

Kun Zhao

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Research Interests

- Molecular beam epitaxial growth of novel quantum films of topological materials and superconductors.
- Atomic-scale probing of exotic quantum phenomena using low-temperature scanning tunneling microscope.
- Characterization of surface structure using low energy electron diffraction.

Technical Skills

- Extensive expertise in high-quality few-layer film growth using molecular beam epitaxy (MBE).
- Extensive expertise in ultra-low-temperature scanning tunneling microscopy (STM) with ^3He refrigerator and dilution refrigerator.
- Expertise in ultra-high-vacuum surface characterization using reflection high-energy electron diffraction (RHEED) and low energy electron diffraction (LEED).
- Expertise in designing, machining and building ultra-high-vacuum systems.
- Expertise in fabricating ceramic materials.
- Expertise in quantum dynamics calculations of attosecond pulse generation (LZH-DICP), tight-binding calculations of electronic band structures, and dynamical LEED I-V calculations of surface structure (SATLEED).
- Familiarity with atomic force microscope (AFM), X-ray diffraction (XRD) and electronic transport measurement.

Education

- Ph.D. Candidate in Physics, Tsinghua University, Beijing, China, 09/2010 – 01/2017.
Thesis: Molecular Beam Epitaxy Growth and Scanning Tunneling Microscopy Studies of Superconducting Monolayer Films.
Adviser: Prof. Qi-Kun Xue.

- B.S. in Physics, Shandong University, Jinan, China, 09/2006 – 06/2010.

Academic Awards

- Second-class *Guanghua* Scholarship for Outstanding Students, Tsinghua University, 2016.
- Third-class Scholarship for Outstanding Students, Tsinghua University, 2014.
- Second-class *Guanghua* Scholarship for Outstanding Students, Tsinghua University, 2011.
- Scholarship for Research and Innovation, Shandong University, 2009.
- First-class Scholarship for Outstanding Students, Shandong University, 2009.
- Second-class Scholarship for Outstanding Students, Shandong University, 2008.

Employment / Research Experience

- Research Associate, Louisiana State University, Baton Rouge, LA, 02/2017 – present.
- Visiting Facility User, Center for Nanophase Materials Sciences at Oak Ridge National Laboratory, Oak Ridge, TN, 06/2017 – 07/2017.
- Research Assistant, Tsinghua University, Beijing, China, 09/2011 – 01/2017.
- Teaching Assistant, Tsinghua University, Beijing, China, 09/2010 – 06/2011.
- Visiting Scholar, Dalian Institute of Chemical Physics, Chinese Academy of Sciences, Dalian, China, 07/2010 – 08/2010.
- Research Assistant, Shandong University, Jinan, China, 09/2007 – 06/2010.

Publications

1. “Disorder-enhanced superconductivity of monolayer NbSe₂ by fractality”, Kun Zhao *et al.*, to be submitted.
2. “Ising superconductivity and quantum phase transition in macro-size monolayer NbSe₂”, Ying Xing, Kun Zhao *et al.*, under review (contributed equally).
3. “Molecular beam epitaxy growth of tetragonal FeS films on SrTiO₃(001) substrates”, Kun Zhao, Hai-Cheng Lin, Wan-Tong Huang, Xiao-Peng Hu, Xi Chen, Qi-Kun Xue and Shuai-Hua Ji, *Chin. Phys. Lett.* **34**, 087401 (2017).
4. “High-temperature superconductivity in single-unit-cell FeSe films on anatase TiO₂(001)”, Hao Ding, Yan-Feng Lv, Kun Zhao, Wen-Lin Wang, Lili Wang, Can-Li Song, Xi Chen, Xu-Cun Ma, and Qi-Kun Xue, *Phys. Rev. Lett.* **117**, 067001 (2016).
5. “Discovery of robust in-plane ferroelectricity in atomic-thick SnTe”, Kai Chang, Junwei Liu,

- Haicheng Lin, Na Wang, Kun Zhao, Anmin Zhang, Feng Jin, Yong Zhong, Xiaopeng Hu, Wenhui Duan, Qingming Zhang, Liang Fu, Qi-Kun Xue, Xi Chen, and Shuai-Hua Ji, *Science* **353**, 274 (2016).
6. “Molecular beam epitaxy growth of superconducting LiFeAs film on SrTiO₃(001) substrate”, Kai Chang, Peng Deng, Teng Zhang, Haicheng Lin, Kun Zhao, Shuai-Hua Ji, Lili Wang, Ke He, Xucun Ma, Xi Chen, and Qi-Kun Xue, *Europhys. Lett.* **109**, 28003 (2015).
 7. “Scanning tunneling microscopy studies of topological insulators”, Kun Zhao, Yan-Feng Lv, Shuai-Hua Ji, Xucun Ma, Xi Chen, and Qi-Kun Xue, *J. Phys.: Condens. Matter* **26**, 394003 (2014).
 8. “Fully gapped topological surface states in Bi₂Se₃ films induced by a *d*-wave high-temperature superconductor”, Eryin Wang, Hao Ding, Alexei V. Fedorov, Wei Yao, Zhi Li, Yan-Feng Lv, Kun Zhao, Li-Guo Zhang, Zhijun Xu, John Schneeloch, Ruidan Zhong, Shuai-Hua Ji, Lili Wang, Ke He, Xucun Ma, Genda Gu, Hong Yao, Qi-Kun Xue, Xi Chen, and Shuyun Zhou, *Nat. Phys.* **9**, 621 (2013).
 9. “A single isolated sub-50 attosecond pulse generation with a two-color laser field by a frequency-chirping technique”, Kun Zhao and Tianshu Chu, *Chem. Phys. Lett.* **511**, 166 (2011).
 10. “Tight-binding model for the electronic structures of SiC and BN nanoribbons”, Kun Zhao, Mingwen Zhao, Zhenhai Wang, and Yingcai Fan, *Physica E* **43**, 440 (2010).
 11. “The modification of Malus law for depolarized polaroid and experimental verification”, Lei Ma, Kun Zhao, Jixia Li, and Hongze Zhang, *College Physics* **29**, 58 (2010) (in Chinese).
 12. “Dielectric and piezoelectric properties of (Li, Ce) modified NaBi₅Ti₅O₁₈ composite ceramics”, Lei Ma, Kun Zhao, Jixia Li, Qi Wu, Minglei Zhao, and Chunlei Wang, *J. Rare Earth*. **27**, 496 (2009).

Conferences

1. “Disorder-enhanced superconductivity in epitaxial monolayer NbSe₂”, APS March Meeting 2017, New Orleans, LA, 03/2017.
2. “Disorder-enhanced superconductivity in epitaxial monolayer NbSe₂”, 12th International Conference on the Structure of Surfaces, Atlanta, GA, 07/2017.