

# Curriculum Vitae

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## **Professional Experiences**

### **Advanced Photon Source, Argonne National Laboratory**

11/2016 – Present      *Physicist*

### **Advanced Photon Source, Argonne National Laboratory**

11/2011 – 10/2016      *Assistant Physicist*

### **Chemical Science and Engineering Division, Argonne National Laboratory**

01/2010 – 10/2011      *Postdoctoral Research Fellow*

### **National Synchrotron Light Source, Brookhaven National Laboratory**

10/2007 – 12/2009      *Research Associate*

## **Education**

### **University of Vermont, Burlington, VT**

09/2002 – 10/2007      *Ph. D. in Materials Science, 10/2007*

### **Beijing University of Technology, Beijing, China**

09/1997 – 06/2002      *B. S. in Materials Science & Engineering, 06/2002*

## **Research Interests**

- *In-situ/operando* and real-time synchrotron x-ray studies of advanced materials synthesis, functionality and applications in particular on surface/interface phenomena and processes in complex environments
- Thin film deposition of epitaxial nanostructures and heterostructures (MBE, PLD, Sputter deposition, MOCVD/CVD/ALD)
- Emergent physics of strongly correlated condensed matters (e.g. oxide interfaces)
- Solid/liquid/gas interfaces for electrochemical energy storage and conversion systems
- Synchrotron-based x-ray techniques to characterize and uncover surface/interface structural modifications and dynamics of epitaxial thin films and heterostructures by using phase retrieval direct methods

## Reviews and Books

1. **Hua Zhou\***, Yizhak Yacoby and Dillon D. Fong, “Atomic Imaging Epitaxial Thin Films and Nanostructures by Phase Retrieving Coherent Bragg Rods”, Annual Review of Materials Research (*to be appeared* in 2019 Issue).
2. **Hua Zhou\*** and Dillon D. Fong, “In situ X-ray Scattering of Epitaxial Oxide Thin Films”, Book Chapter of Epitaxial Growth of Complex Metal Oxides, Edited by G. Koster, G. Rijnders and M. Huijben, Woodhead Publishing (Elsevier) (2015).

## Publications

1. G. X. Ju, D. W. Xu, M. J. Highland, C. Thompson, **H. Zhou**, J. A. Eastman, P. H. Fuoss, P. Zapol, H. J. Kim, and G. B. Stephenson, “Coherent X-ray spectroscopy reveals the persistence of island arrangements during layer-by-layer growth”, Nature Physics XX, XXX (2019). [DOI:10.1038/s41567-019-0448-1].
2. I. C. Tung, A. Krishnamoorthy, S. Sadasivam, **H. Zhou**, Q. Zhang, K. L. Seyler, G. Clark, E. M. Mannebach, C. Nyby, F. Ernst, D. L. Zhu, J. M. Glowina, M. E. Kozina, S. H. Song, S. Nelson, H. Kumazoe, F. Shimojo, R. K. Kalia, P. Vashishta, P. Darancet, T. F. Heinz, A. Nakano, X. D. Xu, A. M. Lindenberg, and H. D. Wen, “Anisotropic structural dynamics of monolayer crystals revealed by femtosecond surface X-ray scattering”, Nature Photonics XX, XXX (2019). [DOI:10.1038/s41566-019-0387-5].
3. J. Y. Cai, Z. Y. Ma, U. Wjinya, M. Zou, Y. Z. Liu\*, **H. Zhou\***, and X. B. Meng\*, “A revisit to atomic layer deposition of zinc oxide using diethylzinc and water as precursors”, Journal of Materials Science 54, 5236 (2019). [DOI:10.1007/s10853-018-03260-3].
4. T. Q. Wang, A. Prakash, Y. Q. Dong, T. Truttman, A. Bucse, R. James, D. D. Fong, J. W. Kim, P. J. Ryan, **H. Zhou**, T. Birol, and B. Jalan, “Engineering SrSnO<sub>3</sub> Phases and Electron Mobility at Room Temperature Using Epitaxial Strain”, ACS Applied Materials Interfaces 10, 43802 (2018). [DOI: 10.1021/acsami.8b16592].
5. R. C. Haislmaier, J. Lapano, Y. K. Yuan, G. Stone, Y. Q. Dong, **H. Zhou**, N. Alem, and R. Engel-Herbert, “Overlapping growth windows to build complex oxide superlattices”, APL Materials 6, 111104 (2018). [DOI:10.1063/1.5061778].
6. Y. K. Yuan, Y. F. Lu, G. Stone, K. Wang, C. M. Brooks, D. G. Schlom, S. B. Sinnott, **H. Zhou\***, and V. Gopalan\*, “Three-dimensional atomic scale electron density reconstruction of octahedral tilt epitaxy in functional perovskites”, Nature Communication 9, 5220 (2018). [DOI:10.1038/s41467-018-07665-1].
7. H. J. Liu, Y. Q. Dong, D. W. Xu, E. A. Karapetrova, S. S. Lee, L. Stan, P. Zapol, **H. Zhou\***,\* and D. D. Fong\*, “Dynamic Field Modulation of the Octahedral Framework in Metal Oxide Heterostructures”, Advanced Materials 30, 1804775 (2018). [DOI:10.1002/adma.201804775].
8. M. N. Luckyanova, J. Mendoza, H. Lu, B. Song, S. Huang, J. Zhou, M. Li, Y. Q. Dong, **H. Zhou**, J. Garlow, L. Wu, B. J. Kirby, A. J. Grutter, A. A. Puretzky, Y. Zhu, M. S. Dresselhaus, A. Gossard, and G. Chen, “Phonon Localization in Heat

