

Se-Hee Lee

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EDUCATION

Ph.D. in Materials Science and Engineering, February 1997, Seoul National University
Dissertation title: *A Study on the Electrochromic Phenomenon of Ni-W Oxide with Electrochemical Insertion of Lithium*

M.S. in Materials Science and Engineering, February 1993, Seoul National University

B.S. in Materials Science and Engineering, February 1991, Seoul National University

M.S. and Ph.D. advisor: Professor SK Joo, Seoul National University

Post-Doctoral advisor: David Benson, National Renewable Energy Laboratory

EMPLOYMENT

Professor, Department of Mechanical Engineering, University of Colorado at Boulder (2014-present)

Associate Professor, Department of Mechanical Engineering, University of Colorado at Boulder (2007-2014)

Invited Professor, Department of Materials Science and Engineering at Seoul National University (Leave of absence for one year, 8/2009-7/2010, from CU Boulder to participate in the World Class University Program at Seoul National University) (2009-2010)

Senior Scientist II, National Renewable Energy Laboratory (2007-2007)

Senior Scientist I, National Renewable Energy Laboratory (2001-2007)

Staff Scientist, National Renewable Energy Laboratory (1999-2001)

Postdoctoral Appointee, National Renewable Energy Laboratory (1997-1999)

PROFESSIONAL RECOGNITION, HONORS, AND ACTIVITIES

- Outstanding Researcher, Department of Mechanical Engineering, University of Colorado at Boulder 9/2015.
- Co-Founder of SiLion (2015)
- Co-Founder of the Solid Power (2013).
- Mollenkopf Faculty Fellowship, College of Engineering and Applied Science, University of Colorado, Boulder CO, 2013-2018.
- 2012 Provost's Faculty Achievement Award, University of Colorado, Boulder CO.
- 2010 CO-LABS Governor's Award for High-Impact Research (Research team for the development of electrochromic windows).
- Founding Research Fellow at the RASEI (Renewable and Sustainable Energy Institute) 2009-present.
- 2009 R&D 100 Award, PowerPlane UX Microbattery - a solid-state thin-film battery.
- World Class University Professor, Hybrid Materials Major at Seoul National University, 2009.

- Invited speaker in the National Academy of Engineering 2008 Japan-American Frontiers of Engineering Symposium, Kobe, Japan Nov 17-19, 2008.
- Outstanding Graduate Educator, Department of Mechanical Engineering, University of Colorado at Boulder 9/2008.
- Technology Transfer Award, National Renewable Energy Laboratory 12/2006.
- Team of the Quarter, National Renewable Energy Laboratory 04/2006.
- Outstanding Performance Awards, National Renewable Energy Laboratory 03/2006.
- Employee of the Month, National Renewable Energy Laboratory 01/2000.
- Employee of the Month, National Renewable Energy Laboratory 09/1998.
- Member, Materials Research Society (MRS), American Ceramics Society (ACerS), Electrochemical Society (ECS)
- Technical session organizer, chair, or co-chair at numerous conferences and technical meetings annually.

RESEARCH PUBLICATIONS

Archival Journals

1. “Structural engineering developments in sulfide solid-state electrolytes for lithium and sodium solid-state batteries” Mohammad Sufiyan Nafis, Zhiming Liang, Se-Hee Lee, Chunmei Ban, *Nano Energy*, 133, 110447 (2025).
2. “Ionic Covalent Organic Frameworks Consisting of Tetraborate Nodes and Flexible Linkers” Lacey J. Wayment, Shaofeng Huang, Hongxuan Chen, Dr. Zepeng Lei, Ashley Ley, Prof. Se-Hee Lee, Wei Zhang, *Angew. Chem. Int. Ed.*, 63, 42, e202410816 (2024).
3. “Functional Polymer Thin Films for Establishing an Effective Electrode Interface in Sulfide-Based Solid-State Batteries” Sungjin Cho, Youson Kim, Youngjin Song, Jin Ryu, Keonwoo Choi, Junyeong Yang, Se-Hee Lee, Sung Gap Im, and Soojin Park, *Advanced Functional Materials*, 34, 32 2314710 (2024).
4. “Improved Cycle Properties of All-solid-state Li-ion Batteries with Al₂O₃ Coating on the Silicon-based Anode” Jejun Jeong, Kikang Lee, Cole Carpenter, Sushovan Shrestha, Jongbeom Kim, Hee-Suk Chung, Jeongtak Moon, Kyu Hwan Oh, Jeong-Yun Sun, Se-Hee Lee, *Journal of Energy Engineering*, 150 2 (2024).
5. “Effect of Polyacrylonitrile Surface Coating on Electrochemical Performance of LiNi_{0.8}Mn_{0.1}Co_{0.1}O₂ in All Solid-State Batteries” Sushovan Shrestha, Cole Carpenter, Jongbeon Kim, Jejun Jeong, Hye Jin Lee, Seul Cham Kim, Hoe Jin Hah, Min-Sang Song, Kyuhwan Oh and Se-Hee Lee, *Journal of The Electrochemical Society*, 169, 060541 (2022).
6. “Effect of Amorphous LiPON Coating on Electrochemical Performance of LiNi_{0.8}Mn_{0.1}Co_{0.1}O₂ (NMC811) in All Solid-State Batteries” Shrestha Sushovan, Jongbeon Kim, Jejun Jeong, Hye Jin Lee, Seul Cham Kim, Hoe Jin Hah, Kyuhwan Oh, Se-Hee Lee, *Journal of The Electrochemical Society*, 168 060537 (2021).
7. “Covalent organic framework based lithium-ion battery: Fundamental, design and characterization” Wei Zhang Yiming Hu, Lacey J. Wayment, Catherine Haslam, Xiye Yang, Se-hee Lee, Yinghua Jin, *EnergyChem*, 3, 100048 (2021).
8. “Local electrical degradations of solid-state electrolyte by nm-scale operando imaging of ionic and electronic transports” C.-S. Jiang, Y. Yin, H. Guthrey, K. Park, S.-H. Lee, M. M. Al-Jassim, *Journal of Power Sources*, 481, 229138 (2021).
9. “Nonuniform Ionic and Electronic Transport of Ceramic and Polymer/Ceramic Hybrid Electrolyte by Nanometer-Scale Operando Imaging for Solid-State Battery” Chun-Sheng

