Jeongkeun (Ryan) Song

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Professional Experience

Oak Ridge National Laboratory — 2024.04 - present
Postdoctoral Research Associate, PI: Dr. Ho Nyung Lee
Research Project: *Quantum phenomena in correlated oxides*

- Investigating quantum transport phenomena in correlated oxide films.
- Leading experiments to discover exotic functionalities in oxide freestanding membranes.

Seoul National University — 2023.09 - 2024.03
Postdoctoral Research Associate, PI: Prof. Changyoung Kim
Research Project: *Magnetotransport properties of altermagnetic oxide*

- Studied altermagnetic properties of RuO_2 films by using magnetotransport properties.
- Investigated altermagnetic band structure of RuO_2 films via ARPES

Education

Seoul National University — 2017.09 - 2023.08
Ph. D., Physics, Research Advisor: Prof. Tae Won Noh
Dissertation Title:
"*Investigation on strain-induced anomalous magnetotransport in antiferromagnetic pyrochlore iridate thin films*"

University of Illinois at Urbana-Champaign — 2013.09 - 2017.05
B.S., Engineering Physics (Focus: Condensed Matter Physics)

St. Mary's High School — 2009.09 - 2013.05
High School in Manhasset, NY

Honors and Awards

Young Scientist Award in Magnetism, Korean Physical Society — 2023.04
Best Oral Presentation Award, Korean Physical Society — 2022.10
Merit-based Scholarship, Seoul National University — 2019.03
Best Teaching Assistant Award, Seoul National University — 2018.03

Skills

Thin film growth
Pulsed laser deposition (PLD), target synthesis (solid-state reaction & spark plasma sintering).

Fabrication of Freestanding membranes via water-soluble sacrificial layer.

Characterization

High-resolution X-ray diffraction and atomic force microscopy.

Transport measurements

Electrical/magnetic transport with PPMS/MPMS, superconductivity via He3 option.

Device fabrication

Electrode deposition (e-Beam evaporator/lithography) and wiring techniques.

Languages

Fluent in Korean and English.

Selected Publications

J. Song, D. Kim, J. Jeong, S. H. Lee, T. Oh, S. Lee, S. Lee, S. Kang, B.-J. Yang, T. W. Noh, and C. Kim*, "Spin-orbit coupling driven magnetic response in altermagnetic RuO_2," *Small*, online Published (2024)

S. Shen†, T. Oh†, **J. Song**†, D. Tian†, X. Shu, Y. Zhang, F. Zhang, Di Yi, X. Li, T. W. Noh, B.-J. Yang, Y. Li*, and P. Yu*, "Selective control of electric charge of Weyl fermions in pyrochlore iridates," *Advanced Materials*, **36**, 2403306 (2024)

J. Song, J. Jeong, E. K. Ko, W. J. Kim, S. Lee, M. Kim, Y. Li, J. H. Lee* and T. W. Noh*, "Engineering Structural Homogeneity and Magnetotransport in strained $Nd_2Ir_2O_7$ thin films," *APL Materials* **11**, 061104 (2023).

J. Song, T. Oh, E. K. Ko, J. H. Lee, W. J. Kim, Y. Zhu, B.-J. Yang, Y. Li*, and T. W. Noh*, "Higher harmonics in planar Hall effect induced by cluster magnetic multipoles," *Nat. Commun.* **13**, 6501 (2022).

Advising/Teaching Experience

Supervising Experience, Oak Ridge National Laboratory

[UTK-ORNL]: Supervised 2 University of Tennessee at Knoxville graduate students in designing experiments to study novel STM properties of correlated oxides films.

[ORNL-RSI program]: Supervised 2 summer undergraduate interns to understand chemical mechanism of oxide freestanding membranes.

Teaching Assistant, Seoul National University

[General University Physics 1 (Spring 2019)]: Assisted in grading and test preparation, conducted office hours, and led section classes to support student learning.

[Electronic Circuits (Fall 2018)]: Supervised designing and performing electronic circuits

[General Physics] Introduction to laboratory experiments: Supervised designing and performing general physics experiments. Instructed general safety.

Activities and Outreach

Session chair: Exploring the Properties and Applications of Freestanding Membranes—From 2D to 3D, *MRS Fall meeting 2024*

Peer-reviewed journal articles for *Nature, Nature Nanotechnology, Science Advances, Nano Letters, APL Materials, Physical Review Letters*

Invited Talks

"Exotic magnetotransport phenomena in correlated oxide films" *MRS Spring 2025*	2025.04
"Investigation of strain-induced anomalous magnetotransport in antiferromagnetic $Nd_2Ir_2O_7$ thin films" *Stanford Institute for Materials and Energy Sciences*	2023.02
"Investigation of magnetotransport properties in antiferromagnetic pyrochlore iridate films" *Condensed Matter Seminar at Materials Science Division, Argonne National Laboratory*	2023.01
"Exotic transport properties of strained pyrochlore iridate films" *IRG Seminar, Cornell University*	2022.09

Military Services

Professional research personnel	2020.09 -2023.09

Full Publication list

1. Shengchun Shen[†], Taekoo Oh[†], **Jeongkeun Song**[†], Di Tian[†], Xinyu Shu, Yang Zhang, Fan Zhang, Di Yi, Xiaoguang Li, Tae Won Noh, Bohm-Jung Yang, Yangyang Li, and Pu Yu, "Selective control of electric charge of Weyl fermions in pyrochlore iridates." Advanced Materials, online published (2024).

