

Menglin Zhu

Curriculum Vitae with References

Department of Materials Science and Engineering
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Research Interest

- Advancing (scanning) transmission electron microscopy techniques for material analysis
- Probing structure/chemistry correlations in 3D using multislice electron ptychography
- Exploring material behavior and emergent phenomena with *in situ* electron microscopy
- Extracting insights from microscopy data using statistical analysis and machine learning

Education and Training

- 2023–present **Postdoctoral Researcher**, *Massachusetts Institute of Technology*, Prof. James M. LeBeau.
2018–2023 **Ph.D. in Materials Science and Engineering**, *Ohio State University*, Prof. Jinwoo Hwang.
2014–2017 **B.S. in Materials Science and Engineering**, *Ohio State University*, Prof. Jinwoo Hwang.

Honors & Awards

- 2023 **Postdoctoral Scholar** of Microscopy Society of America, awarded as a postdoctoral researcher for the paper submitted for the Microscopy and Microanalysis conference 2023
- 2022 **Student Scholar** of Microscopy Society of America, awarded as a Ph.D. candidate for the paper submitted for the Microscopy and Microanalysis conference 2022
- 2021 **Presidential Fellow** of Ohio State University, the most prestigious award given by the Graduate School to outstanding Ph.D. candidates
- 2017 **The Mars Fontana Scholarship** by Ohio State University, awarded to the most outstanding senior student in the Department of Material Science and Engineering
- 2016 **Summer Research Fellow** of Ohio State University
Markworth-Woolley Scholarship by Ohio State University

Publications

*Equal Contribution, Citations: 1003, h-Index: 15

- [42]₂₀₂₅ **Menglin Zhu***, Michael Xu*, Yu Yun, Liyan Wu, Or Shafir, Colin Gilgenbach, Lane W Martin, Ilya Grinberg, Jonathan E Spanier, and James M LeBeau. Insights into chemical and structural order at planar defects in Pb₂MgWO₆ using multislice electron ptychography. *ACS Nano*, DOI:10.1021/acsnano.4c14833.
- [41]₂₀₂₅ Jith Sarker, Prachi Garg, Abrar Rauf, Ahsiur Rahman Nirjhar, Hsien-Lien Huang, **Menglin Zhu**, A F M Anhar Uddin Bhuiyan, Lingyu Meng, Hongping Zhao, Jinwoo Hwang, Eric Osei-Agyemang, Saquib Ahmed, and Baishakhi Mazumder. Microscopic and spectroscopic investigation of (Al_xGa_{1-x})₂O₃ films: Unraveling the impact of growth orientation and aluminum content. *Adv. Mater. Interfaces*, DOI:10.1002/admi.202301016.
- [40]₂₀₂₅ Jieun Kim, Yubo Qi, Abinash Kumar, Yun-Long Tang, Michael Xu, Hiroyuki Takenaka, **Menglin Zhu**, Zishen Tian, Ramamoorthy Ramesh, James M LeBeau, Andrew M Rappe, and Lane W Martin. Size-driven phase evolution in ultrathin relaxor films. *Nat. Nanotechnol.*, DOI:10.1038/s41565-025-01863-x.

