, M. Pita-Vidal, K. Watanabe, T. Taniguchi, P. Jarillo-Herrero, M. M. Fogler, A. Alu, D. N. Basov. "Manipulation and steering of hyperbolic surface polaritons in hexagonal boron nitride" ***Adv Mater.*** 30, 1706358 (2018).
16. **S. Dai**, M. Tymchenko, Z. Xu, T. Tran, Y. Yang, Q. Ma, K. Watanabe, T. Taniguchi, P. Jarillo-Herrero, I. Aharonovich, D. N. Basov, T. H. Tao & A. Alu. "Internal nanostructure diagnosis with hyperbolic phonon polaritons in hexagonal boron nitride" ***Nano Lett.*** 18, 5205 (2018).
17. A. J. Giles, **S. Dai**, I. Vurgaftman, T. Hoffman, S. Liu, L. Lindsay, C. T. Ellis, N. Assefa, I. Chatzakis, T. L. Reinecke, J. G. Tischler, M. M. Fogler, J. H. Edgar, D. N. Basov & J. D. Caldwell. "Ultra-low-loss Polaritons in Isotopically Pure Materials: A New Approach" ***Nature Materials*** 17, 134 (2018).
18. J. Lopez, A. Ambrosio, **S. Dai**, C. Huynh, D. Bell, X. Lin, N. Rivera, S. Huang, Q. Ma, S. Eyhusen, I. Kaminer, K. Watanabe, T. Taniguchi, J. Kong, D. N. Basov, P. Jarillo-Herrero & M. Soljacic. "Large Photothermal Effect in Sub-40 nm h-BN Nanostructures Patterned Via High-Resolution Ion Beam" ***Small*** 14, 1800072 (2018).
19. D. Wang, X. Fan, X. Li, **S. Dai**, L. Wei, W. Qin, F. Wu, H. Zhang, Z. Qi, C. Zeng, Z. Zhang & J. Hou.

"Quantum Control of Graphene Plasmon Excitation and Propagation at Heaviside Potential Steps" ***Nano Lett.*** 18 (2), 1373-1378 (2018).

20. G. Cheng, D. Wang, **S. Dai**, X. Fan, F. Wu, X. Li & C. Zeng. "Nano-imaging of an edge-excited plasmon mode in graphene" ***Nanoscale*** 10, 16314 (2018).
21. **S. Dai**, Q. Ma, Y. Yang, J. Rosenfeld, M. D. Goldflam, A. S. McLeod, Z. Sun, T. Andersen, Z. Fei, M. K. Liu, K. Watanabe, T. Taniguchi, M. Thiemens, F. Keilmann, P. Jarillo-Herrero, M. M. Fogler & D. N. Basov. "Efficiency of Launching Highly Confined Polaritons by Infrared Light Incident on a Hyperbolic Material" ***Nano Lett.*** 17, 5285 (2017).
22. X. Sun, **S. Dai**, S. S. Sunku, L. Le, D. N. Basov & J. W. Fleischer. "Subdiffractional Field Retrieval in Hyperbolic Materials" ***Applied Industrial Optics: Spectroscopy, Imaging and Metrology*** JTu5A. 10 (2017).
23. L. Cheng, D. Wang, **S. Dai**, Y. Yan, X. Fan, L. Wei, C. Zeng. "Near-field imaging of the LaAlO3/SrTiO3 interfacial conductivity" ***J. Infrared Millim. Waves*** 36, 534 (2017).
24. A. Ambrosio, L. A. Jauregui, **S. Dai**, K. Chaudhary, M. Tamagnone, M. M. Fogler, D. N. Basov, F. Capasso, P. Kim & W. L. Wilson. "Mechanical Detection and Imaging of Hyperbolic Phonon Polaritons in Hexagonal Boron Nitride" ***ACS Nano*** 11, 8741 (2017).
25. Y. Shao, K. W. Post, J. Wu, **S. Dai**, A. J. Frenzel, A. R. Richardella, J. Lee, N. Samarth, M. M. Fogler, A. V. Balatsky, D. Kharzeev, D. N. Basov. "Faraday rotation due to surface states in the topological insulator (Bi1-xSbx) 2Te3" ***Nano Lett.*** 17(2), 980-984 (2017).
26. F. Hu, Y. Luan, Z. Fei, I. Palubski, M. Goldflam, **S. Dai**, J. Wu, K. Post, G. C. A. M. Janssen, M. M. Fogler & D. N. Basov. "Imaging the localized plasmon resonance modes in graphene nanoribbons" ***Nano Lett.*** 17, 5423 (2017).
27. F. J. Bezares, A. Sanctis, J. Saavedra, A. Woessner, P. Alonso-González, I. Amenabar, J. Chen, T. Bointon, **S. Dai**, M. M. Fogler, D. N. Basov, R. Hillenbrand, M. Craciun, F. Javier Garcia de Abajo, S. Russo, F. Koppens. "Intrinsic plasmon-phonon interactions in highly-doped graphene: A near-field imaging study" ***Nano Lett.*** 17(10), 5908 (2017).
28. A. J. Giles, **S. Dai**, O. J. Glembocki, A. V. Kretinin, Z. Sun, C. T. Ellis, J. G. Tischler, T. Taniguchi, K. Watanabe, M. M. Fogler, K. S. Novoselov, D. N. Basov & J. D. Caldwell. "Imaging of anomalous internal reflections of hyperbolic phonon-polaritons in hexagonal boron nitride" ***Nano Lett.*** 16(6), 3858 (2016).
29. Z. Fei, J. Foley, W. Gannett, M. Liu, **S. Dai**, G. Ni, A. Zettl, M. M. Fogler, G. Wiederrecht, S. K. Gray, D. N. Basov. "Ultraconfined Plasmonic Hotspots inside Graphene Nanobubbles" ***Nano Lett.*** 16(12), 7842-7848 (2016).
30. **S. Dai**, Q. Ma, M. K. Liu, T. Andersen, Z. Fei, M. D. Goldflam, M. Wagner, K. Watanabe, T. Taniguchi, M. Thiemens, F. Keilmann, G. C. A. M. Janssen, S-E. Zhu, P. Jarillo-Herrero, M. M. Fogler & D. N. Basov. "Graphene on hexagonal boron nitride as a tunable hyperbolic metamaterial" ***Nature Nanotech.*** 10, 682-686 (2015).
31. **S. Dai**, Q. Ma, T. Andersen, A. S. McLeod, Z. Fei, M. K. Liu, M. Wagner, K. Watanabe, T. Taniguchi, M. Thiemens, F. Keilmann, P. Jarillo-Herrero, M. M. Fogler & D. N. Basov. "Subdiffractional focusing and guiding of polaritonic rays in a natural hyperbolic material" ***Nature Comm.*** 6, 6963 (2015).

