Lily Y. Guo

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EDUCATION

University of Illinois at Urbana-Champaign (UIUC), Illinois, U.S. September 2020-Present
Bachelor of Science, Engineering Physics Graduation: May 2024
Bachelor of Science, Astronomy
Minor in Mathematics

RESEARCH INTERESTS

Two-dimensional (2D) materials; Quantum devices; Strongly correlated quantum phenomena; Topological materials; Novel measurement technique development.

RESEARCH EXPERIENCES

UIUC Abbamonte Group with Prof. Peter Abbamonte June 2023-Present
Development of in-situ Sputtering and Annealing System coupled with Momentum-resolved Electron Energy Loss Spectroscopy (M-EELS)

- Design and engineer a heating stage for precise *in-situ* annealing at high temperature (up to 800 degrees Celsius).
- Establish an argon-source sputtering system for sample surface preparation.
- Improve the performance of the sputtering and annealing system using test samples characterized by low energy electron diffraction (LEED).
- Programmed a pressure readout module compatible with an ion gauge using programming language C and achieved real-time pressure monitoring in ultra-high vacuum (UHV).

UIUC Wang Lab with Prof. Pengjie Wang June 2023-Present
Ultra-Low Electron Temperature Measurements and *Air-sensitive 2D Materials Fabrication*

- Designed and fabricated a multi-stage filter to minimize the sample electron temperature.
- Designed and fabricated universal chip carriers for experiments in different cryostats, including a quantum design dynacool PPMS, variable temperature inserts, dilution refrigerators, and cryogenic systems at the National High Magnetic Field Laboratory, Florida State University.
- Design and fabricate a high-stability homemade 2D materials transfer system for glove box.

UIUC Chiang Lab with Prof. Tai-Chang Chiang January 2023-June 2023
X-ray Diffraction Study of CDW in Single-Layer $ZrTe_2$

- Performed reciprocal space mapping of X-ray diffraction data obtained by synchrotron-based measurement.
- Developed a Python data processing tool capable of pixel-by-pixel intensity normalization, aberration correction, noise reduction, and peak fitting of detector images.
- Investigate atomic lattice displacements associated with the CDW phase in single-layer $ZrTe_2$, revealing its electron-driven nature and correlation with an excitonic phase reported by collaborators.

Fabrication and Spectroscopic Investigation of Te/Sb Topological Heterostructures

- Developed growth procedures of ultrathin Te/Sb film heterostructures on Bi-wetted Si(111)-(7×7) using molecular beam epitaxy (MBE).
- Performed *in-situ* characterizations of the sample surface's lattice and electronic band structures using reflection high-energy electron diffraction (RHEED) and angle-resolved photoemission spectroscopy (ARPES), respectively.
- Established the dependence of interfacial interactions on annealing conditions and Te coverage and unveiled a transition from a sharp Te/Sb interface to a Te-Sb alloy by tracking changes in the band dispersions of the Sb.

TALKS

X-ray Diffraction Study of Single-Layer $ZrTe_2$ (Abstract Submitted) — March 2024
American Physical Society (APS) March Meeting, Minneapolis, U.S.

Poster: *X-ray Diffraction Study of Single-Layer $ZrTe_2$* (Abstract Submitted) — January 2024
APS Conferences for Undergraduate Women in Physics (CUWiP), Ann Arbor, U.S.

Discovering Novel Quantum Phenomena in Two-Dimensional Materials — September 2023
Undergraduate Physics Seminar, UIUC, Illinois, U.S.

Poster: *X-ray Diffraction Study of Single-Layer $ZrTe_2$* — September 2023
Undergraduate Research Symposium, UIUC, Illinois, U.S.

AWARDS

UIUC Excellence in Physics Scholarship — November 2023
UIUC Dean's List — 2020-2021
Bronze Honour, International Youth Math Challenge — 2020

PROFESSIONAL SERVICES

UIUC ENG 100 Grainger Engineering Orientation Seminar, *Teaching Assistant* — Fall 2023
UIUC Physics Department Orientation, Undergraduate Research Panel, *Panelist* — October 2023
Physics Academic Program Review (APR), *Panelist* — October 2023
Society for Women in Physics, *Peer Mentor* — September 2022-Present
UIUC Grainger Engineering Course Registration, *Registration Assistant* — June 2022-August 2022

SKILLS

Technical: Certified Student Machinist, Material Research Laboratory Machine Shop

Lab: Angle-resolved photoemission spectroscopy (ARPES); Ultra-high vacuum (UHV); Sputtering gun; Annealing stage; Molecular beam epitaxy (MBE); Reflection high-energy electron diffraction (RHEED); Low energy electron diffraction (LEED); Cryogenic system; Electronic/PCB design.

Programming: Python; C/C++; MATLAB; Wolfram Mathematica; Java; Igor Pro; Solidwork/Fusion360; KiCAD; LaTeX.

Communication: English (professional work proficiency); Chinese (native).

REFERENCES

Prof. Peter Abbamonte
Fox Family Professor in Engineering at UIUC, Email: abbamont@illinois.edu

Prof. Tai-Chang Chiang
Research Professor of Physics at UIUC, Email: tcchiang@illinois.edu

Prof. Pengjie Wang
Assitant Professor of Physics at UIUC, Email: pengjiew@illinois.edu