Younghwan Lee

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CURRENT AFFILIATION

Assistant professor Chonnam National University, Materials Science and Engineering
Mar. 2024 – present

CAREER

Postdoctoral researcher Seoul National University, Materials Science and Engineering
Prof. Min Hyuk Park's group
Jun. 2022 – Feb. 2024

EDUCATION

Ph. D. North Carolina State University, Materials Science and Engineering
Advisor: Prof. Jacob L. Jones
Thesis: Interface Engineering in Ferroelectric $Hf_{0.5}Zr_{0.5}O_2$ thin films
Aug. 2017 – May. 2022

M. S. Seoul National University, Materials Science and Engineering
Advisor: Prof. Shinhoo Kang
Thesis: Densification Behavior and Sintering Mechanism of $MgAl_2O_4$ with Small Addition of Alkaline Earth Metal Carbonates
Mar. 2015 – Aug. 2017

B. S. Pusan National University, Materials Science and Engineering
Advisor: Prof. Hongchae Park
Mar. 2008 - Feb. 2015

RESEARCH INTEREST (KEYWORD)

Ferroelectrics, X-ray Diffraction, HfO_2, Thin film, Atomic layer deposition, Electroceramics

HONORS AND AWARDS

Carolina Science Symposium 2021 (Nov. 11–12, 2021)

- Best overall oral prize (sponsored by AVS Mid-Atlantic)
- ASM Hans Stadelmaier Award
- NCSU Nanofabrication Facility Best Poster Award

Joint conference of the IEEE ISAF-PFM-ECAPD 2022 (Jun. 27 – Jul. 1, 2022)

- Finalist of Best Student Paper Award

Carolina Science Symposium 2019 (Nov. 8, 2019)

- NCSU Nanofabrication Facility Best Poster Award

PUBLICATIONS

Journal Papers

1. **Lee, Y.**[†], Kim, S. H.[†], Jeong, H. W., Park, G. H., Lee, J., Kim, Y. Y., & Park, M. H. (2024). Mitigation of field-driven dynamic phase evolution in ferroelectric $Hf_{0.5}Zr_{0.5}O_2$ films by adopting oxygen-supplying electrode. *Applied Surface Science*, 648, 158948. ([†]**co-1st author**)

2. Kim, S. H.[†], **Lee, Y.** [†], Lee, D. H. [†], Park, G. H., Jeong, H. W., Yang, K., ... & Park, M. H. (2024). Depolarization mitigated in ferroelectric $Hf_{0.5}Zr_{0.5}O_2$ ultrathin films (< 5 nm) on Si substrate by interface engineering. *Journal of Advanced Ceramics.* ([†]**co-1st author**)

3. Lee, J., Kim, S. H., Choi, H., Jeong, H. W., Yang, K., Park, J. Y., ... **Lee, Y.**[*] & Park, M. H.[*] (2024). Ferroelectricity of $Hf_{0.5}Zr_{0.5}O_2$ Thin Film Induced at 350 ^oC by Thermally Accelerated Nucleation During Atomic Layer Deposition. *IEEE Transactions on Electron Devices*. ([*]**co-corresponding author**)

4. Silva, J. P., Alcala, R., Avci, U. E., Barrett, N., Bégon-Lours, L., Borg, M., ... & Schroeder, U. (2023). "Roadmap on ferroelectric hafnia-and zirconia-based materials and devices." *APL Materials*, 11(8).

5. Lee, D. H., Park, G. H., Kim, S. H., Yang, K., Lee, J., Choi, H., ... & Park, M. H. (2023). Effect of Electrode Material on the Polarization Switching Kinetics of $Hf_{0.5}Zr_{0.5}O_2$ film. *IEEE Electron Device Letters*.

6. Lee, D. H.[†], **Lee, Y.**[†], Cho, Y. H., Choi, H., Kim, S. H., & Park, M. H. (2023). Unveiled Ferroelectricity in Well-Known Non-Ferroelectric Materials and Their Semiconductor Applications. *Advanced Functional Materials*, 2303956. ([†]**co-1st author**)

7. Hsain, H. A.[†], **Lee, Y.**[†], Lomenzo, P. D., Alcala, R., Xu, B., Mikolajick, T., ... & Jones, J. L. (2023). Wake-up free ferroelectric hafnia-zirconia capacitors fabricated via vacuum-maintaining atomic layer deposition. *Journal of Applied Physics*, 133(22). ([†]**co-1st author**)

8. **Lee, Y.** [†], Jeong, H. W.[†], Kim, S. H., Yang, K., & Park, M. H. (2023). Effect of stress on fluorite-structured ferroelectric thin films for semiconductor devices. *Materials Science in Semiconductor Processing*, 160, 107411. ([†]**co-1st author**)

9. Park, J. Y.[†], Lee, D. H.[†], Park, G. H., Lee, J., **Lee, Y.**[*], & Park, M. H.[*] (2023). A perspective on the physical scaling down of hafnia-based ferroelectrics. *Nanotechnology*, 34(20), 202001. ([*]**co-corresponding author**)

10. Yang, K.[†], Kim, S. H.[†], Jeong, H. W., Lee, D. H., Park, G. H., **Lee, Y.**[*], & Park, M. H.[*] (2023). Perspective on Ferroelectric Devices: Lessons from Interfacial Chemistry. *Chemistry of Materials*, 35(6), 2219-2237 ([*]**co-corresponding author**)

11. Hsain, H. A., **Lee, Y.**, Lancaster, S., Lomenzo, P. D., Xu, B., Mikolajick, T., ... & Jones, J. L. (2023). Reduced fatigue and leakage of ferroelectric TiN/$Hf_{0.5}Zr_{0.5}O_2$/TiN capacitors by thin alumina interlayers at the top or bottom interface. *Nanotechnology*, 34(12), 125703.

