

YOOUN HEO

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PERSONAL SUMMARY

I am a material physicist, studying all forms of functional materials (ferroic, oxide, organic halide, van der Waals materials) via scanning probe microscopy techniques to understand fundamentals of mechanical, electronic, ionic, and magnetic properties at the atomic to nanoscale length scales for next-generation energy and information technologies.

EDUCATION

Ph.D. in Materials Science at UNSW Sydney **2016 December**
○ Research synopsis: Scanning Probe Microscopy-based studies of ferroelectrics
○ Research exchange at Argonne National Laboratory for 3 months
B. Eng. in Photovoltaics and Solar Energy at UNSW Sydney **2012 March**

RELEVANT RESEARCH EXPERIENCE

Assistant Professor at Inha University **2023 Feb-Present**
○ Scanning probe microscopy studies of functional materials
Research associate at The University of Sydney **2022 Oct-2023 Feb**
○ Scanning transmission electron microscopy for relaxor ferroelectrics
Subgroup leader at ETH Zurich **2021 Sep-2022 Sep**
○ Low temperature scanning probe microscopy for ferroic materials
Postdoctoral researcher at The University of Warwick **2019 June-2021 June**
○ Light-assisted scanning probe microscopy
○ Low temperature scanning probe microscopy
JSPS postdoctoral fellow at Kyoto University **2017 May-2019 May**
○ Pulsed laser deposition for growth of oxide thin films
○ X-ray diffraction studies of complex oxide for structural studies
○ Scanning probe microscopy
○ Transport property and magnetization studies at low temperatures

SKILLSET

- Scanning probe microscopy (AFM, PFM, C-AFM, KPFM, and MFM) under various environments (cooling down to 1.7 K, heating up to 470 K, illumination, and high vacuum pressures)
- Pulsed laser deposition of oxide thin films under ultra-high vacuum conditions
- X-ray diffraction and reciprocal space mapping for thin film analysis

- UV photolithography for electrode patterning
- 2D material transfer and device fabrications
- Low temperature transport and magnetization measurements (PPMS and MPMS)
- Scanning electron microscopy and transmission electron microscopy
- Data processing and statistics analysis (IGOR, ORIGIN, MATLAB)

PUBLICATIONS

- **Yooun Heo**,* Hangbo Zhang, Marin Alexe*
Dynamic control of piezoelectricity enhancement via modulation of the bulk photovoltaic effect in a BiFeO₃ thin film
Advanced Electronic Materials, 2200785 (2022)
- **Yooun Heo**,* Marin Alexe*
Boosting Piezoelectricity under Illumination via the Bulk Photovoltaic Effect and the Schottky Barrier Effect in BiFeO₃
Advanced Materials, 34, 2105845 (2022)
- Hiroko Yokota, CRS Haines,* Suguru Matsumoto, Nozomo Hasegawa, Michael A Carpenter, **Yooun Heo**, Marin Alexe, EKH Salje, Yoshiaki Uesu
Domain wall generated polarity in ferroelastics: Results from resonance piezoelectric spectroscopy, piezoelectric force microscopy, and optical second harmonic generation measurements in LaAlO₃ with twin and tweed microstructures
Physical Review B, 102, 104117 (2020)
- **Y. Heo**,* P. Sharma,* Y. Y. Liu, J. Y. Li, J. Seidel*
Mechanical probing of ferroelectrics at the nanoscale
Journal of Materials Chemistry C, Invited Review, 7, 12441 (2019)
- **Yooun Heo**, Daisuke Kan, Masato Anada, Yusuke Wakabayashi, Hiroo Tajiri, Yuichi Shimakawa
Correlations between oxygen octahedral distortions and magnetic and transport properties in strained La_{0.5}Sr_{0.5}CoO₃ thin films
Physical Review B, 99, 174420 (2019)
- Julia Glaum, **Yooun Heo**, Matias Acosta, Pankaj Sharma, Jan Seidel, Manuel Hinterstein
Revealing the role of local stress on the depolarization of BNT-BT-based relaxors
Physical Review Materials, 3, 054406 (2019)
- **Yooun Heo**, Daisuke Kan, * Yuichi Shimakawa
Nanoscale oxygen ion dynamics in SrFeO_{2.5+δ} epitaxial thin films
Applied Physics Letters, Cover Article, 113, 221904 (2018)
- Chandan Das, Ashish K. Singh, **Yooun Heo**, Garima Aggarwal, Sandeep K. Maurya, Jan Seidel, and Balasubramaniam Kavaipatti*
Effect of Grain Boundary Cross-Section on the Performance of Electrodeposited Cu₂O Photocathodes
The Journal of Physical Chemistry C, 122, 1466 (2018)
- **Y. Heo**, S. Hu, P. Sharma, Kwang-Eun Kim, B.-K. Jang, C. Carzola, C.-H. Yang, J. Seidel*
Impact of Isovalent and Aliovalent Doping on Mechanical Properties of Mixed Phase BiFeO₃
ACS Nano 11, 2805 (2017)
- P. Sharma,* **Y. Heo**, K.-E. Kim, B.-K. Jang, Y. Y. Liu, V. Nagarajan, J. Li, C.-H. Yang and J. Seidel*
Structural and electronic transformation pathways in morphotropic BiFeO₃
Scientific Reports 6, 32347 (2016)

