Jun Xiao, Ph.D.

Education

University of California at Berkeley
Ph. D., Applied Science & Technology, advised by Prof. Xiang Zhang 2018
Nanjing University
B.S., Physics, emphasis on Condensed Matter Physics and Optoelectronics 2012

Professional Experience

University of Wisconsin-Madison 2021.08 - present
Assistant Professor, Materials Science & Engineering

Stanford University & SLAC National Accelerator Laboratory 2018.07- 2021.06
Postdoctoral Scholar, Materials Science & Engineering, Photon Science, with Prof. Aaron Lindenberg
Applied Physics, co-advised by Prof. Tony Heinz from 09/2020

Research Interests

- Photo-induced nonequilibrium phenomena in quantum materials
- Light-driven large-scale processing and manufacturing
- 2D materials and heterostructures for neuromorphic and topological quantum computing
- THz optoelectronics based on ermerging topological materials

Invited Talks & Conference Presentations

- *"High-performance THz optoelectronics enabled by 2D quantum materials",* The Workshop on Innovative Nanoscale Devices and Systems (WINDS) 2024
- *"High-performance THz sensing based on layered topological semimetals",* MRS Fall 2024
- *"THz optoelectronics and ultrafast dynamics of layered topological semimetals",* XII Ultrafast Dynamics & Metastability and Ultrafast Bandgap Photonics conference 2024
- *"Spin-mechanical coupling and dynamics in strained magnetic membranes", ACerS EMA/Electronic Materials and Applications 2024*
- *"Layered topological semimetals for novel high-performance electronics and THz optoelectronics", 23rd American Conference on Crystal Growth and Epitaxy (ACCGE-23) 2023*
- *Dynamic control of structural phase transitions in layered materials for information application.* PEC 2022
- *THz dynamics of emerging low-dimensional antiferromagnets* MRS Fall 2021
- *Terahertz optoelectronic property of correlated quasiparticles in atomically-thin superlattices* AVS 2021
- *Berry curvature memory through stacking transitions in topological semimetals* AVS 2021
- *Novel orderings and quantum properties in layered materials and devices*
  invited virtual seminar Zhejiang University 10. 2021
- *Berry curvature memory enabled by 2D ferroelectric semimetals* EMC 2021
- *Manipulation of the quantum geometrical property in ferroelectric semimetals* Ferro 2021
- *Optical probing emergent orderings and their quantum properties in layered materials*
  University of California, Los Angeles, MSE seminar 01/2021
- *2D Materials For Next-Generation Information Technology:*
  From Functional Material Miniaturization To Energy-Efficient Phase Engineering
  Northeastern University, ECE seminar 01/2021
- *Optical probing emergent orderings and their quantum properties in layered materials*
  University of Wisconsin-Madison, MSE seminar 01/2021
- *Manipulation of topological properties in Weyl semimetal* MRS Fall 2019

- *2D polar crystals*, **invited seminar** USTC 2018
- *Exploration of 2D layered polar materials*, **invited colloquium** Nanjing University 2018
- *Dipole locking in 2D ferroelectric In_2Se_3 crystal* MRS Spring 2018
- *Ferroelectricity and dipole locking in 2D In_2Se_3 crystal* APS March 2018
- *Exploration of vertical dipole in 2D layered polar crystal* APS March 2017
- *Generation and Control of Valley Polarization in 2D Materials*, **invited talk** MRS Spring 2017
- *Valley-Exciton Locked Optical Selection Rule in Monolayer WS_2* APS March 2015