12. **Lee, Y.**, Broughton, R. A., Hsain, H. A., Song, S. K., Edgington, P. G., Horgan, M. D., ... & Jones, J. L. (2022). "The influence of crystallographic texture on structural and electrical properties in ferroelectric $Hf_{0.5}Zr_{0.5}O_2$." *Journal of Applied Physics*, 132(24), 244103.

13. Hsain, H. A., **Lee, Y.**, Lancaster, S., Materano, M., Alcala, R., Xu, B., ... & Jones, J. L. (2022). "Role of Oxygen Source on Buried Interfaces in Atomic-Layer-Deposited Ferroelectric Hafnia–Zirconia Thin Films." *ACS Applied Materials & Interfaces*, 14(37), 42232-42244.

14. Payne, A., Alex Hsain, H., **Lee, Y.**, Strnad, N. A., Jones, J. L., & Hanrahan, B.* (2022). "Thermal stability of antiferroelectric-like Al: HfO_2 thin films with TiN or Pt electrodes." *Applied Physics Letters*, 120(23), 232901.

15. Schroeder, U., Mittmann, T., Materano, M., Lomenzo, P. D., Edgington, P., **Lee, Y. H.**, ... & Jones, J. L.* (2022). "Temperature-Dependent Phase Transitions in $Hf_xZr_{1-x}O_2$ Mixed Oxides: Indications of a Proper Ferroelectric Material." *Advanced Electronic Materials*, 2200265.

16. Hsain, H. A., **Lee, Y.**, Materano, M., Mittmann, T., Payne, A., Mikolajick, T., ... & Jones, J. L.* (2022). "Many routes to ferroelectric HfO_2: A review of current deposition methods." *Journal of Vacuum Science & Technology A: Vacuum, Surfaces, and Films*, 40(1), 010803.

17. Shekhawat, A., Hsain, H. A., **Lee, Y.**, Jones, J. L., & Moghaddam, S.* (2021). "Effect of ferroelectric and interface films on the tunneling electroresistance of the Al_2O_3/ $Hf_{0.5}Zr_{0.5}O_2$ based ferroelectric tunnel junctions." *Nanotechnology*, 32(48), 485204.

18. Lee, D. H.†, **Lee, Y.**†, Yang, K., Park, J. Y., Kim, S. H., Reddy, P. R. S., ... & Park, M. H.* (2021). "Domains and domain dynamics in fluorite-structured ferroelectrics." *Applied Physics Reviews*, 8(2), 021312. (†**co-1st author**)

19. **Lee, Y.**, Alex Hsain, H., Fields, S. S., Jaszewski, S. T., Horgan, M. D., Edgington, P. G., ... & Jones, J. L.* (2021). "Unexpectedly large remanent polarization of $Hf_{0.5}Zr_{0.5}O_2$ metal–ferroelectric–metal capacitor fabricated without breaking vacuum." *Applied Physics Letters*, 118(1), 012903.

20. Park, J. Y.†, Yang, K.†, Lee, D. H.†, Kim, S. H.†, **Lee, Y.**, Reddy, P. S., ... & Park, M. H.* (2020). "A perspective on semiconductor devices based on fluorite-structured ferroelectrics from the materials–device integration perspective." *Journal of Applied Physics*, 128(24), 240904.

21. Hsain, H. A., **Lee, Y.**, Parsons, G., & Jones, J. L.* (2020). "Compositional dependence of crystallization temperatures and phase evolution in hafnia-zirconia $(Hf_xZr_{1-x})O_2$ thin films." *Applied Physics Letters*, 116(19), 192901.

22. Strader, P., **Lee, Y.**, Teska, P., Li, X., & Jones, J. L.* (2019). "Approaches for characterizing surfaces damaged by disinfection in healthcare." *Nano LIFE*, 9(04), 1950002.

23. Nam, S., Lee, M., Kim, B. N., **Lee, Y.**, & Kang, S.* (2017). "Morphology controlled Co-precipitation method for nano structured transparent $MgAl_2O_4$." *Ceramics International*, 43(17), 15352-15359.

RESEARCH PROJECTS

Developing emerging neuromorphic synapse devices based on Ferroelectric Tunneling Junctions (FTJs) using fluorite-structured ferroelectric thin films (**principal investigator**)

- Amount: $ ~150 k (180 million won)
- Period: 2022.9.1–2025.8.31 (terminated at 2024.2.29 due to change of affiliation)
- Grant No.: 2022R1A6A3A0108683211

CONFERENCES

Oral Presentation

Korean Conference on Semiconductors 2024 (Jan. 24 – 26, 2024)

Joint conference of the IEEE ISAF-ISIF-PFM 2023 (Jul. 23 – 27, 2023)

Korean Conference on Semiconductors 2023 (Feb. 13 – 15, 2023)

Fall meeting of the Korean Ceramic Society 2022 (Oct. 26 – 28, 2022)

Materials Science & Technology 2022 (Oct. 9–12, 2022)

Joint conference of the IEEE ISAF-PFM-ECAPD 2022 (Jun. 27 – Jul. 1, 2022)

Carolina Science Symposium 2021 (Nov. 11–12, 2021)

Carolina Science Symposium 2020 (Nov. 12, 2020)

Joint Conference of the IEEE IFCS-ISAF (Jul. 19–23, 2020)

Poster Presentation

Carolina Science Symposium 2019 (Nov. 8, 2019)

Fall meeting of the Korean Ceramic Society 2016 (Nov. 23–25, 2016)

REFERENCES

Available upon request.