2. Yunkyu Park, Seoung-Hun Kang, **Jeongkeun Song**, Sang Woon Hwang, Shan Lin, Jong Mok Ok, Fazhi Yang, Hwangsun Kim, Andrew R. Lupini, Mina Yoon, Sangmoon Yoon, Hua Zhou, Ho Nyung Lee, "Strain Programming of Oxygen Octahedral Symmetry in Perovskite Oxide Thin Films." Advanced Materials Interface, online published (2024).

3. Donghan Kim, Byungmin Sohn, Yeonjae Lee, **Jeongkeun Song**, Mi Kyung Kim, Minjae Kim, and Changyoung Kim, "Strain tunable electronic ground states in two-dimensional iridate thin films." Applied Surface Science **657**, 159801 (2024).

4. **Jeongkeun Song**, Donghan Kim, Ji Hwan Jeong, Seung Hoon Lee, Taekoo Oh, Sangjae Lee, Suyoung Lee, San Kang, Bohm-Jung Yang, Tae Won Noh, and Changyoung Kim, "Spin-orbit coupling driven magnetic response in altermagnetic RuO_2." Small, online published (2024).

5. Jihwan Jeong, Baekjune Kang†, **Jeongkuen Song**†, Sangmin Lee, Choong Hyun Kim, Uksam Choi, Eun Kyo Ko, Jong Hwa Lee, Ji Hye Lee, Miyoung Kim, Tae Won Noh, and Changhee Sohn, "Transparent Conducting Oxide $SrNbO_3$ Thin Film with Record High Figure of Merit" Journal of the European Ceramic Society **44**, 6764 (2024).

6. **Jeongkeun Song**, Jihwan Jeong, Eun Kyo Ko, Ji Hye Lee, Woo Jin Kim, Sangmin Lee, Miyoung Kim, Yangyang Li, Tae Won Noh, "Engineering Structural Homogeneity and Magnetotransport in strained $Nd_2Ir_2O_7$ thin films" APL Materials **11**, 061104 (2023).

7. Junsik Mun, Eun Kyo Ko, Baekjune Kang, Byeongjun Gil, Choong H. Kim, Sungsoo Hahn, **Jeongkeun Song**, Yimei Zhu, Changhee Sohn, Tae Won Noh, and Miyoung Kim, "Extended oxygen octahedral tilt proximity near oxide heterostructures" Nano Lett. **23**, 1036-1043 (2023).

8. Eun Kyo Ko, Sungsoo Hahn, Changhee Sohn, Sangmin Lee, Seung-Sup B. Lee, Byungmin Sohn, Jeong Rae Kim, Jaeseok Son, **Jeongkeun Song**, Youngdo Kim, Donghan Kim, Miyoung Kim, Choong H. Kim, Changyoung Kim, "Tuning orbital-selective phase transitions in a two-dimensional Hund's correlated system" Nature Communications **14 (1)**, 3572 (2023).

9. **Jeongkeun Song**, Taekoo Oh, Eun Kyo Ko, Ji Hye Lee, Woo Jin Kim, Yangyu Zhu, Bohm-Jung Yang, Yangyang Li, and Tae Won Noh, "Higher harmonics in planar Hall effect induced by cluster magnetic multipoles" Nature Communications **13**, 6501 (2022).
10. Woo Jin Kim, **Jeongkeun Song**, Yangyang Li, Tae Won Noh, "Perspective on solid-phase epitaxy as a method for searching novel topological phases in pyrochlore iridate thin films" APL Mater. **10**, 080901 (2022).

11. Yangyang Li, Taekoo Oh, Jaeseok Son, **Jeongkeun Song**, Mi Kyung Kim, Dongjun Song, Sukhyun Kim, Seo Hyoung Chang, Changyoung Kim, Bohm-Jung Yang, Tae Won Noh, "Correlated Magnetic Weyl Semimetal State in Strained $Pr_2Ir_2O_7$" Adv. Mat. **33**, 2008528 (2021).

12. Woo Jin Kim, Taekoo Oh, **Jeongkeun Song**, Eun Kyo Ko, Yangyang Li, Junsik Mun, Bongju Kim, Jaeseok Son, Zhuo Yang, Yoshimitsu Kohama, Miyoung Kim, Bohm-Jung

Yang, Tae Won Noh, “Strain engineering of the magnetic multipole moments and anomalous Hall effect in pyrochlore iridate thin films” Sci. adv. **6**, eabb1539 (2020).

13. Eun Kyo Ko, Junsik Mun, Han Gyeol Lee, Jinkwon Kim, **Jeongkeun Song**, Seo Hyoung Chang, Tae Heon Kim, Suk Bum Chung, Miyoung Kim, Lingfei Wang, Tae Won Noh, “Oxygen Vacancy Engineering for Highly Tunable Ferromagnetic Properties: A Case of $SrRuO_3$ Ultrathin Film with a $SrTiO_3$ Capping Layer” Adv. Funct. Mat. **30**, 2001486 (2020).