

Maohai XIE (谢茂海)

Professor

Department of Physics, The University of Hong Kong, Pokfulam Road, Hong Kong

Phone: (852) 28597945

Facsimile: (852) 25599152

Email: mhxie@hku.hk

Education

PhD 1994 University of London (Imperial College), U.K.

MSc 1988 Chinese Academy of Sciences (CAS), Beijing, China

BEng 1985 Tianjin University, China

Employment

Professor 07/09 - now Physics Department, The University of Hong Kong

Associate Professor 02/02 - 06/09 Physics Department, The University of Hong Kong

Assistant Professor 08/97 - 01/02 Physics Department, The University of Hong Kong

Postdoctoral Fellow 6/95 - 07/97 Imperial College, London, UK

Research Assistant 10/88 - 8/91 Institute of Semiconductors, CAS, China

Administration & Services

President, *Physical Society of Hong Kong* (PSHK), 2011-13

Vice-President, *Physical Society of Hong Kong* (PSHK), 2009-11

Head of Department of Physics, *The University of Hong Kong* (2017-19)

Faculty of Science Human Resource Committee member (2020 – 2021)

Faculty Promotion and Tenure Panel member (2021 – 2025)

Chair/Co-chair of Teaching Committee, Physics Department (2021 –)

Teaching

- Undergraduate

Foundation courses: *Basic Physics; Physics for Engineering Students; Heat Light and Waves*

Core physics courses: *Introductory Quantum Mechanics; Introductory Heat and Thermodynamics; Statistical Mechanics and Thermodynamics, Solid State Physics*

Broadening courses: *Analogue and Digital Circuitry; Introduction to Nanoscience and Nanotechnology*

- Postgraduate: *Device Physics; Physics Experimental Techniques; Semiconductor Technology and Devices; Material Characterization Methods*

Research

Expertise: Experimental surface and materials science, molecular-beam epitaxy, scanning tunneling microscopy, electron and X-ray diffraction, photoelectron spectroscopy

Publications: ~200 journal papers

External Funding as PI & Co-PI: 1 AoE, 2 CRF, 16 GRF, 2 NSFC/RGC, and 1 ITS

Partial List of Recent Publications

1. “Fermi-level depinning achieved by high-work-function $\text{Au}_{1-x}\text{Se}_x$ alloy contacts for high-performance p-type WSe_2 transistors”, *Nat. Comm.* **17**, 7325 (2026)
2. “Single-Site-Directed Unidirectional Epitaxy of Large-Scale 2D Materials”, *Adv. Mater.* **38**, e20837 (2026)
3. “Observation of ultra-long range topological proximity effect induced by interfacial band inversion”, *Mater. Today Phys.* **60**, 102012 (2026)
4. “Broadband measurement of Feibelman’s quantum surface response functions”, Zeling Chen, Shu Yang, Zetao Xie, Jinbing Hu, Xudong Zhang, Yipu Xia, Yonggen Shen, Huirong Su, Maohai Xie, Thomas Christensen, Yi Yang, *Proc. Nat. Acad. Sci.* **122**, e2501121122 (2025)
5. “Theoretical Design and Synthesis of Metal–Inorganic Frameworks Using Host Atom-Centered Building Blocks for Efficient Catalysis with Diverse Reactive Sites”, Chao He, Xingxing Dong, Junqiu Zhang, Shaogang Xu, Xiang Huang, Hui Wang, Changchun He, Xiaowei Liang, Maohai Xie, Hu Xu, *Adv. Funct. Mater.* **35**, 2418750 (2025)
6. “Single-layer MoSeN —a synthetic Janus two-dimensional transition-metal compound grown by plasma-assisted molecular beam epitaxy”, Xingyu Yue, Yipu Xia, Degong Ding, Weng Fu Io, Daliang He, Chao He, Yueyang Wang, Hongxia Xue, Yuanjun Jin, Mengfei Yuan, Junqiu Zhang, Wingkin Ho, Hu Xu, Dong-Keun Ki, Jianhua Hao, Chuanhong Jin, Maohai Xie, *2D Mater.* **12**, 025004 (2025)
7. “Tuning the atomic and electronic structures of mirror twin boundaries in molecular beam epitaxy grown MoSe_2 monolayers via rhenium doping”, Zhoubin Yu, Yipu Xia, Hannu-Pekka Komsa, Junqiu Zhang, Maohai Xie, Chuanhong Jin, *2D Mater.* **11**, 025010 (2024)
8. “Wafer-scale single-crystalline MoSe_2 and WSe_2 monolayers grown by molecular-beam epitaxy at low-temperature — the role of island-substrate interaction and surface steps”, Yipu Xia, Degong Ding, Ke Xiao, Junqiu Zhang, Shaogang Xu, Daliang He, Xingyu Yue, Qing Rao, Xiong Wang, Sujuan Ding, Guoyun Gao, Hongxia Xue, Yueyang Wang, Mengfei Yuan, Wingkin Ho, Dong-Keun Ki, Hu Xu, Xiaodong Cui, Chuanhong Jin, *Maohai Xie, Natural Sciences* **3**, 20220059 (2023)
9. “Formation mechanism of mirror twin grain boundaries in molecular beam epitaxy grown monolayer WSe_2 – MoSe_2 lateral heterojunctions”, Zhoubin Yu, Yawei Dai, Hannu-Pekka Komsa, Xibiao Ren, Mengfei Yuan, *Maohai Xie, Chuanhong Jin, 2D Materials* **10**, 035010 (2023)
10. “Niobium and rhenium doping in MoSe_2 monolayer during molecular beam epitaxy: Shallow dopants and defect proliferation”, Junqiu Zhang, Yipu Xia, Zhoubin Yu, Xingyu Yue, Yuanjun Jin, Mengfei Yuan, Yue Feng, Bin Li, Bo Wang, Wingkin Ho, Chang Liu, Hu Xu, Chuanhong Jin, *Maohai Xie, APL Mater.* **11**, 071113 (2023)
11. “Substrate Effect on Band Bending of MoSe_2 Monolayer Near Mirror-Twin Domain Boundaries”, Mengfei Yuan, Junqiu Zhang, Xingyu Yue, Yipu Xia, Yuanjun Jin, Wingkin Ho, *Maohai Xie, Adv. Electron. Mater.* **9**, 2300112 (2023)

