Curriculum Vitae

Ji Soo Lim, Ph. D.

Date of Birth: Oct. 19, 1988

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Education

2011. 2. - 2019. 2. Integrated Ph.D. Physics, KAIST, Daejeon, Korea

Advisor: Prof. Chan-Ho Yang, Dept. of Physics.

Dissertation: Electric-field-induced oxygen vacancy migration and electronic property modulation in epitaxial Ca-substituted $BiFeO_3$ thin films.

2007. 2. - 2011. 2. B. S. in Physics, KAIST, Daejeon, Korea

(Magna cum laude)

2004. 3. - 2007. 2. Korea Science Academy, Busan, Korea

Career

2011. 2. – 2014. 2. Teaching Assistance at KAIST

2018. 2. – 2018. 12. Research & Education (R&E) Teaching Assistance at KAIST

2019. 2. – 2020. 10. Postdoctoral researcher in Physics, KAIST, Daejeon, Korea

(Advisor: Prof. Chan-Ho Yang, Dept of Physics.)

2020. 11. – Postdoctoral researcher in University of Wuerzburg, Germany

(Advisor: Prof. Ralph Claessen, Experimetelle Physik 4.)

Scholarships / Awards

2007. 2. – 2011. 2. Presidential Science Scholarship, Korea.

2017. 10. 27. KPS 2017 fall meeting, October 27, 2017 (Oral, BEST PRESENTATION AWARD)

2022. 5. ct.qmat (Cluster of Excellence- Complexity and Topology in Quantum Matter) Flexfund (10,000 Euro)

2023. 5. ct.qmat (Cluster of Excellence- Complexity and Topology in Quantum Matter) Flexfund (30,000 Euro)

Research Techniques

1 Thin film Synthesis

- Oxide thin film growth (Number of deposition > 1000 times) :
  - Bulk target synthesis. (Ca doped $BiFeO_3$ series, $BiFeO_3$, $CaFeO_3$, $CaFe_{1-x}Mn_xO_3$ series)
  - Epitaxial thin film growth on various substrates ($DyScO_3$, $SrTiO_3$, Nb:$SrTiO_3$, LSAT,

$LaAlO_3$) by pulsed laser deposition.

- Bottom electrode deposition ($SrRuO_3$, $Pr_{0.7}Ca_{0.3}MnO_3$, $LaNiO_3$) and capping layer deposition.

2 Structural Analysis

- Atomic structure analysis: 2θ-ω scan, Q-scan, Reciprocal space mapping, High-temperature X-ray diffraction and Fast 2θ-ω scan by a 3D-Pixel detector.
- Surface characterization: Scanning electron microscopy (SEM), Atomic force microscopy (AFM), Conductive-AFM, Piezoresponse force microscopy (PFM), Magnetic force microscopy (MFM). (Bruker Multimode and Asylum MFP-3D Infinity) and force-distance curve analysis (estimation of elastic modulus)
- Stoichiometry estimation using an energy-dispersive X-ray spectroscopy (EDS-SEM) and an X-ray photoelectron spectroscopy (XPS).

3 Device Fabrication and electrical measurements

- Photomask design using an AUTOCAD program.
- Micro device fabrication: Photolithography (Mask aligner), Metal electrode deposition (DC sputtering) and Etching process (Ar^+ ion milling).
- Measurement of electrical properties using DC and AC source: Two-point IV characterization, Four-point IV characterization, Field effect transistor measurement, Magnetoresistance, Hall effect measurement and Capacitance-voltage measurement.
- Measurement of ionic conductivity: Impedance spectroscopy and Color trace using an optical microscope.

4 Synchrotron based experiment

- Magnetism study: X-ray absorption spectroscopy-Photoemission electron microscope (XAS-PEEM) and X-ray circular/liner dichroism,
- Electronic structure study: Hard and Soft X-ray photoelectron spectroscopy (XPS), Angle-resolved XPS.

5 Other Research Techniques

- 3D mechanical design of a multifunctional probe for PPMS (Autodesk Inventor).
- Programming for electronics and a PPMS using C & C++, a LabView and a Matlab.
- An image processing using a Matlab programming.
- Model Hamiltonian calculation with Hatree-Fock approximation (Hubbard model and Hubbard-Holstein model).