32. Z. Fei, M. Goldflam, J. Wu, **S. Dai**, M. Wagner, A. McLeod, M. K. Liu, S-E. Zhu, G. C. A. M. Janssen, M. M. Fogler & D. N. Basov. "Edge plasmons and plane plasmons in graphene nanoribbons" ***Nano Lett.*** 15(12), 8271-8276 (2015).
33. Z. Fei, E. G. Iwinski, G-X. Ni, L. M. Zhang, W. Bao, A. S. Rodin, Y. Lee, M. Wagner, M. K. Liu, **S. Dai**, M. Goldflam, M. Thiemens, F. Keilmann, C. N. Lau, A. H. Castro-Neto, M. M. Fogler & D. N. Basov. "Tunneling Plasmonics in Bilayer Graphene" ***Nano Lett.*** 15(8), 4973-4978, (2015).
34. M. K. Liu, A. J. Sternbach, M. Wagner, T. V. Slusar, T. Kong, S. L. Bud'ko, S. Kittiwatanakul, M. M. Qazilbash, A. McLeod, Z. Fei, E. Abreu, J. Zhang, M. Goldflam, **S. Dai**, G-X. Ni, J. Lu, H. A. Bechtel, M. C. Martin, M. B. Raschke, R. D. Averitt, S. A. Wolf, H-T. Kim, P. C. Canfield & D. N. Basov. "Phase transition in bulk single crystals and thin films of VO_2 by nanoscale infrared spectroscopy and imaging" ***Phys. Rev. B*** 91, 245155 (2015).
35. **S. Dai**, Z. Fei, Q. Ma, A. S. Rodin, M. Wagner, A. S. McLeod, M. K. Liu, W. Gannett, W. Regan, K. Watanabe, T. Taniguchi, M. Thiemens, G. Dominguez, A. H. Castro-Neto, A. Zettl, F. Keilmann, P. Jarillo-Herrero, M. M. Fogler & D. N. Basov. "Tunable Phonon Polaritons in Atomically Thin van der Waals Crystals of Boron Nitride" ***Science*** 343, 1125-1129 (2014).
36. M. K. Liu, M. Wagner, J. Zhang, A. S. McLeod, S. Kittiwatanakul, Z. Fei, E. Abreu, M. Goldflam, A. Sternbach, **S. Dai**, K. West, J. Lu, S. A. Wolf, R. D. Averitt & D. N. Basov. "Symmetry breaking and geometric confinement in VO2: Results from a three-dimensional infrared nano-imaging" ***Appl. Phys. Lett.*** 104, 121905 (2014).
37. Z. Fei, A. S. Rodin, W. Gannett, **S. Dai**, W. Regan, M. Wagner, M. K. Liu, A. S. McLeod, G. Dominguez, M.Thiemens, M. M. Fogler, A. H. Castro-Neto, F. Keilmann, A. Zettl, R. Hillenbrand, M. M. Fogler & D. N. Basov. "Electronic and plasmonic phenomena at grain boundaries in chemical vapor deposited graphene" ***Nature Nanotech.*** 8, 821-825 (2013).
38. M. K. Liu, M. Wagner, E. Abreu, S. Kittiwatanakul, A. S. McLeod, Z. Fei, M. Goldflam, **S. Dai**, M. Fogler, J. Lu, S. A. Wolf, R. D. Averitt, D. N. Basov. "Anisotropic electronic state via spontaneous phase separation in strained Vanadium dioxide films" ***Phys. Rev. Lett.*** 111, 096602 (2013).

SYNERGISTIC ACTIVITIES

- **Journal Reviewer** for Nature, Nature Materials, Nature Nanotechnology, Nature Communications, Science Advances, Advanced Materials, Applied Physics Review, Light: Science & Applications, Advanced Science, Nano Letters, Optica, Scientific Reports, Advanced Optical Materials, National Science Review, Nanoscale, ACS Photonics, Nanophotonics, Optical Material Express, Optics Letters, Optics Express, Applied Physics Letters, Annalen der Physik, Journal of Optics, Applied Optics, JOSA B, Photonics and Nanostructures, Journal of Electronic Materials, etc.
- **Proposal Reviewer/Panelist** for National Science Foundation, Army Research Office, Department of Energy, American Chemical Society Petroleum Research Fund.
- **Associate Editorial Board Member** for Journal of Advanced Dielectrics, **Guest Editor** for Nanomaterials, and **Guest Editor** for Frontiers in Materials.
- **Session Chair** for MRS Spring and Fall Meeting & Exhibit, 2017, 2019, 2021, 2022.
- **Faculty advisor** for Materials Society of Auburn.
- **Invited speaker** for APS March meeting (2015), MRS Spring (2019), and MRS Fall meeting (2022)