

Seong Gyu Lee

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RESEARCH INTERESTS

- Electro-chemo-mechanical phenomena at the anodic interface in solid-state batteries
- Interfacial and interphase engineering for Li-metal and anode-free systems
- Carbon-scaffold and binder strategies for scalable, low-pressure all-solid-state cell operation

EDUCATION

Hanyang University, Seoul, Republic of Korea

Mar. 2021 – Aug. 2026

Integrated Ph.D./M.S. Program, Department of Energy Engineering

Advisor: Prof. Yun Jung Lee · Degree conferral expected August 2026

Hanyang University, Seoul, Republic of Korea

Mar. 2015 – Feb. 2021

B.S. in Energy Engineering

PUBLICATIONS

‡ *Equal contribution* **corresponding author*

First-Authored / Co-First-Authored

- [1] **Seong Gyu Lee**‡ et al., “Graphite-in-Carbon Black Scaffolds for Durable, Low-Cost Li-Free Solid-State Batteries via Asymmetric Li Plating and Stripping Pathways,” ACS Energy Letters, under review.
- [2] **Seong Gyu Lee**‡, et al., “Scavenging Meets Reinforcement: A Dual-Functional Electrolyte Additive Approach to Dendrite-Free Lithium-Metal All-Solid-State Batteries under Low-Pressure,” Small, 2025, e08049.
- [3] Dayoung Jun‡, **Seong Gyu Lee**‡, et al., “Oxide-Based Nanoporous Interlayer for Durable Anodic Interface in All-Solid-State Lithium Metal Batteries,” ACS Energy Letters, 2024, 9(7), 3475–3483.
- [4] Gyu Hyeon Lee‡, **Seong Gyu Lee**‡, et al., “Interface engineering on a Li metal anode for an electro-chemo-mechanically stable anodic interface in all-solid-state batteries,” Journal of Materials Chemistry A, 2022, 10(19), 10662–10671.

Co-Authored

- [5] Dayoung Jun‡, Ji Eun Jung‡, Haena Yim, Haejoo Yim, **Seong Gyu Lee**, Kyu Seok Kim, Seihyun Shim, Tae Eun Kim, and Yun Jung Lee*, “Solubility Does Not Matter: Engineered Anode Architectures Activate Cost-Effective Metals for Controlled Lithium Morphology in Li-Free All-Solid-State Batteries,” Advanced Energy Materials, 2025, e02956.
- [6] Dayoung Jun‡, Kyu Seok Kim‡, Tae Eun Kim, Seihyun Shim, **Seong Gyu Lee**, Ji Eun Jung, Ji Young Kim, Ki Yoon Bae, Samick Son, and Yun Jung Lee*, “Strategic cathode configuration for incorporating sacrificial materials in all-solid-state batteries: Mixed vs. separate layer,” Energy Storage Materials, 2025, 78, 104258.
- [7] Dayoung Jun‡, Se Hwan Park‡, Ji Eun Jung, **Seong Gyu Lee**, Kyu Seok Kim, Ji Young Kim, Ki Yoon Bae, Samick Son, and Yun Jung Lee*, “Ultra-Stable Breathing Anode for Li-Free All-Solid-State Battery Based on Li Concentration Gradient in Magnesium Particles,” Advanced Functional Materials, 2024, 34(8), 2310259.
- [8] Sol Hui Park‡, Nam Kyeong Lee‡, **Seong Gyu Lee**, Ji Hyun Han, and Yun Jung Lee*, “Zero-strain cathodes for lithium-based rechargeable batteries: a comprehensive review,” ACS Applied Energy Materials, 2023, 6(1), 12–30.

- [9] Se Hwan Park, Dayoung Jun, Gyu Hyeon Lee, **Seong Gyu Lee**, Ji Eun Jung, and Yun Jung Lee*, “Designing 3D Anode Based on Pore-Size-Dependent Li Deposition Behavior for Reversible Li-Free All-Solid-State Batteries,” *Advanced Science*, 2022, 9(28), 2203130.
- [10] Se Hwan Park‡, Dayoung Jun‡, Ji Eun Jung, **Seong Gyu Lee**, Gyu Hyeon Lee, and Yun Jung Lee*, “Clarification of Li deposition behavior on anodes with a porous interlayer in Li-free all-solid-state batteries,” *Journal of Materials Chemistry A*, 2022, 10(41), 21995–22006.
- [11] Se Hwan Park‡, Dayoung Jun‡, Gyu Hyeon Lee, **Seong Gyu Lee**, and Yun Jung Lee*, “Toward high-performance anodeless batteries based on controlled lithium metal deposition: a review,” *Journal of Materials Chemistry A*, 2021, 9(26), 14656–14681.

PRESENTATIONS

- “Dual-Functional Additive Design for Low-Pressure and Dendrite-Free Operation of All-Solid-State Lithium Metal Batteries,” Gordon Research Conference on Batteries, Ventura, CA, Feb. 2026. **[Poster]**
- “A Dual-Functional Additive Strategy for Low-Pressure Operation and Dendrite Suppression in All-Solid-State Batteries,” Korean Electrochemical Society (KECS) Fall Meeting, 2025. **[Oral]**
- “Oxide-Based Nanoporous Interlayer for Enhanced Anodic Stability in All-Solid-State Lithium Metal Batteries,” 248th Electrochemical Society (ECS) Meeting, 2025. **[Poster]**
- “Inorganic Protective Interlayer based on Solution-Phase Synthesis for Anodic Interface in Li Metal All-Solid-State Batteries,” Materials Research Society (MRS) Fall Meeting, Boston, MA, Dec. 2024. **[Poster]**
- “Solution-Phase Synthesis of Li Metal Protective Interlayer for Stable Anodic Interface in All-Solid-State Batteries,” European Materials Research Society (E-MRS) Fall Meeting, Warsaw, Sep. 2023. **[Oral]**

AWARDS & FELLOWSHIPS

Doctoral Student Research Fellowship	2024 – 2026
Hyundai Motor Chung Mong-Koo Scholarship	2022 – 2026
Brain Korea 21 Four (BK21) Scholarship	2021 – 2026
Excellence Award (2nd place), Best Oral Presentation — KECS Fall Meeting	2025
Best Poster Award (3rd place), SEED Program — UKC 2025	2025
US-Korea Conference on Science, Technology, and Entrepreneurship (KSEA)	
Excellence Award, HY-BK G3 Program — Hanyang University	2022, 2024

PATENTS

13 patent applications and filings (domestic KR, PCT, U.S., and China) related to all-solid-state battery architectures, composite solid electrolytes, anode design, and functional binder strategies.

TECHNICAL SKILLS

Electrochemistry: Galvanostatic cycling, critical current density (CCD) testing, EIS, GITT, CV, LSV, dQ/dV analysis

Cell fabrication: Sulfide electrolyte preparation, electrode casting, pressure-controlled stack assembly and testing

Characterization: SEM, FIB-SEM, XRD, XPS, FT-IR, Raman, DSC, SIMS, surface profilometry, optical microscopy, X-ray tomography, in-situ pressiometry