Professional Service and Outreaching experince

- Reviewer of Research Journals, *Nature, Physical Review Letters, 2D Materials, Laser & Photonics Review, ACS Applied Materials & Interface, Optics Communications, Optical Materials Express, Advanced Optical Materials*.
- Symposium Organizer, "Emergent Quantum Orderings and Properties in 2D Materials and Heterostructures", MRS Spring 2025
- MRSEC AMIC meeting co-organizer, 2025
- Conference organizer, **"**2D Moire Materials" focus sessions (5 sessions), APS March meeting 2023
- Review panelist, NSF ECCS-EPMD, 2023
- Review panelist, NSF DMR-CMP, 2023
- Speaker, Wisconsin MRSEC Breakthrough Research and Education Workshop, 2023
- Host, Wisconsin MRSEC RET program, 2023
- Faculty Participant, WiscProf: Future Faculty in Engineering Workshop, 2023, 2025
- Engineering EXPO, 2023
- Chair, Session M72 "Mn-Te Magnetic Topology III", APS March meeting 2022
- Judge, student poster prize competition, 82nd Physical Electronics Conference, 2022
- Fellow, Madison Teaching and Learning Excellence (MTLE), 2022
- Faculty Participant, WiscProf: Future Faculty in Engineering Workshop, 2022
- Faculty Participant, Precollege Enrichment Opportunity Program for Learning Excellence, 2022
- Panelist, SLAC Public Lecture (July 2021): Leaving Transistors in the Dust: Visualizing the Next Computing Revolution

Awards & Honors

2023 NSF CAREER Award
2022 The Gordon and Betty Moore Foundation EPiQS Flexible Funding, Finalist
2022 Physical Electronics Conferernce Mini-Grant
2022 Madison Teaching and Learning Excellence Fellow
2021 AVS NSTD Early Career Award (finalists)
2021 AVS EMPD Postdoctoral Travel Award

Full Publications [*equal contribution]

[h-index: 23, i10-index: 25, total citations > 8,500. Google Scholar]

1. **T. Xi**, H. Jiang, J. Li, Y. He, Y. Gu, **C. Fox**, L. Primeau, Y. Mao, **J. Rollins**, T. Taniguchi, K. Watanabe, D. van der Weide, D. Rhodes, Y. Zhang, Y. Wang, **J. Xiao**, "Terahertz sensing based on the nonlinear electrodynamics of the two-dimensional correlated topological semimetal $TaIrTe_4$". *Nature Electronics (in press,* 2025*).*
2. **S. Subedi**, W. Liu, W. Fang, **C. Fox**, Z. Zhai, **F. Fei**, P. Yuan, B. Lv, **J. Xiao**, "Colossal terahertz emission with ultrafast tunability based on van der Waals ferroelectrics $NbOI_2$". Advanced Optical Materials 2403471(2025).