- Jiang, Nathan Dunlap, Yejing Li, Harvey Guthrey, Ping Liu, Se-Hee Lee, and Mowafak M. Al-Jassim, *Adv. Energy Mater.* 10, 2000219 (2020).
10. "Towards the Commercialization of the All-Solid-State Li-ion Battery: Local Bonding Structure and the Reversibility of Sheet- Style Si-PAN Anodes," Nathan Arthur Dunlap, Jongbeom Kim, Harvey Guthery, Chun-Sheng Jiang, Ian Morrissey, Conrad R. Stoldt, Kyu Hwan Oh, Mowafak Al-Jassim, and Se-Hee Lee, *Journal of The Electrochemical Society*, 167 060522 (2020).
 11. "A Truxenone-based Covalent Organic Framework as an All-Solid-State Lithium-Ion Battery Cathode with High Capacity" Xiye Yang, Yiming Hu , Nathan Dunlap, Xubo Wang, Shaofeng Huang, Zhiping Su, Sandeep Sharma, Yinghua Jin, Fei Huang, Xiaohui Wang, Se-hee Lee, and Wei Zhang, *Angew. Chem. Int. Ed.*, 59, 1 – 6 (2020).
 12. "Lithium Dendrite Growth Suppression and Ionic Conductivity of Li₂S-P₂S₅-P₂O₅ Glass Solid Electrolytes Prepared by Mechanical Milling" SHL Mazlum Cengiz, Hyukkeun Oh, *Journal of the Electrochemical Society* 166 (16), A3997-A4004 (2019).
 13. "Slurry-Coated Sheet-Style Sn-PAN Anodes for All-Solid-State Li-Ion Batteries" NA Dunlap, J Kim, KH Oh, SH Lee, *Journal of the Electrochemical Society* 166 (6), A915-A922 (2019).
 14. "High-Energy Nickel-Rich Layered Cathode Stabilized by Ionic Liquid Electrolyte" A Heist, S Hafner, SH Lee, *Journal of the Electrochemical Society* 166 (6), A873-A879 (2019).
 15. "Electrochemical Analysis of Factors Affecting the Kinetic Capabilities of an Ionic Liquid Electrolyte" A Heist, SH Lee, *Journal of the Electrochemical Society* 166 (8), A1677-A1684 (2019).
 16. "Crystalline Lithium Imidazolate Covalent Organic Frameworks with High Li-Ion Conductivity" Y Hu, N Dunlap, S Wan, S Lu, S Huang, I Sellinger, M Ortiz, Y Jin, S Lee, Wei Zhang, *Journal of the American Chemical Society* 141 (18), 7518-7525 (2019).
 17. "Synchronized electrospinning and electrospraying technique for manufacturing of all-solid-state lithium-ion batteries" S Hafner, H Guthrey, SH Lee, C Ban, *Journal of Power Sources* 431 (15), 17-24 (2019)
 18. "Improved Stability and Rate Capability of Ionic Liquid Electrolyte with High Concentration of LiFSI" A Heist and S-H Lee, *Journal of the Electrochemical Society* 166 (10), A1860 (2019).
 19. "Nanostructured Si/C Fibers as a Highly Reversible Anode Material for All-Solid-State Lithium-Ion Batteries" KB im, NA Dunlap, SS Han, JJ Jeong, SC Kim, KH Oh, SH Lee, *Journal of The Electrochemical Society*, 165 (9) A1903 (2018).
 20. "Operando X-ray photoelectron spectroscopy of solid electrolyte interphase formation and evolution in Li₂S-P₂S₅ solid-state electrolytes," Kevin N. Wood, K. Xerxes Steirer, Simon E. Hafner, Chunmei Ban, Se-Hee Lee, and Glenn Teeter, *Nature Communications* 9, 2490 (2018).
 21. "Simple and inexpensive coal-tar-pitch derived Si-C anode composite for all-solid-state Li-ion batteries," Nathan A. Dunlap, S. Kim, J. J. Jeong, K. H. Oh, Se-Hee Lee, *Solid State Ionics*, 324, 207-217 (2018).
 22. "Tailored Organic Electrode Material Compatible with Sulfide Electrolyte for Stable All-Solid-State Sodium Batteries," Xiaowei Chi, Yanliang Liang, Fang Hao, Ye Zhang, Justin Whiteley, Hui Dong, Pu Hu, Sehee Lee, and Yan Yao, *Angewandte Chemie International Edition*, 57, 2630 (2018).
 23. "Self-Contained Fragmentation and Interfacial Stability in Crude Micron-Silicon Anodes" Ashley Heist, DanielaMolina Piper, Tyler Evans, Seul Cham Kim, Sang Sub Han, Kyu Hwan Oh, and Se-Hee Lee, *Journal of The Electrochemical Society*, 165 (2) A244-A250 (2018).