- [39] ²⁰²⁴ **Menglin Zhu***, Michael Xu*, Yubo Qi, Colin Gilgenbach, Jieun Kim, Jiahao Zhang, Bridget R Denzer, Lane W Martin, Andrew M Rappe, and James M LeBeau. Bridging experiment and theory of relaxor ferroelectrics at the atomic scale with multislice electron ptychography, DOI: arXiv2408.11685.
- [38] ²⁰²⁴ **Menglin Zhu***, Joseph Lanier*, Sevim Polat Genlik*, Jose G Flores, Victor da Cruz Pinha Barbosa, Mohit Randeria, Patrick M Woodward, Maryam Ghazisaeidi, Fengyuan Yang, and Jinwoo Hwang. Emergent Ferromagnetism at LaFeO₃/SrTiO₃ Interface Arising from Strain-induced Spin-State Transition. *arXiv*, DOI: arXiv2405.12950.
- [37] ²⁰²⁴ **Menglin Zhu**, Joseph Lanier, Jose Flores, Victor da Cruz Pinha Barbosa, Daniel Russell, Becky Haight, Patrick M Woodward, Fengyuan Yang, and Jinwoo Hwang. Structural degeneracy and formation of crystallographic domains in epitaxial LaFeO₃ films revealed by machine-learning assisted 4D-STEM. *Sci. Rep.*, DOI:10.1038/s41598-024-54661-1.
- [36] ²⁰²⁴ Sujan Shrestha, Yongseong Choi, Maximilian Krautloher, **Menglin Zhu**, Jinwoo Hwang, Bernhard Keimer, Ambrose Seo, and Jong-Woo Kim. Exploring magnetic anisotropy and robustness of the J_{eff} state under substantial orthorhombic distortion in Sr₂IrO₄ thin films. *Phys. Rev. B Condens. Matter*, DOI:10.1103/PhysRevB.109.104415.
- [35] ²⁰²⁴ Jith Sarker, Prachi Garg, Abrar Rauf, Ahsir Rahman Nirjhar, Hsien-Lien Huang, **Menglin Zhu**, A F M Anhar Uddin Bhuiyan, Lingyu Meng, Hongping Zhao, Jinwoo Hwang, Eric Osei-Agyemang, Saquib Ahmed, and Baishakhi Mazumder. Microscopic and spectroscopic investigation of (Al_xGa_{1-x})₂O₃ films: Unraveling the impact of growth orientation and aluminum content. *Adv. Mater. Interfaces*, DOI:10.1002/admi.202301016.
- [34] ²⁰²⁴ Hao Pan*, **Menglin Zhu***, Ella Banyas, Louis Alaerts, Megha Acharya, Hongrui Zhang, Jiyeob Kim, Xianzhe Chen, Xiaoxi Huang, Michael Xu, Isaac Harris, Zishen Tian, Francesco Ricci, Brendan Hanrahan, Jonathan E Spanier, Geoffroy Hautier, James M LeBeau, Jeffrey B Neaton, and Lane W Martin. Clamping enables enhanced electromechanical responses in antiferroelectric thin films. *Nat. Mater.*, DOI:10.1038/s41563-024-01907-y.
- [33] ²⁰²⁴ I-Hsuan Kao, Junyu Tang, Gabriel Calderon Ortiz, **Menglin Zhu**, Sean Yuan, Rahul Rao, Jiahan Li, James H Edgar, Jiaqiang Yan, David G Mandrus, Kenji Watanabe, Takashi Taniguchi, Jinwoo Hwang, Ran Cheng, Jyoti Katoch, and Simranjeet Singh. Unconventional Unidirectional Magnetoresistance in vdW Heterostructures. *arXiv*, DOI: arXiv2405.10889.
- [32] ²⁰²⁴ Gabriel A Calderón Ortiz, **Menglin Zhu**, Andrew Wadsworth, Letian Dou, Iain McCulloch, and Jinwoo Hwang. Unveiling nanoscale ordering in amorphous semiconducting polymers using four-dimensional scanning transmission electron microscopy. *ACS Appl. Mater. Interfaces*, DOI:10.1021/acsami.4c11198.
- [31] ²⁰²³ Kaitian Zhang, Chenxi Hu, Vijay Gopal Thirupakuzi Vangipuram, Lingyu Meng, Christopher Chae, **Menglin Zhu**, Jinwoo Hwang, Kathleen Kash, and Hongping Zhao. Effect of varying threading dislocation densities on the optical properties of InGa_N/Ga_N quantum wells with intentionally created V-shaped pits. *J. Vac. Sci. Technol. B Nanotechnol. Microelectron.*, DOI:10.1116/6.0003141.
- [30] ²⁰²³ Jith Sarker, Prachi Garg, **Menglin Zhu**, Christofer M Rouleau, Jinwoo Hwang, Eric Osei-Agyemang, and Baishakhi Mazumder. Understanding the Structural–Chemical Evolution of Epitaxial NbN/Al₂O₃/NbN Trilayers with Varying NbN Thickness. *ACS Appl. Eng. Mater.*, DOI:10.1021/acsaenm.3c00555.

