

PRIMARY WORKS

During my PhD, I primarily focused on phase-field simulations of polarization domain distribution and evolution in ferroelectric thin films, providing theoretical support for novel nanoelectronic devices. As of February 2023, I have published 33 SCI papers and co-authored a professional book chapter, accumulating nearly 900 citations and an h-index of 18. Before graduating, I led the development of a parallel phase-field simulation software suite called μ PRO and began exploring its commercialization potential.

Upon graduation, I joined MuPRO LLC, founded by my doctoral advisor Professor Long-Qing Chen in 2020. As the sole employee, I managed all aspects of the company, ranging from simulation software development to commercialization. My responsibilities included creating parallel programs, maintaining servers, overseeing user databases, designing promotional materials, and handling international sales and support. In three years, I executed the initial product development plan, which involved expanding our product line with several simulation software for PCs and unifying existing parallel server applications into a mesoscale phase-field simulation SDK. This positioned μ PRO as the world's first comprehensive phase-field simulation commercial software for functional materials. Our clients include prestigious institutions such as Tsinghua University, Chinese Academy of Sciences, University of Wisconsin-Madison, Samsung, and other universities and enterprises across China, the United States, Germany, South Korea, and Japan, generating over five hundred thousand dollars in sales revenue.

WORKING EXPERIENCE

2020/05-NOW	Simulation Research Scientist, MUPRO LLC , <i>State College, USA</i> Development and commercialization for the μ PRO packages.
2017 FALL., 2014 SPR.	Teaching assistant, <i>State College, USA</i> Thermodynamics(undergrad), Materials Process Kinetics(undergrad)

EDUCATION

2013-2020	Ph.D. of Materials Science and Engineering at Pennsylvania State University , USA Advisor: Long-Qing CHEN GPA: 3.73/4.0 Dissertation: Influence of defect on polarization distribution in ferroelectrics: a phase-field study Defended on 2020/04/06
2009-2013	Bachelor Degree with honor in Materials Science and Engineering at Shanghai Jiaotong University , China CORE GRADE: 90.13/100 , RANKING: 6/140 Thesis: Internal friction investigation of the AlAg system Defended on 2013/06/06

COMPUTER SKILLS

Fortran	:lead the development of μ PRO for HPC
C	:solely developed a series of utilities libraries for μ PRO PC version
C++	:solely developed μ Viz, a 3D data visualization tool using VTK+Qt
Cross-platform GUI	:solely developed the cross-platform μ PRO for PC using Electronjs + Reactjs
Shell	:solely developed μ Batch, a high-throughput jobs creator for μ PRO
Python	:data mining with Pandas, web crawling with selenium
Web dev	:Astrojs, Reactjs, Vuejs, AWS Lambda, SES, DynamoDB
Visual	:Blender, Paraview, VTK, OpenGL
Misc.	: \LaTeX , Linux, Git, CMake, Jenkins

HIGHLIGHTS

- [1] **Xiaoxing Cheng**, Qiwu Shi, Eric Parsonnet, Natalya Fedorova, Ren-Ci Peng, Abel Fernandez, Alexander Qualls, Xiaoxi Huang, Xue Chang, Hongrui Zhang, David Pesquera, Sujit Das, Dmitri Nikonov, Ian Young, Long-Qing Chen, Lane W. Martin, Yen-Lin Huang, Jorge Íñiguez, and Ramamoorthy Ramesh. The role of lattice dynamics in ferroelectric switching. *Nature Communications*, 13(1):1110, March 2022, IF=17.694.
- [2] **Xiaoxing Cheng**, Ren-Ci Pen, Bin Peng, Ziyao Zhou, Long-Qing Chen, and Ming Liu. Domain patterns and super-elasticity of freestanding BiFeO₃ membranes via phase-field simulations. *Acta Materialia*, 208:116689, April 2021, IF=9.209.
- [3] **Xiaoxing Cheng**, Yen-Lin Huang, Lu Zheng, Peng Chen, Shang-Lin Hsu, Tiannan Yang, Xiaoyu Wu, Louis Ponet, Ramamoorthy Ramesh, Long-Qing Chen, Sergey Artyukhin, Ying-Hao Chu, and Keji Lai. Unexpected Giant Microwave Conductivity in a Nominally Silent BiFeO₃ Domain Wall. *Advanced Materials*, 32(9):1905132, 2020, IF=32.086.
- [4] Linze Li, **Xiaoxing Cheng**, Thomas Blum, Huaixun Huyan, Yi Zhang, Colin Heikes, Xingxu Yan, Chaitanya Gadre, Toshihiro Aoki, Mingjie Xu, Lin Xie, Zijian Hong, Carolina Adamo, Darrell G. Schlom, Long-Qing Chen, and Xiaoqing Pan. Observation of Strong Polarization Enhancement in Ferroelectric Tunnel Junctions. *Nano Letters*, 19(10):6812–6818, October 2019, IF=12.262.
- [5] Linze Li, **Xiaoxing Cheng**, Jacob R Jokisaari, Peng Gao, Jason Britson, Carolina Adamo, Colin Heikes, Darrell G Schlom, Long-Qing Chen, and Xiaoqing Pan. Defect-induced hedgehog polarization states in multiferroics. *Physical Review Letters*, 120(13):137602, 2018, IF=9.185.
- [6] Zi Long Bai, **Xiao Xing Cheng**, Dong Fang Chen, David Wei Zhang, Long-Qing Chen, James F. Scott, Cheol Seong Hwang, and An Quan Jiang. Hierarchical Domain Structure and Extremely Large Wall Current in Epitaxial BiFeO₃ Thin Films. *Advanced Functional Materials*, 28(31):1801725, 2018, IF=19.924.