24. "Electrophoretic kinetics of concentrated TiO₂ nanoparticle suspensions in aprotic solvent," SY Lee, JR Yim, SH Lee, IS Choi, K Nam, YC Joo, *Electronic Materials Letters*, 14, 79-82 (2018)
25. "Stable Lithium Deposition Using a Self-Optimizing Solid Electrolyte Composite," Justin M. Whiteley, Simon Hafner, Chengpu Zhu, Wei Zhang, and Se-Hee Lee, *Journal of The Electrochemical Society*, 164 (13) A2962-A2966 (2017).
26. "In Situ Engineering of the Electrode-Electrolyte Interface for Stabilized Overlithiated Cathodes," T. Evans, Piper, Daniela Molina et al. *Advanced Materials*, 29, 1604549 (2017).
27. "All-solid-state disordered LiTiS₂ pseudocapacitor," Justin M. Whiteley, Simon Hafner, Sang Sub Han, Seul Cham Kim, Viet-Duc Le, Chunmei Ban, Yong Hyun Kim, Kyu Hwan Oh and Se-Hee Lee, *J. Mater. Chem. A*, 5, 15661 (2017).
28. "Ex Situ Investigation of Anisotropic Interconnection in Silicon-Titanium-Nickel Alloy Anode Material" Cho, Jong-Soo; Alaboina, Pankaj Kumar; Kang, Chan-Soon; et al. *Journal of the Electrochemical Society*, 164, A968-A972 (2017).
29. "Controlled Growth of Nanostructured Biotemplates with Cobalt and Nitrogen Codoping as a Binderless Lithium-Ion Battery Anode," TM Huggins, JM Whiteley, CT Love, K Lee, SH Lee, ZJ Ren, JC Biffinger, *ACS Applied Materials and Interfaces*, 8, 40, 26868-26877 (2016).
30. "Cross-Linked Aluminum Dioxymethylene Coating for Stabilization of Silicon Electrodes," Daniela Molina Piper, Younghee Lee, Seoung-Bum Son, Tyler Evans, Feng Lin, Dennis Nordlund, Xingcheng Xiao, Steven M. George, Se-Hee Lee, and Chunmei Ban, *Nano Energy*, 22, 202-210 (2016).
31. "FeS₂-Imbedded Mixed Conducting Matrix as a Solid Battery Cathode," JM Whiteley, S. Hafner, SS Han, SC Kim, KH Oh, SH Lee, *Advanced Energy Materials*, 6, 1600495 (2016).
32. "High-capacity and highly reversible silicon-tin hybrid anode for solid-state lithium-ion batteries," Justin M. Whiteley, Ji Woo Kim, Daniela Molina Piper, and Se-Hee Lee, *Journal of the Electrochemical Society*, 163, A251 (2016).
33. "Ionic Covalent Organic Frameworks with Spiroborate Linkage," Ya Du, Haishen Yang, Justin Michael Whiteley, Shun Wan, Yinghua Jin, Se-Hee Lee, and Wei Zhang, *Angewandte Chemie International Edition*, 55, 5, 1737-1741 (2016).
34. "Observations of stress accumulation and relaxation in solid-state lithiation and delithiation of suspended Si microcantilevers," JJ Brown, SH Lee, JL Xiao, ZC Wu, *Physica Status Solidi A – Application and Materials Science*, 213, 2156-2168 (2016).
35. "Optimized Silicon Electrode Architecture, Interface, and Microgeometry for Next-Generation Lithium-Ion Batteries," D. Molina Piper, T. Evans, S. Xu, S.C. Kim, S. S. Han, K. L. Liu, K. H. Oh, R. Yang, and S.-H. Lee, *Advanced Materials*, 28, 188 (2016).
36. "Structure and Reactivity of Alucone-Coated Films on Si and Li_xSi_y Surfaces," Yuguang Ma, Julibeth M. Martinez de la Hoz, Ivette Angarita, Jose M. Berrio-Sanchez, Laura Benitez, Jorge M. Seminario, Seoung-Bum Son, Se-Hee Lee, Steven M. George, Chunmei Ban, and Perla B. Balbuena, *ACS Applied Materials & Interfaces*, 7, 11948 (2015).
37. "Ultra-thin Solid-State Li-Ion Electrolyte Membrane Facilitated by a Self-Healing Polymer Matrix," J. M. Whiteley, P. Taynton, W. Zhang, S.-H. Lee-Hee, *Advanced Materials*, 27, 6922 (2015).
38. "Doped Si nanoparticles with conformal carbon coating and cyclized-polyacrylonitrile network as high-capacity and high-rate lithium-ion battery anodes," Ming Xie, Daniela Molina Piper, Miao Tian, Joel Clancey, Steven M George, Se-Hee Lee and Yun Zhou, *Nanotechnology* 26, 65401 (2015).

39. "Electrospun polyacrylonitrile microfiber separators for ionic liquid electrolytes in Li-ion batteries," T. Evans, J.-H. Lee, V. Bhat, S.-H. Lee, *Journal of Power Sources*, 292, 1 (2015).
40. "Mitigating irreversible capacity losses from carbon agents via surface modification," Daniela Molina Piper, Seoung-Bum Son, Jonathan J Travis, Younghee Lee, Sang Sub Han, Seul Cham Kim, Kyu Hwan Oh, Steven M George, Se-Hee Lee, Chunmei Ban, *Journal of Power Sources* 275, 605 (2015).
41. "Stable silicon-ionic liquid interface for next-generation lithium-ion batteries," D. Molina Piper, Tyler Evans, Kevin Leung, T. Watkins, J. Olson, S. C. Kim, S. S. Han, V. Bhat, K. H. Oh, D. Buttry, S.-H. Lee, *Nature communications*, 6, 6230 (2015).
42. "Surface-Coating Regulated Lithiation Kinetics and Degradation in Silicon Nanowires for Lithium Ion Battery," Langli Luo, et al., *ACS Nano*, 9, 5559 (2015).
43. "The effect of energetically coated ZrO_x on enhanced electrochemical performances of $Li(Ni_{1/3}Co_{1/3}Mn_{1/3})O_2$ cathodes using modified radio frequency (RF) sputtering," J. H. Lee, J. W. Kim, H.-Y. Kang, S. C. Kim, S. S. Han, K. H. Oh, S.-H. Lee, J.-C. Joo, *Journal of Materials Chemistry*, 3, 12982 (2015).
44. "Tin Networked Electrode Providing Enhanced Volumetric Capacity and Pressureless Operation for All-Solid-State Li-Ion Batteries," J. N. Whiteley, J. W. Kim, C. S. Kang, J. S. Cho, K. H. Oh, S.-H. Lee, *Journal of the Electrochemical Society*, 162, A711 (2015).
45. "Tunable Sn structures in porosity-controlled carbon nanofibers for all-solid-state lithium-ion battery anodes," Dae-Hyun Nam, Ji Woo Kim, Ji-Hoon Lee, So-Yeon Lee, Hae-A-Seul Shin, Se-Hee Lee, and Young-Chang Joo, *J. Materials Chemistry*, 3 11021 (2015).
46. "Utilization of Al_2O_3 Atomic Layer Deposition for Li ion pathways in Solid State Li Batteries," Jae Ha Woo, Jonathan J. Travis, Steven M. George, and Se-Hee Lee, *J. Electrochem. Soc.*, 162, A344 (2015).
47. "Preparation of mesoporous Si@PAN electrodes for Li-ion batteries via the in-situ polymerization of PAN," Thomas A. Yersak, JaeWook Shin, Ziying Wang, Daniel Estrada, Justin Whiteley, Se-Hee Lee, Michael J. Sailor, and Ying Shirley Meng, *ECS Electrochemistry Letters*, 4, A33, (2015).
48. "In Situ Transmission Electron Microscopy Probing of Native Oxide and Artificial Layer on Silicon Nanoparticles for Lithium Ion Battery," Yang He, Daniela Piper, Meng Gu, Jonathan Travis, Steven George, Se-Hee Lee, Arda Genc, Lee Pullan, Jun Liu, Scott Mao, Ji-Guang Zhang, Chunmei Ban, Chongmin Wang, *ACS Nano*, 8, 11816 (2014).
49. "Ionic Liquid Enabled FeS_2 for High Energy-Density Lithium-Ion Batteries," Tyler Evans, Daniela Molina Piper, Seul Cham Kim, Sang Sub Han, Vinay Bhat, Kyu Hwan Oh, and Se-Hee Lee, *Advanced Materials*, 26, 7386 (2014).
50. "Empowering the Lithium Metal Battery through a Silicon-based Superionic Conductor," Justin Michael Whiteley, Jae Ha Woo, En-Yuan Hu, Kyung-Wan Nam, and Se-Hee Lee, *J. Electrochem. Soc.*, 161, A1812 (2014).
51. "Corrosion of stainless steel battery components by bis(fluorosulfonyl)imide based ionic liquid electrolytes," Tyler Evans, Jared Olson, Vinay Bhat, Se-Hee Lee *Journal Power Sources*, 269, 616 (2014).
52. "Electrochemically induced and orientation dependent crack propagation in single crystal silicon," Chan Soon Kang, Seoung-Bum Son, Ji Woo Kim, Seul Cham Kim, Yong Seok Choi, Jae Young Heo, Soon-Sung Suh, Young-Ugk Kim, Yeon Yi Chu, Jong Soo Cho, Se-Hee Lee, Kyu Hwan Oh, *Journal Power Sources*, 267, 739 (2014).
53. "Hierarchical porous framework of Si-based electrodes for minimal volumetric expansion," Daniela Molina Piper, Jae Ha Woo, Seoung-Bum Son, Seul Cham Kim, Kyu Hwan Oh, and Se-Hee Lee, *Advanced Materials*, 26, 3520 (2014).