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- [28]₂₀₂₃ Xiaolei Guo, Hsien-Lien Huang, **Menglin Zhu**, Karthikeyan Hariharan, Szu-Chia Chien, Ngan Huynh, Jinwoo Hwang, Wolfgang Windl, Christopher D Taylor, Eric J Schindelholtz, and Gerald S Frankel. Interstitial elements created via metal 3D printing. *Mater. Today*, DOI:10.1016/j.mattod.2023.04.020.
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- [26]₂₀₂₂ Wenyi Zhou, Alexander J Bishop, **Menglin Zhu**, Igor Lyalin, Robert Walko, Jay A Gupta, Jinwoo Hwang, and Roland K Kawakami. Kinetically Controlled Epitaxial Growth of Fe₃GeTe₂ van der Waals Ferromagnetic Films. *ACS Applied Electronic Materials*, DOI:10.1021/acsaelm.2c00185.
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- [24]₂₀₂₂ S Shrestha, M Krautloher, M Zhu, J Kim, J Hwang, J Kim, J W Kim, B Keimer, and A Seo. Emergent interlayer magnetic order via strain-induced orthorhombic distortion in the 5d Mott insulator Sr₂IrO₄. *Phys. Rev. B: Condens. Matter Mater. Phys.*, DOI:10.1103/PhysRevB.105.L100404.
- [23]₂₀₂₂ Olivia G Licata, **Menglin Zhu**, Jinwoo Hwang, and Baishakhi Mazumder. Nanoscale chemistry and ion segregation in zirconia-based ceramic at grain boundaries by atom probe tomography. *Scr. Mater.*, DOI:10.1016/J.SCRIPAMAT.2022.114603.
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- [21]₂₀₂₂ Hyunseok Kim, Sangho Lee, Jiho Shin, **Menglin Zhu**, Marx Akl, Kuangye Lu, Ne Myo Han, Yongmin Baek, Celesta S Chang, Jun Min Suh, Ki Seok Kim, Bo In Park, Yanming Zhang, Chanyeol Choi, Heechang Shin, He Yu, Yuan Meng, Seung Il Kim, Seungju Seo, Kyusang Lee, Hyun S Kum, Jae Hyun Lee, Jong Hyun Ahn, Sang Hoon Bae, Jinwoo Hwang, Yunfeng Shi, and Jeehwan Kim. Graphene nanopattern as a universal epitaxy platform for single-crystal membrane production and defect reduction. *Nat. Nanotechnol.*, DOI:10.1038/s41565-022-01200-6.
- [20]₂₀₂₂ Md Rezaul Karim, Benthara Hewage Dinushi Jayatunga, Kaitian Zhang, **Menglin Zhu**, Jinwoo Hwang, Kathleen Kash, and Hongping Zhao. Band Structure Engineering Based on InGa_N/ZnGeN₂ Heterostructure Quantum Wells for Visible Light Emitters. *Cryst. Growth Des.*, DOI:10.1021/acs.cgd.1c00630.
- [19]₂₀₂₂ I Hsuan Kao, Ryan Muzzio, Hantao Zhang, **Menglin Zhu**, Jacob Gobbo, Sean Yuan, Daniel Weber, Rahul Rao, Jiahan Li, James H Edgar, Joshua E Goldberger, Jiaqiang Yan, David G Mandrus, Jinwoo Hwang, Ran Cheng, Jyoti Katoch, and Simranjeet Singh. Deterministic switching of a perpendicularly polarized magnet using unconventional spin-orbit torques in WTe₂. *Nature Materials* 2022 21:9, DOI:10.1038/s41563-022-01275-5.