Publications

1. K. Kamala Bharathi, Won-Mo Lee, Ji Ho Sung, **Ji Soo Lim**, Seung Jin Kim, Kanghyun Chu, Jung Won Park, Jong Hyun Song, Moon-Ho Jo, and Chan-Ho Yang, "*Detection of electrically formed*

photosensitive area in Ca-doped $BiFeO_3$ thin films", **Applied Physics Letters,** 102, 012908 (2013).

2. Atsushi Ikeda-Ohno, **Ji Soo Lim**, Takuo Ohkochi, Chan-Ho Yang and Jan Seidel, "*Investigation of continuous changes in the electric-field-induced electronic state in $Bi_{1-x}Ca_xFeO_{3-\square}$*", **Physical Chemistry Chemical Physics**, 16, 17412-17416 (2014).
3. Songbai Hu, Zengji Yue, **Ji Soo Lim**, Sara J. Callori, Joel Bertinshaw, A. Ikeda-Ohno, Takuo Ohkochi, Chan-Ho Yang, X. Wang, Clemens Ulrich and Jan Seidel, "*Growth and Properties of Fully Strained $SrCoO_x$ (x>2.8) Thin Films on $DyScO_3$*", **Advanced Materials Interfaces**, 2, 1500012 (2015).
4. Hoyoung Jang, Glen Kerr, **Ji Soo Lim**, Chan-Ho Yang, Chi-Chang Kao and Jun-Sik Lee, "*Orbital reconstruction in a self-assembled oxygen vacancy nanostructure*", **Scientific Reports,** 5, 12402 (2015).
5. **Ji Soo Lim**, Jin Hong Lee, Atsushi Ikeda-Ohno, Takuo Ohkochi, Ki-Seok Kim, Jan Seidel, and Chan-Ho Yang, "*Electric-field-induced insulator to Coulomb glass transition via oxygen-vacancy migration in Ca-doped $BiFeO_3$*", **Physical Review B,** 94, 035123 (2016).
6. **Ji Soo Lim**, Jin Hong Lee, Heung-Sik Park, Ran Gao, Tae Yeong Koo, Lane W. Martin, Ramamoorthy Ramesh and Chan-Ho Yang, "*Ultrafast collective oxygen-vacancy flow in Ca-doped $BiFeO_3$*", **NPG Asia Materials**, 10, 943-955 (2018).
7. Heung-Sik Park, **Ji Soo Lim**, Jeonghun Suh and Chan-Ho Yang, "*Real-time observation of filamentary conduction pathways in Ca-doped $BiFeO_3$*". **Applied Physics Letters,** 115, 183901 (2019).
8. Han-Byul Jang, **Ji Soo Lim** and Chan-Ho Yang, "*Film-thickness-driven superconductor to bosonic insulator transition in cuprate superconductors*", **Scientific Reports,** 10, 3236 (2020).
9. **Ji Soo Lim** and Chan-Ho Yang, "*Charge-neutral defects control conductivity*", **Nature Materials**, *News & Views* (17 August 2020).
10. **Ji Soo Lim**, Jounghee Lee, Byeoung Ju Lee, Yong-Jin Kim, Heung-Sik Park, Jeonghun Suh, Ho-Hyun Nahm, Sang-Woo Kim, Byeong-Gwan Cho, Tae Yeong Koo, Eunjip Choi, Yong-Hyun Kim and Chan-Ho Yang, "*Harnessing the topotactic transition in oxide heterostructures for fast and high-efficiency electrochromic applications*", **Science Advances,** (2020).
11. Jeonghun Suh, **Ji Soo Lim,** Heung-Sik Park and Chan-Ho Yang, "*Complementary study of anisotropic ion conduction in (110)-oriented Ca-doped BiFeO3 films using electrochromism and impedance spectroscopy*", **Applied Physics Letters,** 119, 022902 (2021).
12. **Ji Soo Lim**, Ho-Hyun Nahm, Marco Campanini, Jounghee Lee, Yong-Jin Kim, Heung-Sik Park, Jeonghun Suh, Jun Jung, Yongsoo Yang, Tae Yeong Koo, Marta D Rossell, Yong-Hyun Kim, Chan-Ho Yang, "*Critical ionic transport across an oxygen-vacancy ordering transition*", **Nature Communications**, 13, 5130 (2022).
13. Heung-Sik Park*, **Ji Soo Lim***, Jeonghun Suh, Chan-Ho Yang, "*Electric-field-induced epitaxial*

breakdown and emergent magnetoresistance due to strong oxygen reduction in Ca-doped $BiFeO_3$", **Physical Review Materials**, 6, 024404 (2022).