54. "Microstructural evolution induced by micro-cracking during fast lithiation of single-crystalline silicon," Yong Seok Choi, Matt Pharr, Chan Soon Kang, Seoung-Bum Son, Seul Cham Kim, Kee-Bum Kim, Hyunchul Roh, Se-Hee Lee, Kyu Hwan Oh, and Joost J. Vlassak, *Journal of Power Sources*, 265, 160 (2014).
55. "Unexpected high power performance of atomic layer deposition coated $\text{Li}[\text{Ni}_{1/3}\text{Mn}_{1/3}\text{Co}_{1/3}]\text{O}_2$ cathodes," Ji Woo Kim, Jonathan J. Travis, Enyuan Hu, Kyung-Wan Nam, Seul Cham Kim, Chan Soon Kang, Jae-Ha Woo, Xiao-Qing Yang, Steven M. George, Kyu Hwan Oh, Sung-Jin Cho, and Se-Hee Lee, *Journal Power Sources*, 254, 190 (2014).
56. "Derivation of an iron pyrite all-solid-state composite electrode with ferrophosphorus, sulfur, and lithium sulfide as precursors," Thomas A. Yersak, Tyler Evans, Justin M. Whiteley, Seoung-Bum Son, Brian Francisco, Kyu Hwan Oh, and Se-Hee Lee, *J. Electrochem. Soc.*, 161, A663 (2014).
57. "A stabilized PAN- FeS_2 cathode with an EC/DEC liquid electrolyte," Seoung-Bum Son, Thomas A. Yersak, Daniela Molina Piper, Seul Cham Kim, Chan Soon Kang, Jong Soo Cho, Soon-Sung Suh, Young-Ugk Kim, Kyu Hwan Oh, Se-Hee Lee, *Advanced Energy Materials*, 4, 128 (2014).
58. "Reversible High Capacity Si Nanocomposite Anodes enabled by Molecular Layer Deposition," Daniela Molina Piper, Jonathan J. Travis, Matthias Young, Seoung-Bum Son, Seul Cham Kim, Steven M. George, Kyu Hwan Oh, Chunmei Ban, and Se-Hee Lee, *Advanced Materials*, 26, 1596 (2014).
59. "Effect of organic solvent addition to $\text{PYR}_{13}\text{FSI} + \text{LiFSI}$ electrolytes on aluminum oxidation and rate performance of $\text{Li}(\text{Ni}_{1/3}\text{Mn}_{1/3}\text{Co}_{1/3})\text{O}_2$ cathodes," Tyler Evans, Jarred Olson, Vinay Bhat, and Se-Hee Lee, *Journal of Power Sources*, 265, 132 (2014).
60. "Designing thermal and electrochemical oxidation processes for delta- MnO_2 nanofibers for high-performance electrochemical capacitors," J.H. Lee, T.Y. Yang, H.Y. Kang, D.H. Nam, N.R. Kim, Y.Y. Lee, S.-H. Lee, and Y.C. Joo, *Journal of Materials Chemistry A*, 2 (20), 7197-7204 (2014).
61. "Ion-Exchangeable Functional Binders and Separator for High Temperature Performance of $\text{Li}_{1.1}\text{Mn}_{1.86}\text{Mg}_{0.04}\text{O}_4$ Spinel Electrodes in Lithium Ion Batteries," Seung Hee Woo, Hyung-Woo Lim, Sangbin Jeon, Jonathan J. Travis, Steven M. George, Se-Hee Lee, Yong Nam Jo, Jun Ho Song, Yoon Seok Jung, Sung You Hong, Nam-Soon Choi, and Kyu Tae Lee, *J. Electrochem. Soc.*, 160, A2234 (2013).
62. "Fabrication of Carbon Nanopatterns and Nanoribbons Using Directly Nanoimprinted Polyacrylonitrile Precursors: A Scalable, Lithographic Approach," Zheng Zhang, Daniela Molina Piper, Seoung-Bum Son, Seul Cham Kim, Kyu Hwan Oh, Se-Hee Lee, and Yifu Ding, *Polymer*, 54, 5936 (2013).
63. "Face-Centered Cubic Lithium Crystals Formed in Mesopores of Carbon Nanofiber Electrodes," Byoung-Sun Lee, Jong-Hyun Seo, Seoung-Bum Son, Seul Cham Kim, In-Suk Choi, Jae-Pyoung Ahn, Kyu Hwan Oh, Se-Hee Lee, and Woong-Ryeol Yu, *ACS Nano*, 7, 5801 (2013).
64. "Binder-Free Three-Dimensional Silicon/Carbon Nanowire Networks for High Performance Lithium-Ion Battery Anodes," Wei Wang, Miao Tian, Yujie Wei, Se-Hee Lee, Yung-Cheng Lee, and Ronggui Yang, *Nano Energy*, 2, 943 (2013).
65. "An all-solid-state Li-ion battery with a pre-lithiated Si-Ti-Ni alloy anode," Thomas A. Yersak, Seoung-Bum Son, Jong Soo Cho, Soon-Sung Suh, Young-Ugk Kim, Jeong-Tak Moon, Kyu Hwan Oh, and Se-Hee Lee, *J. Electrochem. Soc.*, 160, A1497-A1501 (2013).
66. "Electrochemical evolution of iron sulfide and sulfur based cathode for solid state Li-ion batteries," Thomas A. Yersak, Conrad Stoldt, and Se-Hee Lee, *J. Electrochem. Soc.*, 160, A1009-A1015 (2013).