- [18]₂₀₂₁ Tiancong Zhu, Alexander J Bishop, Tong Zhou, **Menglin Zhu**, Dante J O'Hara, Alexander A Baker, Shuyu Cheng, Robert C Walko, Jacob J Repicky, Tao Liu, and Others. Synthesis, Magnetic Properties, and Electronic Structure of Magnetic Topological Insulator MnBi_2Se_4 . *Nano Lett.*, DOI:10.1021/acs.nanolett.1c00141.
- [17]₂₀₂₁ Md Rezaul Karim, Brenton A Noesges, Benthara Hewage Dinushi Jayatunga, **Menglin Zhu**, Jinwoo Hwang, Walter R L Lambrecht, Leonard J Brillson, Kathleen Kash, and Hongping Zhao. Experimental determination of the valence band offsets of ZnGeN_2 and $(\text{ZnGe})_{0.94}\text{Ga}_{0.12}\text{N}_2$ with GaN. *J. Phys. D Appl. Phys.*, DOI:10.1088/1361-6463/abee45.
- [16]₂₀₂₁ Soohyun Im, Yunzhi Yuchi Wang, Pengyang Zhao, Geun Hee Yoo, Zhen Chen, Gabriel Calderon, Mehrdad Abbasi Gharacheh, **Menglin Zhu**, Olivia Licata, Baishakhi Mazumder, David A Muller, Eun Soo Park, Yunzhi Yuchi Wang, and Jinwoo Hwang. Medium-range ordering, structural heterogeneity, and their influence on properties of Zr-Cu-Co-Al metallic glasses. *Physical Review Materials*, DOI:10.1103/PhysRevMaterials.5.115604.
- [15]₂₀₂₁ Yang Cheng, Sisheng Yu, **Menglin Zhu**, Jinwoo Hwang, and Fengyuan Yang. Tunable topological Hall effects in noncollinear antiferromagnet $\text{Mn}_3\text{Sn}/\text{Pt}$ bilayers. *APL Materials*, DOI:10.1063/5.0048733.
- [14]₂₀₂₀ Tiancong Zhu, Dante J O'Hara, Brenton A Noesges, **Menglin Zhu**, Jacob J Repicky, Mark R Brenner, Leonard J Brillson, Jinwoo Hwang, Jay A Gupta, and Roland K Kawakami. Coherent growth and characterization of van der Waals 1T-VSe₂ layers on GaAs (111) B using molecular beam epitaxy. *Physical Review Materials*, DOI:10.1103/PhysRevMaterials.4.084002.
- [13]₂₀₂₀ Sujan Shrestha, Matthew Coile, **Menglin Zhu**, Maryam Souri, Jiwoong Kim, Rina Pandey, Joseph W Brill, Jinwoo Hwang, Jong-Woo Kim, and Ambrose Seo. Nanometer-Thick Sr_2IrO_4 freestanding films for flexible electronics. *ACS Applied Nano Materials*, DOI:10.1021/acsanm.0c01351.
- [12]₂₀₂₀ Taeseon Lee, **Menglin Zhu**, Taylor Dittrich, Jinwoo Hwang, Anupam Vivek, and Glenn S Daehn. Microstructural Investigation of the Impact Weld Interface of Pseudo Single Grained Cu and Ag. *Metall. Mater. Trans. A*, DOI:10.1007/s11661-019-05557-7.
- [11]₂₀₂₀ Aidan J Lee, Adam S Ahmed, Brendan A McCullian, Side Guo, **Menglin Zhu**, Sisheng Yu, Patrick M Woodward, Jinwoo Hwang, P Chris Hammel, and Fengyuan Yang. Interfacial Rashba-Effect-Induced Anisotropy in Nonmagnetic-Material-Ferrimagnetic-Insulator Bilayers. *Phys. Rev. Lett.*, DOI:10.1103/PhysRevLett.124.257202.
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- [9]₂₀₂₀ Micah S Haseman, Md Rezaul Karim, Daram Ramdin, Brenton A Noesges, Ella Feinberg, Benthara Hewage Dinushi Jayatunga, Walter R L Lambrecht, **Menglin Zhu**, Jinwoo Hwang, Kathleen Kash, and Others. Deep level defects and cation sublattice disorder in ZnGeN_2 . *J. Appl. Phys.*, DOI:10.1063/1.5141335.
- [8]₂₀₂₀ Yang Cheng, Sisheng Yu, **Menglin Zhu**, Jinwoo Hwang, and Fengyuan Yang. Electrical Switching of Tristate Antiferromagnetic Néel Order in $\alpha\text{-Fe}_2\text{O}_3$ Epitaxial Films. *Phys. Rev. Lett.*, DOI:10.1103/PhysRevLett.124.027202.
- [7]₂₀₂₀ A F M Anhar Uddin Bhuiyan, Zixuan Feng, Jared M Johnson, Hsien-Lien Huang, Jith Sarker, **Menglin Zhu**, Md Rezaul Karim, Baishakhi Mazumder, Jinwoo Hwang, and Hongping Zhao. Response to "Comment on 'Phase transformation in MOCVD growth of $(\text{Al}_x\text{Ga}_{1-x})_2\text{O}_3$ thin films'"[APL Mater. 8, 089101 (2020)]. *APL Materials*, DOI:10.1063/5.0014806.

