Jingxian Li

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Employment

Los Alamos National Laboratory — Los Alamos, NM
Postdoc in Center for Integrated Nanotechnologies — *Oct. 2024 – Now*

- Project: Superconducting Nickelate Thin Films by Pulsed Laser Deposition

Education

University of Michigan — Ann Arbor, MI
Ph.D. in Materials Science and Engineering, GPA: 4.0/4.0 — *Aug. 2020 – Sep. 2024*

- Thesis: Thermodynamic Principles and Engineering of Resistive Memory

M.S. in Computer Vision, Electrical and Computer Engineering, GPA: 4.0/4.0 — *Aug. 2022 – June 2024*

- Courses: Machine Learning, Foundations of Computer Vision, Advanced Topics in Computer Vision

University of Science and Technology — Beijing, China
M.E. in Materials Science and Engineering — *Sep. 2015 – Jan. 2018*

B.E. in Materials Physics, GPA:92.3/100 — *Sep. 2011 – June 2015*

Research Skills

Programming: Python, C/C++, HTML/CSS, MATLAB, LaTeX
Libraries: Pandas, NumPy, Matplotlib, Pytorch, Scikit-learn
Software: COMSOL, 3D-MAX, Adobe Illustrator, Origin Lab
Materials: PVD (e-beam evaporation, sputtering, PLD), PECVD, ALD
Device: Photolithography, Reactive-ion etching, Rapid thermal anneal
Test: Keysight B1500A, Keithley 4200-SCS, Bio-logic SP300, NI DAQ-6358, PPMS
Chacterization: TEM, EDS, FIB, SEM, XPS, XRD, AFM, AES, ToF-SIMS

Research Projects

University of Michigan — Ann Arbor, MI
High Temperature Nonvolatile Electrochemical Random-access Memory — *Aug. 2022 – Sep. 2024*

- Designed, fabricated and tested nonvolatile electrochemical devices operational at temperatures up to 600°C, advancing memory technologies capable of reliable function for extreme conditions
- Combined Transmission Electron Microscopy (TEM) and phase-field model to understand the mechanisms of switching and retention

Thermodynamic Origin of Nonvolatility in Resistive Memory — *Aug. 2020 – July 2024*

- Collaborated with Oak Ridge National Lab and Ford Research to evaluate the speed and direction of oxygen transport in the amorphous Tantalum oxides
- Developed a phase-field model incorporating the properties of tantalum oxide to simulate the retention behavior of resistive memory devices and predict three retention failure regimes through simulation
- Fabricated resistive memory devices, switched their resistance states, and experimentally verified all three predicted retention failure behaviors

University of Science and Technology — Beijing, China
Electrochemical and Thermodynamic Processes of Metal Nanoclusters — *Aug. 2018 – Jan. 2020*

- Designed, fabricated and tested artificial synapses based on Ag nanoclusters to emulate the calcium ion dynamics in biological synapses
- Explained the operation mechanism of the memristive synapses using TEM and EDS

Engineered Switching Behavior in TaOx based Memristor for Nonvolatile Computing — *Aug. 2017 – Aug. 2018*

- Engineered analog switching linearity in TaOx based memristor with ion diffusion limiting layer (1 nm Al_2O_3)
- Achieved high on/off ratio with ion diffusion limiting layer (2 nm Al_2O_3) and implemented Boolean logic

Modulated Analog Resistive Switching in Bilayer Oxide based Memristive Synapses — *May. 2016 – Aug. 2017*

- Discovered that rich suboxide phases in the switching material is favorable for increasing the number of resistance states, which was proved by analog switching characteristics of different materials, XPS, SEM, and TEM characterization results

The Study on Electroluminescence Properties of a New Blue Phosphorescent dye *Jan. 2015 – Aug. 2015*

- Fabricated organic light-emitting diodes (OLED) based on a new blue phosphorescent dye (Cz-C8-FIrpic)
- Explored photophysical properties of Cz-C8-FIrpic using UV-vis absorption and photoluminescence spectra

Teaching Assistantship

University of Michigan Ann Arbor, MI

MATSCIE 482: Product Design and Manufacturing *Jan. 2023 – Apr. 2023*

- Collaborated with professors to guide senior students applying their accrued knowledge towards intricate projects
- Promoted effective teamwork among students by setting clear expectations and monitoring progress
- Utilized tools such as CATME to facilitate the assessment process

Publications

[1] Alec Talin, Jordan Meyer, **Jingxian Li**, et al., Electrochemical random-access memory – progress, perspectives and opportunities. **Chemical Reviews**, 125(4), 1962-2008, 2025.

[2] **Jingxian Li***, et al., Nonvolatile electrochemical memory at 600 ^{o}C enabled by composition phase separation. **Device**, 3(3), 100623, 2025.

[3] **Jingxian Li**, et al., Thermodynamic origin of nonvolatility in resistive memory. **Matter**, 7(11), 3970-3993, 2024.

[4] **Jingxian Li**, et al., Electrochemical and thermodynamic processes of metal nanoclusters enabled biorealistic synapses and leaky-integrate-and-fire neurons. **Materials Horizons**, 7, 71–81, 2020.

[5] **Jingxian Li**, et al., Engineering resistive switching behavior in taox based memristive devices for non-von neumann computing applications. China Semiconductor Technology International Conference (CSTIC), IEEE, 2018.

[6] **Jingxian Li**, et al., Tuning analog resistive switching and plasticity in bilayer transition metal oxide based memristive synapses. **RSC Advances**, 7, 3132–43140, 2017.

[7] Chuang Yao†, **Jingxian Li†**, et al., Design, synthesis and characterization of a new blue phosphorescent ir complex. **Journal of Materials Chemistry C**, 3, 8675–8683, 2015.

Honors & Awards

- **MRS Graduate Student Silver Award**, Materials Research Society (MRS), 2023 Fall
- **APL Machine Learning Outstanding Oral Presentation Award**, EL20 Symposium Session, Materials Research Society (MRS), 2023 Fall
- **Final List of Student Oral Award**, Electronic Materials Conference (EMC), 2023
- **Gold Poster Award Winner**, Annual Symposium Poster Session of Michigan Materials Research Institute (MMRI), University of Michigan, 2023
- **Outstanding Graduate of Beijing**, Top 1% of Students in University of Science and Technology, Beijing, 2015
- **Undergraduate Mathematical Contest in Modelling, 1st Prize, Beijing**, Beijing Mathematical Society, 2014
- **Merit Student of Beijing**, Top 0.1% of Students in University of Science and Technology, Beijing, 2014
- **National Scholarship**, Top 1% of Students in University of Science and Technology, Beijing, 2012 & 2013
- **Undergraduate Physics Competitions of Beijing, 2nd Prize**, Beijing Physics Society, 2014
- **Undergraduate Mathematics Competitions of Beijing, 3rd Prize**, Beijing Mathematical Society, 2012