- Conduction”, *Science Advance* 4, eaat9460 (2018). [DOI: 10.1126/sciadv.aat9460].
9. H. T. Zhang, Z. Zhang, **H. Zhou**, H. Tanaka, D. D. Fong, and S. Ramanathan, “Beyond electrostatic modification: design and discovery of functional oxide phases via ionic-electronic doping”, *Advances in Physics: X* 4, 1523686 (2018). [DOI:10.1080/23746149.2018.1523686].
  10. J. Mandal, Y. Fu, A. C. Overvig, M. X. Jia, K. Sun, N. N. Shi, **H. Zhou**, X. H. Xiao, N. F. Yu, and Y. Yang, “Hierarchically porous polymer coatings for highly efficient passive daytime radiative cooling”, *Science* 362, 315 (2018). [DOI: 10.1126/science.aat9513].
  11. L. Zhang, W. X. Hou, G. H. Dong, Z. Y. Zhou, S. S. Zhao, Z. Q. Hu, W. Ren, M. F. Chen, C. W. Nan, J. Ma, **H. Zhou**, W. Chen, Z. G. Ye, Z. D. Jiang, and M. Liu, “Low voltage induced reversible magnetoelectric coupling in Fe<sub>3</sub>O<sub>4</sub> thin films for voltage tunable spintronic devices”, *Materials Horizons* 5, 991 (2018). [DOI:10.1039/C8MH00763B].
  12. Y. Wang, L. Gao, Y. Yang, Y. Xiang, Z. Chen, Y. Q. Dong, **H. Zhou**, Z. H. Cai, G. C. Wang, and J. Shi, “The Non-trivial Strength of van der Waals Epitaxial Interaction in Soft Perovskites”, *Physical Review Materials* 2, 076002 (2018). [DOI:10.1103/PhysRevMaterials.2.076002].
  13. C. Z. Zhu, Q. R. Shi, B. Z. Xu, S. F. Fu, G. Wan, C. Yang, S. Y. Yao, J. H. Song, **H. Zhou**, D. Du, S. P. Beckman, D. Su, and Y. H. Lin, “Hierarchically porous M-N-C (M=Co and Fe) single-atom electrocatalysts with robust MN<sub>x</sub> active moieties enable enhanced ORR performance”, *Advanced Energy Materials* 8, 180956 (2018). [DOI:10.1002/aenm.201801956].
  14. Y. F. Sun, M. Kotiuga, D. Lim, B. Narayanan, M. Cherukara, Z. Zhang, Y. Q. Dong, R. H. Kou, C. J. Sun, Q. Y. Lu, I. Waluyo, A. Hunt, H. Tanaka, A. N. Hattori, S. Gamage, Y. Abate, V. G. Pol, **H. Zhou**, S. K. R. S. Sankaranarayana, B. Yildiz, K. M. Rabe, and S. Ramanathan, “Strongly correlated perovskite lithium ion shuttles”, *Proceedings of the National Academy of Sciences of the United States of America* 115, 9672 (2018) [DOI:10.1073/pnas.1805029115].
  15. R. R. Rao, M. J. Kolb, J. Hwang, A. F. Pedersen, A. Mehta, H. You, K. A. Stoerzinger, Z. X. Feng, **H. Zhou**, H. Bluhm, L. Giordano, I. E. L. Stephens, and Y. Shao-Horn, “Surface Orientation Dependent Water Dissociation on Rutile Ruthenium Dioxide”, *Journal of Physical Chemistry C* 122, 17802 (2018). [DOI: 10.1021/acs.jpcc.8b04284].
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  17. G. X. Ju, M. J. Highland, C. Thompson, J. A. Eastman, P. H. Fuoss, **H. Zhou**, R. Dejusd, and G. B. Stephenson, “Characterization of the X-ray coherence properties of an undulator beamline at the Advanced Photon Source”, *Journal of Synchrotron Radiation* 25, 1036 (2018). [DOI:10.1107/S1600577518006501].
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- Photoluminescence, and Lifetime of CsPbX<sub>3</sub> (X = Cl, Br, I) Nanocrystal”, *Advanced Functional Materials* 28, 1800945 (2018). [DOI:10.1002/adfm.201800945].
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  34. T. J. Anderson, **H. Zhou**, L. Xie, J. P. Podkaminer, J. J. Patzner, S. Ryu, X. Q. Pan, and C. B. Eom, "Interfacial B-site atomic configuration in polar (111) and non-polar (001) SrIrO<sub>3</sub>/SrTiO<sub>3</sub> heterostructures", *APL Materials* 5, 096110 (2017). [DOI:10.1063/1.4993170].
  35. N. Laanait, W. Saenrang, **H. Zhou**, C. B. Eom, and Z. Zhang, "Dynamic X-ray diffraction imaging of the ferroelectric response in bismuth ferrite", *Advanced Structural and Chemical Imaging* 3, 11 (2017). [DOI:10.1186/s40679-017-0044-3].
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### **Invited Talks/Presentations**