67. "Facile Conductive Bridges Formed between Silicon Nanoparticles inside Hollow Carbon Nanofibers," Byoung-Sun Lee, Seoung-Bum Son, Jong-Hyun Seo, Kyu-Min Park, Geunsung Lee, Se-Hee Lee, Kyu Hwan Oh, Jae-Pyoung Ahn, and Woong-Ryeol Yu, *Nanoscale*, 5, 4790-4796 (2013).
68. "Conformal coatings of cyclized-PAN for mechanically resilient Si nano-composite anodes," Daniela Molina Piper, Seul Chan Kim, Chan Soon Kang, Keunho Lee, Seoung-Bum Son, Thomas A. Yersak, Heung Nam Han, Kyu Hwan Oh, Anne C. Dillon, and Se-Hee Lee, *Advanced Energy Materials*, 3, 697-702 (2013).
69. "Unexpected Improved Performance of ALD Coated LiCoO₂/graphite Li-ion Batteries," Yoon Seok Jung, Peng Lu, Andrew S. Cavanagh, Chunmei Ban, Gi-Heon Kim, S.-H. Lee, Steven M. George, Stephen J. Harris, and Anne C. Dillon, *Advanced Energy Materials*, 3, 213-219 (2013).
70. "Solid State Enabled Reversible Four Electron Storage," Thomas A. Yersak, H. Alex MacPherson, Seul Cham Kim, Viet-Duc Le, Chan Soon Kang, Seoung-Bum Son, Yong-Hyun Kim, James E. Trevey, Kyu Hwan Oh, Conrad Stoldt, and Se-Hee Lee, *Advanced Energy Materials* 3, 120-127 (2013).
71. "Effect of Compressive Stress on Electrochemical Performance of Silicon Anodes," Daniela Molina Piper, Thomas A. Yersak, and Se-Hee Lee, *J. Electrochem. Soc.*, 160, A77-A81 (2013).
72. "Effect of Pores in Hollow Carbon Nanofibers on Their Negative Electrode Properties for a Lithium Rechargeable Battery," Byoung-Sun Lee, Seoung-Bum Son, Kyu-Min Park, Geunsung Lee, Kyu Hwan Oh, Se-Hee Lee, Woong-Ryeol Yu, *ACS Applied Materials & Interfaces*, 4, 6701-6709 (2012).
73. "A highly reversible nano-silicon anode enabled by mechanical confinement in an electrochemically activated Li_{3.2}Ti₄Ni₄Si₇ matrix," Seoung-Bum Son, Seul Cham Kim, Chan Soon Kang, Thomas A. Yersak, Yoon-Chang Kim, Chun-Gyoo Lee, Sung-Hwan Moon, Jong Soo Cho, Jeong-Tak Moon, Kyu Hwan Oh, and Se-Hee Lee, *Advanced Energy Materials* 2, 1226-1231 (2012).
74. "Electrochemical Investigation of All-Solid-State Lithium Batteries with a High Capacity Sulfur-Based Electrode," James E. Trevey, Jeremy R. Gilsdorf, Conrad R. Stoldt, Se-Hee Lee, and Ping Liu, *J. Electrochem. Soc.*, 159, A1019-A1022 (2012).
75. "Pd Effect on Reliability of Ag Bonding Wires in Microelectronic Devices in High-Humidity Environments," Jong-Soo Cho," Kyung-Ah Yoo, Jeong-Tak Moon, Seoung-Bum Son, Se-Hee Lee, and Kyu Hwan Oh, *Met. Mater. Int.*, 18, 881-885 (2012).
76. "Controlled synthesis of aligned Ni-NiO core-shell nanowire arrays on glass substrates as a new supercapacitor electrode," Jin Young Kim, Se-Hee Lee, Yanfa Yan, Jihun Oh and Kai Zhu, *RSC Advances*, 2, 8281-8285 (2012).
77. "Improved Functionality of Lithium-Ion Batteries Enabled by Atomic Layer Deposition on Porous Microstructure of Polymer Separators and Coating Electrodes," Yoon Seok Jung, Andrew S. Cavanagh, Lynn Gedvilas, Widjonarko Nicodemus, Isaac D. Scott, Se-Hee Lee, Gi-Heon Kim, Steven M. George, and Anne C. Dillon, *Advanced Energy Materials*, 2, 1022-1027 (2012).
78. "Efficient photocatalytic degradation of acid orange 7 on metal oxide p-n junction composites under visible light," Jum Suk Jang, Hyun Gyu Kim, and Se-Hee Lee, *J. Phys. Chem. Solids*, 73, 1372-1377 (2012).
79. "Ambient Temperature and Pressure Mechanochemical Preparation of Nano-LiTiS₂," Thomas A. Yersak, Yanfa Yan, Conrad Stoldt and Se-Hee Lee, *ECS Electrochemistry Letters*, 1, A21-A23 (2012).
80. "Nanoscale Interface Modification of LiCoO₂ for Solid-State Li Batteries," Jae Ha Woo, James E. Trevey, Andrew S. Cavanagh, Yong Seok Choi, Seul Cham Kim, Steven M.