- [6] ²⁰²⁰ A F M Anhar Uddin Bhuiyan, Zixuan Feng, Jared M Johnson, Hsien-Lien Huang, Jith Sarker, **Menglin Zhu**, Md Rezaul Karim, Baishakhi Mazumder, Jinwoo Hwang, and Hongping Zhao. Phase transformation in MOCVD growth of $(\text{Al}_x\text{Ga}_{1-x})_2\text{O}_3$ thin films. *APL Materials*, DOI:10.1063/1.5140345.
- [5] ²⁰¹⁹ Baishakhi Mazumder, Jith Sarker, Yuewei Zhang, Jared M Johnson, **Menglin Zhu**, Siddharth Rajan, and Jinwoo Hwang. Atomic scale investigation of chemical heterogeneity in β - $(\text{Al}_x\text{Ga}_{1-x})_2\text{O}_3$ films using atom probe tomography. *Appl. Phys. Lett.*, DOI:10.1063/1.5113627.
- [4] ²⁰¹⁹ Md Rezaul Karim, Zixuan Feng, Jared M Johnson, **Menglin Zhu**, Jinwoo Hwang, and Hongping Zhao. Low-Pressure Chemical Vapor Deposition of In_2O_3 Films on Off-Axis c-Sapphire Substrates. *Cryst. Growth Des.*, DOI:10.1021/acs.cgd.8b01924.
- [3] ²⁰¹⁹ Zhiyuan Feng, Belinda Hurley, **Menglin Zhu**, Zi Yang, Jinwoo Hwang, and Rudolph Buchheit. Corrosion Inhibition of AZ31 Mg Alloy by Aqueous Selenite (SeO_3^{2-}). *J. Electrochem. Soc.*, DOI:10.1149/2.0911914jes.
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Teaching Experience

- Fall, 2023 **3.34 Imaging of Materials**, guest lecturer, Massachusetts Institute of Technology
- Fall, 2020 **MSE3151 Transport Phenomenon and Kinetics**, teaching assistant, Ohio State University
- Fall, 2019 **MSE3332 Undergraduate Lab II**, laboratory assistant and instructor, Ohio State University

Synergistic Activities

- 2023-present **Mentor of two graduate students** on project *Collaborative for Hierarchical Agile and Responsive Materials (CHARM) under cooperative agreement W911NF-19-2-011*
- 2023 **Co-organize Microscopy and Microanalysis conference P08 symposium** entitled *Atomic Scale Microscopy of Interfaces and Heterostructures with Correlated Phenomena*
- 2023 **Mentor of two REU Students** on project *NFO Thin Films Grown via an Off-Axis Sputtering Method; STEM Characterization of $\text{NdFeO}_3/\text{SrTiO}_3$ Thin Films*
- 2022 **Mentor of one REU Student** on project *Effects of Octahedral Tilting and Lattice Strain on LaFeO_3*

References

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