1. "Atomic Imaging Multifunctional Heterostructures and Heterointerfaces by Phasing Coherent Bragg Rods", *Electronic Materials and Applications 2017 Meeting*, Orlando, Jan. 20<sup>th</sup>, 2017
2. "Atomic Imaging Multifunctional Oxide Heterostructures by Phasing Coherent Bragg Rods", *Department of Materials Science and Engineering Seminar*, Rensselaer Polytechnic Institute, Sep. 14<sup>th</sup>, 2016
3. "Bridging Fundamental Physics and Chemistry of Ionic Electrolyte Gating on Oxide Heterostructures: Structural Basis", *Oxide Thin Films for Advanced Energy and Information Applications Second Conference (Fusion Conference)*, March 5<sup>th</sup>, 2016
4. "Exploring Materials at Multidimensions by Phasing Reciprocal Space via Direct Methods", *X-ray science lecture in Department of Materials Science and Engineering at University of Wisconsin at Madison*, Dec. 7<sup>th</sup>, 2015
5. "Atomic Mapping Functional Interfaces by Phasing Coherent Bragg Rods for Correlated Materials and Energy Systems", *Department of Materials Science and Engineering Seminar*, Stanford University, Aug. 12<sup>th</sup>, 2015
6. "Exploring Wonderland of Low Dimensional Materials by Modern Surface/Interface X-ray Probes", *The International Workshop on Advanced X-ray Source and Diagnostics (WAXSD 2014)*, Sep. 5<sup>th</sup>, 2014
7. "Deciphering Structural Subtlety at Oxide Interfaces by Phasing Coherent Bragg Rods For Emergent States and Energy Systems", *Oxide Thin Films for Advanced Energy and Information Applications First Conference (Fusion Conference)*, July 14<sup>th</sup>, 2014
8. "Deciphering How Oxides Heterostructures Meet at Interfaces: Atomic Mapping by Phasing Coherent Bragg Rods", *2014 MRS Spring meeting Symposium J7.02*, April 24<sup>th</sup>, 2014
9. "Atomic Mapping by Phasing Coherent Bragg Rods: Exploring Wonderlands at Interfaces", *X-ray science lecture in Department of Materials Science and*

- Engineering at University of Wisconsin at Madison, Oct. 14<sup>th</sup>, 2012
10. "Atomic Mapping by Phase Retrieving Coherent Bragg Rods: Deciphering How Complex Oxides Meet at Interfaces", 2012 Oxides Workshop: Future directions for emergent discoveries at oxide interfaces by design, July. 10<sup>th</sup>, 2012
  11. "Deciphering Subtlety at Interface: Insights from Surface/Interface X-ray Scattering", Advanced Photon Source, Argonne National Laboratory, Feb. 24th, 2011
  12. "Imaging Interfacial Structures by Phasing Coherent Bragg Rod: Total and Element-Specific Structure Factors", National Synchrotron Light Source User Seminar, Nov. 20<sup>th</sup>, 2009
  13. "Imaging Interfacial Structures by Interface Scattering/Diffraction and Phase Retrieval Direct Methods", Materials Science and Engineering Department, John Hopkins University, Sep.22<sup>nd</sup>, 2009
  14. "Probing Energetic Surface Processes by Real-time Surface Scattering and Atomic Imaging of Epitaxial Interface Systems by Surface Diffraction", Condense Matter Physics and Materials Science Seminar, Brookhaven National Laboratory, Sep. 1<sup>st</sup>, 2009.
  15. "Atomic Imaging of Epitaxial Interface Systems by Surface Diffraction and Probing Energetic Surface Processes by Real-time Surface Scattering", Advanced Photon Source XSD Seminar, Argonne National Laboratory, Aug. 17<sup>th</sup>, 2009
  16. "Direct Structural Imaging by Synchrotron X-ray Diffraction-based Fourier-Phase-Retrieval Methods", ShangHai Synchrotron Radiation Facility Science Seminar, China, Jan. 12<sup>th</sup>, 2009
  17. "Atomic scale imaging of ultrathin HTS cuprate epitaxial films using COBRA", National Synchrotron Light Source User Science Seminar, Oct. 3<sup>rd</sup>, 2008