- George, Kyu Hwan Oh, and Se-Hee Lee, *J. Electrochem. Soc.*, 159, A1120-A1124 (2012).
81. "Li₂S-Li₂O-P₂S₅ Solid Electrolyte for All-Solid-State Lithium Batteries," James E. Trevey, Jeremy Gilsdorf, Conrad Stoldt, and Se-Hee Lee, *Solid State Ionics*, 214, 25-30 (2012).
 82. "Fabrication of Si core/C shell Nanofibers and their Electrochemical Performances as a Lithium-ion Battery Anode," Byoung-Sun Lee, Seoung-Bum Son, Kyu-Min Park, Jong-Hyun Seo, Se-Hee Lee, In-Suk Choi, In Kyu Hwan Oh and Woong-Ryeol Yu, *Journal of Power Sources*, 206, 267-273 (2012).
 83. "Nanostructured all-solid-state supercapacitor based on Li₂S-P₂S₅ glass-ceramic electrolyte," Brian E. Francisco, Christina M. Jones, Se-Hee Lee, and Conrad R. Stoldt, *Appl. Phys. Lett.*, 100, 103902 (2012).
 84. "Anodic properties of hollow carbon nanofibers for Li-ion battery," Byoung-Sun Lee, Seoung-Bum Son, Kyu-Min Park, Woong-Ryeol Yu, Kyu-Hwan Oh and Se-Hee Lee, *Journal of Power Sources*, 199, 53-60 (2012).
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PATENTS

1. “ANODE MATERIAL—METHOD OF PRODUCTION AND SOLID-STATE BATTERY MADE THEREWITH” US 12,155,068 B2 (Nov. 26, 2024).
2. “Multi-layer Current Collector for Anodeless Li-Metal Cell” US Patent application (03/27/24).
3. “Filamentous Organism-Derived Carbon-Based Materials, and Methods of Making and Using Same/Imprinting” US Patent (11,554,990) issued on 1/17/2023.
4. “Multi-layer Current Collector for Anodeless Li-Metal Cell” PCT Application on 04/06/2023 (WO 2023/055585 A1).
5. “Filamentous organism-derived carbon-based materials, and methods of making and using same” Z. Ren, M. T. Huggins, J. C. Biffinger, C. T. Love, SH Lee, J. M. Whiteley, US Patent (10,829,420)
6. “Ionic liquid-enabled high-energy Li-ion batteries” SH Lee, D. Molina Piper, T Evans,

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 12. "Amorphous carbon material, especially vapor deposited from ethylene; catalytic activity of the catalyst layer is preserved; preferably the catalyst layer is composed of platinum group metals, or their alloys," US patent (7,233,034).
 13. "Pd/V₂O₅ device for colorimetric H₂ detection," US patent (7,419,635).
 14. "Thin film buried anode battery," US patent (7,632,602).
 15. "Nano-composite materials," US patent (7,722,966).
 16. "H₂O doped WO₃, ultra-fast, high-sensitivity hydrogen sensors," US patent (7,910,373).
 17. "Method and Pd/V₂O₅ device for H₂ detection," US patent (8,084,265).
 18. "Thin film lithium-based batteries and electrochromic devices fabricated with nanocomposite electrode materials," US patent (8,643,930).
 19. "Homogeneous, dual layer, solid state, thin film deposition for structural and/or electrochemical characteristics," US patent (8,691,447).
 20. "Multi Layer Solid Electrolyte for Lithium Thin Film Batteries," US patent (9,093,707).
 21. "Anodic Dendritic Growth Suppression System for Secondary Lithium Batteries," US patent pending (20100143769).
 22. "Lithium Battery Electrodes with Ultra-thin Alumina Coatings," US patent pending (20120077082).
 23. "Lithium All-Solid-State Battery," US patent pending (20140377664)

INVITED TALKS

1. "Advanced Solid-State Batteries" Samsung SDI, Aug 7 (2024).
2. "Technology overview of Solid State Batteries" LG Energy Solution, Oct 6 (2023).
3. "Advanced Li-ion Batteries" Chonnam National University, Korea, Jan 6 (2022).
4. "Solid State Li Batteries" KAIST, December 28 (2020).
5. "Local bonding structure and the reversibility of sheet-style Si-PAN anodes" MRS Fall meeting (2020).
6. "Battery Research at Electrochemical Energy Laboratory" BMW (2019).
7. "Technology overview of Solid State Batteries" Samsung, June 22 (2018).
8. "Nanoscale Interface Engineering for Improved Li-ion Batteries" NREL, September 19 (2017).
9. "Solid State Li Batteries" LG Chem, June 15, (2017)
10. "Solid State Electrolyte Membrane Facilitated by a Self-Healing Polymer" Beyond Li-ion VI, PNNL, May 24-26 (2016).
11. "Ionic Liquid Enabled High Energy-Density Lithium-ion Batteries," Daniela Molina Piper, Tyler Evans, Kevin Leung, Tylan Watkins, Jarred Olson, Seul Cham Kim, Sang Sub Han, Vinay Bhat, Kyu Hwan Oh, Daniel A. Buttry, and Se-Hee Lee*, MRS Fall Meeting, Boston, Dec 1, (2015).
12. "Silicon-based Lithium Superionic Conductor for Solid-State Lithium Metal Battery,"

