

## Jun Xiao

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### Education

- University of California Berkeley, Ph. D in Applied Science & Technology, 2018.
- Nanjing University, B.S. in Physics, 2012.

### Professional Experience

- **Assistant Professor**, 2021.8 - present  
Department of Materials Science and Engineering  
Department of Physics (Affiliate)  
Department of Electrical and Computer Engineering (Affiliate)  
The University of Wisconsin Madison
- **Postdoctoral Scholar**, 2018-2021  
Materials Science and Engineering, Applied Physics  
Stanford University

### Research Expertise

Optical/THz/Microwave light-matter interactions, 2D ferroelectricity and magnetism, cavity optomechanics, sensing and transduction devices.

### Past Research Significance

- Demonstration of 2D Janus materials [Nature Nanotechnology 2017]
- Discovery of new ferro orderings including dipole-locking and sliding ferroelectricity [Physical Review Letter 2018; Nature Physics 2020]
- Invention of Berry curvature memory device based on quantum geometrical properties and nonlinear Hall effect in 2D semimetals [Nature Physics 2020]
- Demonstration of electrically controlled phase transition and nonlinear optical modulators at 2D limit [Nature 2017; Nature Electronics 2021]
- Observation of chiral phonon dynamics [Science 2018]
- Stacking ordering engineering of 2D materials for novel physics and device applications [Chemical Reviews 2023]

## Honors and Awards

- 2023 NSF CAREER award
- 2022 The Gordon and Betty Moore Foundation EPiQS Flexible Funding, Finalist
- 2022 APS FECS 2022 Physical Electronics Conference Mini-Grants
- 2022 Madison Teaching and Learning Excellence Fellow
- 2021 AVS NSTD Early Career Award, Finalist
- 2021 AVS EMPD Postdoctoral Travel Award

## Invited Research Presentations

1. “Spin-mechanical coupling and dynamics in strained magnetic membranes”, ACerS EMA/Electronic Materials and Applications 2024
2. “Layered topological semimetals for novel high-performance electronics and THz optoelectronics”, 23rd American Conference on Crystal Growth and Epitaxy (ACCGE-23) 2023
3. " Dynamic control of structural phase transitions in layered materials for information applications”, Physical Electronics Conference (PEC) 2022
4. “Berry Curvature Memory Through Stacking Transitions in Topological Semimetals”, NSTD Early Career Competition, AVS 2021 (Virtual)
5. “Novel structure and quantum properties of emergent 2D materials”, School of Micro-Nano Electronics, Zhejiang University, China, October 2021 (Virtual).

## Synergistic Activities

- 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
- 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
- Reviewers for *Nature*, *Nature Electronics*, *Physical Review Letters*, *Physical Review B*, *Physical Review Applied*, *Matter*, *Optical Communications*, *ACS Applied Materials and Interfaces*, *Laser & Photonics Review*, *Scientific Reports*

## Patent

1. J. Xiao, A. Lindenberg, “Nanometer scale nonvolatile memory device and method for storing binary and quantum memory states”, US 11,355,697

2. J. Xiao, Y. Wang, D. Van der Weide, “Terahertz radiation detectors based on thin films of non-centrosymmetric layered topological semimetals”, US 18/448,648

## Publications [\* equal contribution]

[h-index: 20, i10-index: 22, total citations 6700 in 03/2024. [Google Scholar](#)]

1. **F. Carter**, Y. Mao, X. Zhang, Y. Wang, **J. Xiao**, “Stacking order engineering of two-dimensional materials and device applications”, *Chemical Reviews* (2023).
2. 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).
3. 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).
4. 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<sub>2</sub>-Graphene van der Waals Heterostructures”, *Nano Letters* 21, 8051 (2021)
5. **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).
6. 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).
7. 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<sub>3</sub> Membranes”, *Nature Communications* 11, 3141(2020).
8. 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).
9. 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).
10. Y. Wang, **J. Xiao**, S. Yang, Yu. Wang, X. Zhang, “Second-harmonic generation spectroscopy on two-dimensional materials”, *Optical Materials Express*, 9, 1136 (2019).
11. **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”
12. 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<sub>2</sub> on GaN with enhanced valley helicity”, *Advanced Materials*, 30, 1703888 (2018).

13. 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 WSe<sub>2</sub> monolayer”, *ACS Photonics*, 5, 2701 (2018).
14. 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).
15. Y. Wang\*, **J. Xiao**\*, H. Zhu, Y. Li, Y. Alsaied, K. Y. Fong, Y. Zhou, S. Wang, W. Shi, Yu. Wang, A. Zettl, E. J. Reed & X. Zhang, “Structural phase transition in monolayer MoTe<sub>2</sub> driven by electrostatic doping”, *Nature*, 550, 487 (2017).
16. 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).
17. **J. Xiao**, M. Zhao, Yu. Wang & X. Zhang, “Excitons in atomically thin 2D semiconductors and their applications”, *Nanophotonics*, 6, 1309 (2017).
18. 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).
19. 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)
20. 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).
21. 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<sub>2</sub>.” *Science*, 350, 1065 (2015).
22. 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<sub>2</sub>”, *Nature Nanotechnology*, 10, 151-155 (2015).
23. **J. Xiao**, Z. Ye, Y. Wang, H. Zhu, Yu. Wang & X. Zhang, “Nonlinear optical selection rule based on valley-exciton locking in monolayer WS<sub>2</sub>”, *Light: Science & Applications* 4, e366 (2015).
24. **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).