### **Conference and Workshop Presentations**

1. "In-situ Probing Structures of Electrolytes at Graphene Surfaces: Coupling Synchrotron X-Ray Interface Scattering with Molecular Modeling", *presentation in Materials Research Society Fall meeting* (VV 10.25), Boston MA, Nov. 2012.
2. "Molecular Layering of Imidazolium-based Ionic Liquids at Graphene Surfaces: Interfacial Densification and Overscreening", *oral presentation in Materials Research Society spring meeting* (BBB 2.9), San Francisco CA, April 2012.
3. "Atomic Probing Structures of Electrolytes at Graphene Surface: Insights from X-ray Scattering and Molecular Dynamics", *oral presentation in American Physical Society annual meeting* (H39.00013), Boston MA, March 2012.
4. "How water meets graphene", *oral presentation in American Physical Society annual meeting* (V41.00006), Dallas TX, March 2011.
5. "Anomalous expansion of the copper to apical oxygen distance in interfacial high-temperature superconducting cuprate bilayer films", *oral presentation in Materials Research Society Fall meeting* (W6.3), San Francisco CA, Apr. 2009.
6. "Quantitative determination of smoothing mechanisms of self-organized sputter ripple patterning on sapphire", *oral presentation in Materials Research Society Fall meeting* (KK1.8), Boston MA, Nov. 2007.

7. "Ion-irradiation-induced surface ripples on sapphire", *oral presentation in Materials Research Society Fall meeting (N6.5)*, Boston MA, Nov. 2006.
8. "Wavelength tunability of ion-bombardment-induced ripples on sapphire", *oral presentation in American Physical Society annual meeting (D12.011)*, Baltimore MD, March 2006.
9. "In-situ grazing incidence small angle x-ray scattering study of tunable nanoripples on ion-etched sapphire surfaces", *oral presentation in Materials Research Society spring meeting (Q5.6)*, San Francisco CA, March 2005.
10. "In-situ study of Co pattern formation by synchrotron x-ray scattering and atomic force microscopy", *oral presentation in American Physical Society annual meeting (B32.012)*, Montreal Canada, March 2004.

## **Recognition and Honors**

### **Research Recognition**

*Gopal K. Shenoy Excellence in Beamline Science Award* 2018  
 Awarding institution: Advanced Photon Source  
*NSLS/CFN Poster Session Award Winner* 2009  
 Awarding institution: Brookhaven National Laboratory

### **Graduate Recognition**

*Graduate Research Fellowship* 2003  
 Awarding institution: NSF Vermont EPSCoR

### **Undergraduate Recognition**

*Summa Cum Laude* 2002  
 Awarding institution: Beijing University of Technology  
*SONY Award for Merits* 2000  
 Awarding institution: SONY Inc.

## **Professional Memberships**

Full Member of the American Physical Society (APS)  
 Full Member of the Materials Research Society (MRS)  
 Full Member of the American Ceramic Society (ACS)

## **Peer Reviews**

Reviewers for peer-review based academic journals  
*Proceedings of the National Academy of Sciences of the United States of America*  
*Physical Review Letters*  
*Advanced Materials*  
*Nano Letters*  
*Advanced Materials Technology*  
*Physical Review B*

*APL Materials*  
*Journal of Physical Chemistry*  
*Applied Physics Letters*  
*Journal of Applied Physics*  
*AIP-Advances*  
*Applied Surface Science*  
*Journal of Physics: Condense Matter*  
*Journal of Physics D: Applied Physics*  
*Journal of Synchrotron Radiation*  
*Semiconductor Science and Technology*  
*Superconductor Science and Technology*  
*Physica Scripta*

### **Funding Reviews**

Reviewers for Condensed Matter Physics Panel of Division of Material Research at National Science Foundation

### **Panel Reviews**

Reviewers for Advanced Photon Source (APS) Proposal Review Panel and Stanford Synchrotron Radiation Lightsource (SSRL) Proposal Review Panel  
Review Panel for Surface/Interface Beamlines at Shanghai Synchrotron Radiation Facility (SSRF) and Beijing High Energy Photon Source (BHEPS)