- Sehee Lee, DDG-GOMD, Miami, Florida, March (2015).
13. "Advanced Batteries for Sustainable Energy," GEARRS, Boulder CO, March 5, 2015
 14. "All-solid-state Li-ion battery with a superionic ceramic electrolyte, a high capacity anode, and an interfacially engineered high voltage cathode," Beyond Lithium Ion VII, June, Argonne, 2014.
 15. "Atomic-scale Surface Engineering for Advanced Li-ion Batteries," MS&T Spring Meeting, San Diego 2014.
 16. "Advanced Materials for Li-ion Batteries," Samsung SDI, Aug. 23 2013.
 17. "ALD for Improved Li-ion Batteries," MRS spring meeting, San Francisco 2013.
 18. "All Solid State Batteries for High Energy Applications," 37th International Conference & Exposition on Advanced Ceramics & Composites, Daytona Beach, January 27, 2013.
 19. "Nanostructured Materials for Electrochemical Energy Storage," University of Michigan, January 11, 2013.
 20. "All Solid State Li Batteries for Electric Vehicles," an ARPA-E workshop on "crash safe energy storage systems for electric vehicles," Nov. 12-13 2012, Denver, CO
 21. "All Solid State Li-ion Batteries," Chemistry Department, University of Colorado at Boulder, September 17, 2012.
 22. "Si based Anode Materials for Li-ion Batteries," Samsung SDI, August 21, 2012.
 23. "Advanced Li-ion Batteries," National Renewable Energy Laboratory, Oct 11, 2011.
 24. "Advances in Li-ion Batteries," Texas A&M, March 23, 2011.
 25. "ALD for Improved Li-ion Batteries," 10th International Conference on Atomic Layer Deposition, Seoul, Korea, June 21, 2010.
 26. "Advanced Li-ion Batteries," Samsung SDI, April 16, 2010.
 27. "Direct atomic layer deposition on the composite electrode for lithium-ion batteries," The 6th Petite Workshop on Defect Chemical nature of Energy Materials, Damyang, Korea, September 6-9, 2009.
 28. "Alternative Energy" 2008 Japan-America Frontiers of Engineering Symposium in the session entitled, November 17-19, 2008 (Monday - Wednesday) in Tsukuba International Congress Center in Tsukuba, Japan.
 29. "Nanostructured Metal Oxides for Energy Applications," The Fifth International Conference on Hot-Wire Chemical Vapor Deposition (HWCVD, Cat-CVD) August 20-24, 2008 in Cambridge, MA, USA.
 30. "Polymer derived ceramics for lithium-ion batteries," MS&T-08 (Oct 5-9, 2008, Pittsburgh, PA).
 31. "Nanostructured molybdenum oxide as a negative electrode materials for lithium-ion batteries," MRS fall meeting, Boston 2007.
 32. "Nanostructured Metal Oxides for Improved Energy Storage Devices," Argonne National Laboratory, September 27th, 2007.
 33. "Metal Oxide Nanoparticles for Improved Electrochromic and Lithium-Ion Battery Technologies," U.S.-Korea Forums on Nanotechnology, April 26th & 27th, Honolulu, HI 2007.
 34. "Metal Oxide Nanoparticles for Battery and Electrochromic Applications," Se-Hee Lee, et al. The 1st NanoScience & Applications Conference, NIST October 16-19, 2005 Boulder CO.
 35. "Electrochromic Materials and Device Research - Some Challenges and Opportunities," SKC Korea, May 12, 2005.

TEACHING

Courses Taught

Spring 2008, Material Science 2 - Behavior (MCEN 5044 001)

Fall 2008, Energy Conversion and Storage (MCEN 4228 003, 5228 003)
 Spring 2009, Material Science 2 - Behavior (MCEN 5044 001)
 Fall 2009, Hybrid Materials for Sustainability (Seoul National University)
 Spring 2010, Solid State Electronic Devices (Seoul National University)
 Fall 2010, Energy Conversion and Storage (MCEN 4228 003, 5228 003)
 Spring 2011, Thermodynamics and Kinetics of Materials (MCEN 5228 013)
 Fall 2011, Materials Science (MCEN 2024 001)
 Spring 2012, Thermodynamics II (MCEN 3032 002)
 Fall 2012, Energy Conversion and Storage (MCEN 4228 008, 5228 008)
 Spring 2013, Materials Science (MCEN 2024)
 Fall 2013, Energy Conversion and Storage (MCEN 4228, 5228)
 Spring 2014, Materials Science (MCEN 2024)
 Fall 2014, Materials Science (MCEN 5034)
 Spring 2015, Energy Conversion and Storage (MCEN 4228 003, 5228 003)
 Fall 2015, Energy Conversion and Storage (MCEN 4228 003, 5228 003)
 Spring 2016, Energy Conversion and Storage (MCEN 4228 003, 5228 003)
 Fall 2016, Intro to Research
 Spring 2017, Energy Conversion and Storage (MCEN 4228 003, 5228 003)
 Fall 2017, Materials Science (MCEN 2024 001)
 Spring 2018, Energy Conversion and Storage (MCEN 4228 003, 5228 003)
 Fall 2018, Materials Science (MCEN 2024-001, -002)
 Spring 2019, Energy Conversion and Storage (MCEN 4228 003, 5228 003)
 Fall 2019, Materials Science (MCEN 2024-001, -002)
 Spring 2020, Energy Conversion and Storage (MCEN 4228 003, 5228 003)
 Fall 2020, Materials Science (MCEN 2024-001, -002)
 Spring 2021, Energy Conversion and Storage (MCEN 4228 003, 5228 003)
 Spring 2022, Energy Conversion and Storage (MCEN 4228 003, 5228 003)
 Spring 2023, Materials Chemistry (MCEN 5024)
 Spring 2024, Materials Chemistry (MCEN 5024)

Thesis Students

Current

Advisor for 1 current PhD students (Mohammad Sufiyan Nafis)

Supervisor for 1 Postdoc (Zhiming Liang)