CONFERENCE PRESENTATIONS

- [1] **Xiaoxing Cheng**, Jason Britson, and Long-Qing Chen. Grain boundary's influence on the spontaneous polarization configuration in PZT. In *Third International Symposium on Phase-field Method*, State College, PA, USA, August 2014.
- [2] **Xiaoxing Cheng**, Jason Britson, and Long-Qing Chen. Influence of single coherent twin grain boundary on ferroelectric domain configuration in PZT system. In *Materials Science and Technology*, Pittsburgh, PA, USA, October 2014.
- [3] **Xiaoxing Cheng** and Long-Qing Chen. Polarization around dislocation in SrTiO₃, the role of flexoelectricity, electrostriction and defect charges. In *Fundamental Physics of Ferroelectrics and Related Materials 2020*, Silver Spring, MD, USA, January 2020.

FULL PUBLICATION LISTS

- [1] Igor Batraev, Saurabh Chaitanya, **Xiaoxing Cheng**, Dina V Dudina, Vijayan Krishnaraj, Ravinder Kumar, Yue Li, Weijie Lu, Alakesh Manna, José Miguel Molina Jordá, et al. *Metal Matrix Composites: Materials, Manufacturing and Engineering*, volume 3. Walter de Gruyter GmbH & Co KG, 2014.
- [2] B. Winchester, N. Balke, **Xiaoxing Cheng**, A. N. Morozovska, S. Kalinin, and L. Q. Chen. Electroelastic fields in artificially created vortex cores in epitaxial BiFeO₃ thin films. *Applied Physics Letters*, 107(5):052903, August 2015.
- [3] Jia-Mian Hu, Tiannan Yang, Kasra Momeni, **Xiaoxing Cheng**, Lei Chen, Shiming Lei, Shujun Zhang, Susan Trolier-McKinstry, Venkatraman Gopalan, Gregory P. Carman, Ce-Wen Nan, and Long-Qing Chen. Fast Magnetic Domain-Wall Motion in a Ring-Shaped Nanowire Driven by a Voltage. *Nano Letters*, 16(4):2341–2348, April 2016.
- [4] Yongbiao Wang, Liming Peng, Yanzhou Ji, **Xiaoxing Cheng**, Nan Wang, Yan Zhao, Yanan Fu, Long-Qing Chen, and Wenjiang Ding. The effect of low cooling rates on dendrite morphology during directional solidification in Mg–Gd alloys: In situ X-ray radiographic observation. *Materials Letters*, 163:218–221, 2016.