- **Y. Heo**, J. H. Lee, L.Xie, X. Pan, C.-H. Yang, and J. Seidel*
Enhanced conductivity at orthorhombic-rhombohedral phase boundaries in BiFeO₃ thin films
Nature Publishing Group Asia Materials **8**, e297 (2016)
- P. Sharma,* **Y. Heo**, K.-E. Kim, B.-K. Jang, Y. Y. Liu, V. Nagarajan, J. Li, C.-H. Yang and J. Seidel*
Morphotropic phase elasticity of strained BiFeO₃
Advanced Materials Interfaces **3**, 1600033 (2016)
- Sabrina Beckmann, Yee M. Oo, Xiaomin Li, Cornelia Welte, Lena Kröniger, **Yooun Heo**, Daniela Ribeiro, Farzana H. Kastury, Matthew Lee, Mohan Bhadbhade,
Uwe Deppenmeier, Jan Seidel, Chris Marjo, and Mike Manefield*
Novel phenazine crystals serve as electrochemical adaptors for direct electron transfer to methanogens
Energy & Environmental Science **9**, 644 (2016)
- **Y. Heo**, D. Kan, Y. Shimakawa, and J. Seidel*
Resistive Switching Properties of Epitaxial BaTiO_{3-δ} Thin Films Tuned by After-Growth Oxygen Cooling Pressure
Physical Chemistry Chemical Physics **18**, 197 (2016)
- Jae S. Yun,* Anita Ho-Baillie, Shujuan Huang, Sang H. Woo, **Yooun Heo**, Jan Seidel, Fuzhi Huang, Yi-Bing Cheng, and Martin A. Green*
Benefit of Grain Boundaries in Organic-Inorganic Halide Planar Perovskite Solar Cells
Journal of Physical Chemistry Letters **6**, 875 (2015)
- **Y. Heo**, B.-K. Jang, K.-E. Kim, C.-H. Yang, and J. Seidel*
Nanoscale mechanical softening of morphotropic BiFeO₃
Advanced Materials **26**, 7568 (2014)
- K.-E. Kim, B.-K. Jang, **Y. Heo**, M. Jeong, J. Y. Lee, J. Seidel, and C.-H. Yang*
Electric control of straight stripe conductive mixed-phase nanostructures in La-doped BiFeO₃
Nature Publishing Group Asia Materials **6**, e81 (2014)

SELECTED ORAL PRESENTATIONS

- IEEE ISAF 2021 Virtual Conference (May16-21, 2021)
Title: Unravelling Correlation Between Light-Induced Enhancement of Piezoelectricity and the Bulk Photovoltaic Effect in BiFeO₃
- EPSRC network meeting: Ferroelectric, ferroelastic and multiferroic domain walls: a new horizon in nanoscale functional materials (Sep 17-19, 2019, University of Cambridge, United Kingdom)
Title: Scanning probe microscopy studies of nanoscale functionalities in complex oxide thin films
- The Japan Society of Applied Physics Spring Meeting (Mar 09-12, 2019, Tokyo Institute of Technology, Japan)
Title: Nanoscale dynamics of oxygen ions in SrFeO_{2.5+δ} epitaxial thin films
- The 2018 European Materials Research Society (EMRS) Fall Meeting (Sep 17-19, 2018, Warsaw University of Technology, Poland)
Title: Nanoscale oxygen dynamics in epitaxial SrFeO_{2.5+δ} thin films
- The 2018 ISAF-FMA-AMF-AMEC-PFM (IFAAP) Joint Conference (May 27 – June 1, 2018, Hiroshima University, Japan)
Title: Impact of Isovalent and Aliovalent Doping on Mechanical Properties of Mixed Phase BiFeO₃
- JSPS Core-to-Core Workshop (December 5-7, 2017, National Taiwan University, Taiwan)
Title: Nanoscale control of oxygen vacancies and oxygen dynamics in complex oxide thin films

- The 15th International Conference on Advanced Materials 2017 (IUMRS-ICAM 2017 August 27 – September 01, 2017, Kyoto University, Japan)
Title: Enhanced conductivity of phase boundaries in tensile strained BiFeO₃
- The 2014 Materials Research Society Fall Meeting (November 30-December 5, 2014, Hynes Convention Center, USA)
Title: Nanoscale Mechanical Softening of Morphotropic BiFeO₃
- 3rd biennial conference of the Combined Australian Materials Societies (November 26-28, 2014, University of Sydney, Australia)
Title: Resistive Switching Properties of Epitaxial BaTiO_{3-δ} Thin Films
- 4th Asia Pacific-Korea Conference (AKC) on Science and Technology (November 20-22, 2014, The Hilton Sydney Hotel, Australia)
Title: (1) Nanoscale mechanical switching of mixed phase BiFeO₃
(2) Nanoscale Science and Technology: Engineering of Advanced Functional Materials

REFEREES

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