Completed

Advisor for Nathan Dunlap, Ph.D., Mech Engineering, May 2020

Research topic: Li-ion Batteries

Advisor for Justin Whiteley, Ph.D., Mech Engineering, May 2016

Research topic: Li-ion Batteries

Advisor for Tyler Evans, Ph.D., Mech Engineering, December 2015

Research topic: Li-ion Batteries

Advisor for Daniela Piper, Ph.D., Mech Engineering, August 2014

Research topic: Li-ion Batteries

Advisor for Jaeha Woo, Ph.D., Mech Engineering, August 2014

Research topic: Li-ion Batteries

Advisor for Thomas Yersak, Ph.D., Mech Engineering, August 2013

Research topic: Li-ion Batteries

Advisor for Isaac Scott, Ph.D., Mech Engineering, January 2013

Research topic: Li-ion Batteries

Advisor for James Trevey, Ph.D., Mech Engineering, August 2011

Research topic: Li-ion Batteries

Advisor for Leah Riley, Ph.D., Mech Engineering, August 2011

Research topic: Li-ion Batteries

Advisor for Christine M. White, MS, Mech Engineering, August 2009

Research topic: Electrochromic devices

Advisor for Sangkyu Lee, MS, Mech Engineering, August 2009

Research topic: Li-ion Batteries

Advisor for Jumsuk Jang, Postdoc, Mech Engineering (2008-2010)

Research topic: Photoelectrochemistry

Advisor for Yoon Seok Jung, Postdoc, Mech Engineering (2008-2009)

Research topic: Li-ion Batteries

Committee Member for Tania Tauer, Ph.D. Chemical Engineering, 2013

Committee Member for Chris DeLuca, Ph.D. Aerospace Engineering, 2013

Committee Member for Jonathan Metts, Ph.D. Aerospace Engineering, 2012

Committee Member for Dongjoon Ahn, PhD, Mech Engineering, 2009

Committee Member for Ben Maples, EE M.S. 2012

Misc. Advising

Undergraduate/graduate Independent Study (6), Faculty Advisor

Summer Undergraduate Research Experience (3), Faculty Advisor

SERVICE

- Served on PUEC (2019 – present).
- Served on FLRC (2017 – 2020).
- Graduate Committee Chair, Department of Mechanical Engineering, University of Colorado at Boulder (2015-2016).
- Faculty Search Committee Chair, Department of Mechanical Engineering, 2013.
- Served on the Boulder Faculty Assembly in Senate Year 2012-2013 representing faculty in Mechanical Engineering at meetings of the full Assembly and plan to continue to participate in faculty governance.
- Served on the Diversity committee within the BFA (2012 – present).
- I will get involved in a new BFA initiative to look at the impact and effect of new technologies including MOOCs and other emerging trends.
- Co-organizer for a symposium entitled “Materials Aspects of Advanced Lithium Batteries” at the Materials Research Society Meeting, Fall 2012.
- Served as a research affiliate for the Materials Science and Engineering (MSE) program and participated in several MSE Program workshops. (CU Boulder)
- Received 2010 CO-LABS Governor’s Award for High-Impact Research (Research team for the development of electrochromic windows)
- Founding RASEI Fellow at the newly formed RASEI (Renewable and Sustainable Energy

Institute). RASEI is a new joint institute between CU-Boulder and the U.S. Department of Energy's National Renewable Energy Laboratory in Golden. Its focus includes forming one of the world's leading university and federal laboratory partnerships in the development and commercialization of renewable energy technologies. The RASEI Council of Fellows are considering important issues such as a strategic hiring plan for new faculty, detailed governance plans, and research thrust areas for the institute. During the last two years, I hosted five seminar speakers for "Big Energy Seminar Series," which is sponsored by the RASEI. The RASEI Big Energy Series brought nationally and internationally recognized speakers with a focus on large, secure, sustainable energy systems.

- Symposium chair for the "Energy" session at the ENGE 2010 (International conference on electronic materials and nanotechnology for green environment).
- Participated in the World Class University (WCU) program in the Department of Materials Science and Engineering (MSE, <http://mse.snu.ac.kr>) at Seoul National University (SNU, www.snu.ac.kr) which started in Fall 2009. As an invited professor, I taught two classes (Hybrid Materials for Sustainability and Solid State Electronic Devices) for the Fall 2009 and Spring 2010 semesters and have established strong collaboration between world-renowned international scholars and Korean faculty members.
- Co-organizer for a symposium entitled "Nanostructured Materials for Energy Storage" at the Materials Research Society Meeting, April 2011.
- International Advisory Board Member for the journal of "Electronic Materials Letters" since 2009.
- Lead Organizer for a symposium entitled "Solid-State Batteries" at the Materials Research Society Meeting, March 2010.
- Delivered an invited lecture entitled "Electrical Energy Storage and its Importance to Sustainable Renewable Energy" at the 2008 Japan-America Frontiers of Engineering Symposium in Kobe, Japan. Since 1995, the NAE (National Academy of Engineering) has held an annual Frontiers of Engineering symposium that brings together 100 outstanding engineers (ages 30-45) from U.S. companies, universities, and government labs to discuss leading-edge research and technical work across a range of engineering fields. The Frontiers program has expanded internationally with the addition of three bilateral meetings with Germany (1998), Japan (2000), and India (2006).
- Organizing Committee in MS&T-08 (Oct 5-9, 2008, Pittsburgh, PA).
- Scientific Committee in IME-8 (8th International Meeting on Electrochromism, Seoul Korea, Aug. 24-28, 2008).
- Program Committee in IME-5 (5th International Meeting on Electrochromism, Denver CO USA, Aug. 6-9, 2002).
- Regular reviewer for archival journals:
 - Acta Materialia
 - ACS Applied Materials & Interfaces
 - ACS Nano
 - Advanced Materials
 - Advanced Energy Materials
 - Advanced Functional Materials
 - Angewandte Chemie International Edition
 - Applied Physics Letters
 - Carbon
 - Chemistry Communications
 - Chemistry of Materials

Electrochimica Acta
Electrochemistry Communications
Journal of Applied Physics
Journal of American Chemical Society
Journal of American Ceramic Society
Journal of Electrochemical Society
Journal of Materials Science
Journal of Power Sources
Journal of Vacuum Science and Technology
Langmuir
Materials Letters
Materials Science and Engineering B
Nano Letters
Solid State Ionics
Thin Solid Films

- Regular grant proposal reviewer:
National Science Foundation
Department of Energy
Department of Defense