- [5] Yue Zhang, Yizhi Wang, Zhihong Xiong, Yongming Hu, Weixing Song, Qiu-an Huang, **Xiaoxing Cheng**, Long-Qing Chen, Chunwen Sun, and Haoshuang Gu. V_2O_5 Nanowire Composite Paper as a High-Performance Lithium-Ion Battery Cathode. *ACS Omega*, 2(3):793–799, 2017.
- [6] Jia-Mian Hu, Bo Wang, Yanzhou Ji, Tiannan Yang, **Xiaoxing Cheng**, Yi Wang, and Long-Qing Chen. Phase-Field Based Multiscale Modeling of Heterogeneous Solid Electrolytes: Applications to Nanoporous Li_3PS_4 . *ACS Applied Materials & Interfaces*, 9(38):33341–33350, 2017.
- [7] Yongbiao Wang, Liming Peng, Yanzhou Ji, **Xiaoxing Cheng**, Cunlong Wang, Yujuan Wu, Yanan Fu, and Long-Qing Chen. Effect of cooling rates on the dendritic morphology transition of Mg–6Gd alloy by in situ X-ray radiography. *Journal of Materials Science & Technology*, 34(7):1142–1148, 2018.
- [8] Linze Li, **Xiaoxing Cheng**, Jacob R Jokisaari, Peng Gao, Jason Britson, Carolina Adamo, Colin Heikes, Darrell G Schlom, Long-Qing Chen, and Xiaoqing Pan. Defect-induced hedgehog polarization states in multiferroics. *Physical Review Letters*, 120(13):137602, 2018.
- [9] Mingqiang Li, **Xiaoxing Cheng**, Ning Li, Heng-Jui Liu, Yen-Lin Huang, Kaihui Liu, Ying-Hao Chu, Dapeng Yu, Long-Qing Chen, Yuichi Ikuhara, and Gao, Peng. Atomic-scale mechanism of internal structural relaxation screening at polar interfaces. *Physical Review B*, 97(18):180103, 2018.
- [10] Zi Long Bai, **Xiao Xing Cheng**, Dong Fang Chen, David Wei Zhang, Long-Qing Chen, James F. Scott, Cheol Seong Hwang, and An Quan Jiang. Hierarchical Domain Structure and Extremely Large Wall Current in Epitaxial BiFeO_3 Thin Films. *Advanced Functional Materials*, 28(31):1801725, 2018.
- [11] Ji Ma, Jing Ma, Qinghua Zhang, Renci Peng, Jing Wang, Chen Liu, Meng Wang, Ning Li, Mingfeng Chen, **Xiaoxing Cheng**, Gao, Peng, Lin Gu, Long-Qing Chen, Pu Yu, Jinxing Zhang, and Ce-Wen Nan. Controllable conductive readout in self-assembled, topologically confined ferroelectric domain walls. *Nature nanotechnology*, 13(10):947, 2018.
- [12] Ren-Ci Peng, Jia-Mian Hu, Tiannan Yang, **Xiaoxing Cheng**, Jian-Jun Wang, Hou-Bing Huang, Long-Qing Chen, and Ce-Wen Nan. Switching the chirality of a magnetic vortex deterministically with an electric field. *Materials Research Letters*, 6(12):669–675, 2018.
- [13] Ren-Ci Peng, **Xiaoxing Cheng**, Ji Ma, Houbing Huang, Jing Ma, Long-Qing Chen, and Ce-Wen Nan. Understanding and predicting geometrical constraint ferroelectric charged domain walls in a BiFeO_3 island via phase-field simulations. *Applied Physics Letters*, 113(22):222902, 2018.
- [14] Yi Zhang, Haidong Lu, Lin Xie, Xingxu Yan, Tula R Paudel, Jeongwoo Kim, **Xiaoxing Cheng**, Hui Wang, Colin Heikes, Linze Li, et al. Anisotropic polarization-induced conductance at a ferroelectric-insulator interface. *Nature nanotechnology*, 13(12):1132, 2018.
- [15] Fang-Yin Lin, **Xiaoxing Cheng**, Long-Qing Chen, and Susan B Sinnott. Strain effects on domain structures in ferroelectric thin films from phase-field simulations. *Journal of the American Ceramic Society*, 101(10):4783–4790, 2018.
- [16] Linze Li, Jacob R. Jokisaari, Yi Zhang, **Xiaoxing Cheng**, Xingxu Yan, Colin Heikes, Qiyin Lin, Chaitanya Gadre, Darrell G. Schlom, Long-Qing Chen, and Xiaoqing Pan. Control of Domain Structures in Multiferroic Thin Films through Defect Engineering. *Advanced Materials*, 30(38):1802737, 2018.