12. “Atomistic insight into the epitaxial growth mechanism of single-crystal two-dimensional transition-metal dichalcogenides on Au (111) substrate”, Degong Ding, Shuang Wang, Yipu Xia, Pai Li, Daliang He, Junqiu Zhang, Sunwen Zhao, Guanghui Yu, Yonghui Zheng, Yan Cheng, Maohai Xie, Feng Ding, Chuanhong Jin, *ACS Nano* **16**, 17356 (2022)
13. “Metal-phosphorus network on Pt (111)”, Junqiu Zhang, Xingxing Dong, Shaogang Xu, Yipu Xia, Wingkin Ho, Hu Xu, Maohai Xie, *2D Mater.* **9**, 045002 (2022)
14. “Large-Area Tellurium/Germanium Heterojunction Grown by Molecular Beam Epitaxy for High-Performance Self-Powered Photodetector”, Beining Zheng, Zehan Wu, Feng Guo, Ran Ding, Jianfeng Mao, Maohai Xie, Shu Ping Lau, Jianhua Hao, *Adv. Opt. Mater.* **9**, 2101052 (2021)
15. “Single-layer Mo₅Te₈—A new polymorph of layered transition-metal chalcogenide”, Junqiu Zhang, Yipu Xia, Bo Wang, Yuanjun Jin, Hao Tian, Wing kin Ho, Hu Xu, Chuanhong Jin, Maohai Xie, *2D Mater* **8**, 015006 (2020)
16. “Charge Density Modulation and the Luttinger Liquid State in MoSe₂ Mirror Twin Boundaries”, Yipu Xia, Junqiu Zhang, Yuanjun Jin, Wingkin Ho, Hu Xu, Maohai Xie, *ACS Nano* **14**, 10716 (2020)
17. “Quantum Confined Tomonaga–Luttinger Liquid in Mo₆Se₆ Nanowires Converted from an Epitaxial MoSe₂ Monolayer”, Yipu Xia, Bo Wang, Junqiu Zhang, Yuanjun Jin, Hao Tian, Wingkin Ho, Hu Xu, Chuanhong Jin, Maohai Xie, *Nano Lett.* **20**, 2094 (2020)
18. “Two-dimensional metal-phosphorus network”, Hao Tian, Jun-Qiu Zhang, Wingkin Ho, Jin-Peng Xu, Bowen Xia, Yipu Xia, Jing Fan, Hu Xu, Maohai Xie, SY Tong, *Matter* **2**, 111 (2020)
19. “Niobium doping induced mirror twin boundaries in MBE grown WSe₂ monolayers”, Chuanhong JIN Bo WANG, Yipu XIA, Junqiu ZHANG, Hannu-Pekka KOMSA, Maohai XIE, Yong PENG, *Nano Res.* **13**, 1889 (2020)
20. “A Shallow Acceptor of Phosphorous Doped in MoSe₂ Monolayer”, Y Xia, J Zhang, Z Yu, Y Jin, H Tian, Y Feng, B Li, W Ho, C Liu, H Xu, C H Jin, M H Xie, *Adv. Electr. Mater.* **6**, 1900830 (2020)
21. “Multifarious interfaces, band alignments, and formation asymmetry of WSe₂-MoSe₂ heterojunction grown by molecular-beam epitaxy”, Y Dai, X Ren, J Zhang, J Liu, H Liu, W Ho, X Dai, CH Jin, M H Xie, *ACS Appl. Mater. & Interfaces* **11**, 43766 (2019)
22. “Room-temperature ferroelectricity in MoTe₂ down to the atomic monolayer limit”, S Yuan, X Luo, HL Chan, C Xiao, Y Dai, M H Xie, J H Hao, *Nat. Comm.* **10**, 1775 (2019)
23. “Hole doping in epitaxial MoSe₂ monolayer by nitrogen plasma treatment”, Y Xia, B Wang, J Zhang, Y Feng, B Li, X Ren, H Tian, J Xu, W Ho, H Xu, C Liu, C Jin, M H Xie, *2D Mater.* **5**, 041005 (2018)
24. “One-dimensional phosphorus chain and two-dimensional blue phosphorene grown on Au (111) by molecular-beam epitaxy”, J.P. Xu, J.Q. Zhang, H. Tian, H. Xu, W.K. Ho, M.H. Xie, *Phys. Rev. Mater.* **1**, 061002(R) (2017)
25. “Inversion Domain Boundary Induced Stacking and Bandstructure Diversity in Bilayer MoSe₂”, J.H. Hong, C. Wang, H.J. Liu, X.B. Ren, J.L. Chen, G. Wang, J.F. Jia, M.H. Xie, C.H. Jin, W. Ji, J. Yuan, Z. Zhang, *Nano Lett.* **17** (11), 6653-6660 (2017)
26. “Multivalency-Driven Formation of Te-Based Monolayer Materials: A Combined First-Principles and Experimental study”, Z. Zhu, X. Cai, S. Yi, J. Chen, Y. Dai, C. Niu, Z. Guo, M.H. Xie, F. Liu, J.H. Cho, Y. Jia, Z. Zhang, *Phys. Rev. Lett* **119**, 106101(2017)