3. Y. He, A. Strasser, N. Hagopian, B. Bierman, H. Ma, **C. Fox**, Z. Li, N. Pederson, T. Taniguchi, K. Watanabe, **J. Xiao**, Y. Wang, P. Voyles, X. Qian, D. Rhodes, "Evidence for topological states and a Lifshitz transition in metastable 2M-WSe_2", *Advanced Functional Materials* (2025).
4. Y. Liu, J. Gong, S. Acharya, Y. Li, A. Abrand, **F. Fei**, J. Rudie, J. Zhou, Y. Lu, H. Abbasi, D. Vincent, S. Haessly, T. Tsai, **J. Xiao**, P. Mohseni, S. Yu, Z. Ma, "Characterization of AlGaAs/GeSn heterojunction band alignment via X-ray photoelectron spectroscopy." *Applied Surface Science* 685, 162006 (2025).
5. Y. Mao, F. Fei, D. Zhang, H. Jiang, C. Fox, Y. He, D. Rhodes, C. Ma, **J. Xiao**, Y. Wang, "Reveal stacking phase transition via nanomechanical resonator". ***npj 2D Materials and Applications*** 8, 75 (2024).
6. F. Fei, Y. Mao, W. Fang, W. Liu, J. Rollins, ALN Kondusamy, B. Lv, Y. Ping, Y. Wang, **J. Xiao**, "Spin-mechanical coupling in 2D antiferromagnet CrSBr", ***Nano Letters*** 24, 10467 (2024).
7. E. Sie, M. Othman, C. Nyby, D. Pemmaraju, C. Garcia, Y. Wang, B. Guzelturk, C. Xia, **J. Xiao**, A. Poletayev, B. Okai, M. Hoffmann, S. Park, X. Shen, J. Yang, R. Li, A. Reid, S. Weathersby, P. Muscher, N. Finney, D. Rhodes, L. Balicas, E. Nanni, J. Hone, W. Chueh, T. Devereaux, P. Narang, T. Heinz, X. Wang, A. Lindenberg. "Giant Terahertz birefringence in an ultrathin anisotropic semimetal", ***Nano Letters***, 24, 6031 (2024).
8. **F. Carter**, Y. Mao, X. Zhang, Y. Wang, **J. Xiao**, "Stacking order engineering of two-dimensional materials and device applications", ***Chemical Reviews*** 124, 1862(2023).
9. X. Andrade, C.D. Pemmaraju, A. Kartsev, **J. Xiao**, A. Lindenberg, S. Rajpurohit, L. Tan, T. Ogitsu, A. Correa, "INQ, a modern GPU-accelerated computational framework for (time-dependent) density functional theory", ***Journal of Chemical Theory and Computation*** 17, 7747 (2021).
10. Y. Wang, **J. Xiao**, T. Chung, Z. Nie, S. Yang, X. Zhang, "Direct electrical modulation of second-order optical susceptibility with record-high strength", ***Nature Electronics*** 4, 725 (2021).
11. D. Luo, J. Tang, X. Shen, F. Ji, J. Yang, S. Weathersby, M. Kozina, Z. Chen, **J. Xiao**, Y. Ye, T. Cao, G. Zhang, X. Wang, A. M. Lindenberg, "Twist-Angle-Dependent Ultrafast Charge Transfer in MoS_2-Graphene van der Waals Heterostructures", ***Nano Letters*** 21, 8051 (2021)
12. **J. Xiao**, Y. Wang, H. Wang, C.D. Pemmaraju, S. Wang, P. Muscher, E.J. Sie, C. Nyby, T.P. Devereaux, X. Qian, X. Zhang & A. M. Lindenberg, "Berry curvature memory through electrically driven stacking transitions", ***Nature Physics***, 16, 1028 (2020).
13. S. S. Cheema, D. Kwon, N. Shanker, R. Reis, S. Hsu, **J. Xiao**, H. Zhang, R. Wagner, A. Datar, M. R. McCarter, C. R. Serrao, A. K. Yadav, G. Karbasian, C. Hsu, A. J. Tan, L. Wang, V. Thakare, X. Zhang, A. Mehta, E. Karapetrova, R. Chopdekar, P. Shafer, E. Arenholz, C. Hu, R. Proksch, R. Ramesh, J. Ciston, S. Salahuddin, "Enhanced ferroelectricity in ultrathin films grown directly on silicon", ***Nature*** 580, 478 (2020).
14. R. Xu, J. Huang, E. Barnard, S.S. Hong, P. Singh, E. Wong, T. Jansen, V. Harbola, **J. Xiao**, B.Y. Wang, S. Crossley, D. Lu, S. Liu, H. Hwang, "Strain-Induced Room-Temperature Ferroelectricity in $SrTiO_3$ Membranes", ***Nature Communications*** 11, 3141(2020).
15. J. H. Lee, J. H. Lee, **J. Xiao**, M. S. Desai, X. Zhang, S.W. Lee, "Vertical self-assembly of polarized phage nanostructure for energy harvesting", ***Nano Letters***, 19, 2661 (2019).
16. H. Zhao, Y. Zhao, Y. Song, M. Zhou, W. Lv, L. Tao, Y. Feng, B. Song, Y. Ma, J. Zhang, **J. Xiao**, Y. Wang, D. Lien, M. Amani, H. Kim, X. Chen, Z. Wu, Z. Ni, P. Wang, Y. Shi, Ha. Ma, X. Zhang, J. Xu, A. Troisi, A. Javey, X. Wang, "Strong optical response and light emission from a monolayer molecular crystal", ***Nature Communications***, 10, 5589 (2019).
17. Y. Wang, **J. Xiao**, S. Yang, Yu. Wang, X. Zhang, "Second-harmonic generation spectroscopy on two-dimensional materials", ***Optical Materials Express***, 9, 1136 (2019).
18. **J. Xiao**, H. Zhu, Y. Wang, W. Feng, Y. Hu, A. Dasgupta, Y. Han, Yu. Wang, D.A. Muller, L. W. Martin, P. Hu & X. Zhang, "Intrinsic two-dimensional ferroelectricity with dipole locking", ***Physical Review Letters***, 120, 227601 (2018). **Editor's Suggestion**; News & Views by ***Nature***, "Stable and switchable electric polarization in two dimensions"