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- [18] Linze Li, **Xiaoxing Cheng**, Thomas Blum, Huaixun Huyan, Yi Zhang, Colin Heikes, Xingxu Yan, Chaitanya Gadre, Toshihiro Aoki, Mingjie Xu, Lin Xie, Zijian Hong, Carolina Adamo, Darrell G. Schlom, Long-Qing Chen, and Xiaoqing Pan. Observation of Strong Polarization Enhancement in Ferroelectric Tunnel Junctions. *Nano Letters*, 19(10):6812–6818, October 2019.
- [19] Yi Zhang, Haidong Lu, Xingxu Yan, **Xiaoxing Cheng**, Lin Xie, Toshihiro Aoki, Linze Li, Colin Heikes, Shu Ping Lau, Darrell G. Schlom, Longqing Chen, Alexei Gruverman, and Xiaoqing Pan. Intrinsic Conductance of Domain Walls in BiFeO_3 . *Advanced Materials*, 31(36):1902099, 2019.
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- [21] Juan Du, **Xiaoxing Cheng**, Tiannan Yang, Long-Qing Chen, Frédéric Mompiau, and Wenzheng Zhang. In Situ TEM Study on the Sympathetic Nucleation of Austenite Precipitates. *Acta Metall Sin*, 55(4):511–520, January 2019.
- [22] Yu Hui Huang, Jian-Jun Wang, Tian Nan Yang, **Xiaoxing Cheng**, Bing Liu, Yong Jun Wu, and Long-Qing Chen. Thermodynamic and phase-field studies of phase transitions, domain structures, and switching for Ba(ZrxTi1-x)O₃ solid solutions. *Acta Materialia*, 186:609–615, March 2020.
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- [26] Cheng-Chao Hu, Zhao Zhang, **Xiao-Xing Cheng**, Hou-Bing Huang, Yang-Guang Shi, and Long-Qing Chen. Ultrasensitive magnetostrictive responses at the pre-transitional rhombohedral side of ferromagnetic morphotropic phase boundary. *Journal of Materials Science*, 56(2):1713–1729, January 2021.
- [27] Ning Li, Ruixue Zhu, **Xiaoxing Cheng**, Heng-Jui Liu, Zhangyuan Zhang, Yen-Lin Huang, Ying-Hao Chu, Long-Qing Chen, Yuichi Ikuhara, and Peng Gao. Dislocation-induced large local polarization inhomogeneity of ferroelectric materials. *Scripta Materialia*, 194:113624, March 2021.
- [28] **Xiaoxing Cheng**, Ren-Ci Pen, Bin Peng, Ziyao Zhou, Long-Qing Chen, and Ming Liu. Domain patterns and super-elasticity of freestanding BiFeO₃ membranes via phase-field simulations. *Acta Materialia*, 208:116689, April 2021.
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- [31] Yiqian Liu, Junfu Liu, Hao Pan, **Xiaoxing Cheng**, Zijian Hong, Ben Xu, Long-Qing Chen, Ce-Wen Nan, and Yuan-Hua Lin. Phase-Field Simulations of Tunable Polar Topologies in Lead-Free Ferroelectric/Paraelectric Multilayers with Ultrahigh Energy-Storage Performance. *Advanced Materials*, page 2108772, 2022.
- [32] **Xiaoxing Cheng**, Qiwu Shi, Eric Parsonnet, Natalya Fedorova, Ren-Ci Peng, Abel Fernandez, Alexander Qualls, Xiaoxi Huang, Xue Chang, Hongrui Zhang, David Pesquera, Sujit Das, Dmitri Nikonov, Ian Young, Long-Qing Chen, Lane W. Martin, Yen-Lin Huang, Jorge Íñiguez, and Ramamoorthy Ramesh. The role of lattice dynamics in ferroelectric switching. *Nature Communications*, 13(1):1110, March 2022.
- [33] Pao-Wen Shao, Heng-Jui Liu, Yuanwei Sun, Mei Wu, Ren-Ci Peng, Meng Wang, Fei Xue, **Xiaoxing Cheng**, Lei Su, Peng Gao, Pu Yu, Long-Qing Chen, Xiaoqing Pan, Yachin Ivry, Yi-Chun Chen, and Ying-Hao Chu. Flexoelectric Domain Walls Originated from Structural Phase Transition in Epitaxial BiVO₄ Films. *Small*, 18(19):2107540, 2022.
- [34] Yuanjie Su, Weixiong Li, **Xiaoxing Cheng**, Yihao Zhou, Shuai Yang, Xu Zhang, Chunxu Chen, Tiannan Yang, Hong Pan, Guangzhong Xie, Guorui Chen, Xun Zhao, Xiao Xiao, Bei Li, Huiling Tai, Yadong Jiang, Long-Qing Chen, Fei Li, and Jun Chen. High-performance piezoelectric composites via β phase programming. *Nature Communications*, 13(1):4867, August 2022.