19. Y. Wan, **J. Xiao**, J. Li, X. Fang, K. Zhang, L. Fu, P. Li, Z. Song, H. Zhang, Yu. Wang, M. Zhao, J. Lu, N. Tang, G. Ran, X. Zhang, Y. Ye & L. Dai, "Epitaxial single-layer MoS_2 on GaN with enhanced valley helicity", ***Advanced Materials***, 30, 1703888 (2018).
20. M.S. Eggleston, S.B. Desai, K. Messer, S.A. Fortuna, S. Madhvapathy, **J. Xiao**, X. Zhang, E. Yablonovitch, A. Javey & M. Wu, "Ultrafast spontaneous emission from a slot-antenna coupled WSe2 monolayer", ***ACS Photonics***, 5, 2701 (2018).
21. H. Zhu, J. Yi, M. Li, **J. Xiao**, L. Zhang, C. Yang, Y. Wang, R. Kaindl, L. Li & X. Zhang, "Observation of chiral phonon", ***Science***, 359, 579 (2018).
22. Y. Wang*, **J. Xiao***, H. Zhu, Y. Li, Y. Alsaid, K. Y. Fong, Y. Zhou, S. Wang, W. Shi, Yu. Wang, A. Zettl, E. J. Reed & X. Zhang, "Structural phase transition in monolayer $MoTe_2$ driven by electrostatic doping", ***Nature***, 550, 487 (2017).
23. A.Y. Lu*, H. Zhu*, **J. Xiao***, C.-P. Chuu, Y. Han, M.-H. Chiu, C.-C. Cheng, C.-W. Yang, K.-H. Wei, Y. Yang, Yu. Wang, D. Sokaras, D. Nordlund, P. Yang, D. A. Muller, M.-Y. Chou, X. Zhang & L.-J. Li, "Janus monolayers of transition metal dichalcogenides", ***Nature Nanotechnology***, 12, 744 (2017).
24. **J. Xiao**, M. Zhao, Yu. Wang & X. Zhang, "Excitons in atomically thin 2D semiconductors and their applications", ***Nanophotonics***, 6, 1309 (2017).
25. Q. Hu, D. Jin, **J. Xiao**, S. H. Nam, X. Liu, Y. Liu, X. Zhang & N. X. Fang, "Ultrafast fluorescent decay induced by metal-mediated dipole–dipole interaction in two-dimensional molecular aggregates", ***PNAS***, 114, 10017 (2017).
26. Y. Ye, **J. Xiao**, H. Wang, Z. Ye, H. Zhu, M. Zhao, Yu. Wang, J. Zhao, X. Yin & X. Zhang, "Electrical generation and control of the valley carriers in a monolayer transition metal dichalcogenide", ***Nature Nanotechnology***, 11, 598–602 (2016)
27. M. Zhao, Z. Ye, R. Suzuki, Y. Ye, H. Zhu, **J. Xiao**, Yu. Wang, Y. Iwasa & X. Zhang, "Atomically Phase-Matched Second-Harmonic Generation in a 2D Crystal", ***Light: Science & Applications***, 5, e16131 (2016).
28. M. Amani*, D. Lien*, D. Kiriya*, **J. Xiao**, A. Azcatl, J. Noh, S. R. Madhvapathy, R. Addou, S. KC, M. Dubey, K. Cho, R. M. Wallace, S.-C. Lee, J.-H. He, J. W. Ager, X. Zhang, E. Yablonovitch & A. Javey, "Near-unity photoluminescence quantum yield in MoS_2." ***Science***, 350, 1065 (2015).
29. H. Zhu*, Yu. Wang*, **J. Xiao**, M. Liu, S. Xiong, Z. Wong, Z. Ye, Y. Ye, X. Yin & X. Zhang, "Observation of piezoelectricity in free-standing monolayer MoS_2", ***Nature Nanotechnology***, 10, 151-155 (2015).
30. **J. Xiao**, Z. Ye, Y. Wang, H. Zhu, Yu. Wang & X. Zhang, "Nonlinear optical selection rule based on valley-exciton locking in monolayer WS_2", ***Light: Science & Applications*** 4, e366 (2015).
31. **J. Xiao**, Y. Wang, Z. Hua, X. Wang, C. Zhang & M. Xiao, "Carrier multiplication in semiconductor nanocrystals detected by energy transfer to organic dye molecules", ***Nature Communications***, 3, 1170 (2012).