

Exponent®
Engineering & Scientific Consulting

Sophie Lee, Ph.D., P.E.

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Professional Profile

Dr. Sophie Lee consults on a wide range of products related to electrochemistry and energy storage technologies. In particular, Dr. Lee has worked on a broad array of technologies including sodium and lithium-ion batteries, aqueous flow batteries, lithium-air batteries, and electrolyzers. They also routinely assist clients with lifetime assessments, performance enhancements, cell failure analysis and degradation mechanisms from lab scale to multi-KW cell stacks.

Dr. Lee is experienced in a variety of analytical techniques including electrochemical characterizations, such as standard battery cycling and testing, cyclic voltammetry (CV), rotating (ring) disk electrode measurements (RDE/RRDE), electrochemical impedance spectroscopy (EIS), as well as material characterizations, including X-ray photoelectron spectroscopy (XPS), Fourier transform infrared spectroscopy(FTIR), UV-VIS, profilometry, scanning electron microscopy (SEM), X-ray diffraction (XRD), and X-ray computed tomography (CT). Additionally, they have experience with advanced cleanroom and microfabrication techniques, DC and RF thin film sputtering, stereolithography for rapid prototyping, and modeling electrochemical systems in COMSOL.

Dr. Lee completed a Ph.D. in Chemical Engineering at Drexel University with research focused on interfacial phenomena in Sodium and Lithium-Ion batteries. They developed a novel microfabricated electrode array for electroanalysis of soluble electrolyte degradation products. Prior to graduate school they worked as a research engineer developing flow batteries for grid scale energy storage applications and hold two patents related to flow battery management.

Academic Credentials & Professional Honors

Ph.D., Chemical Engineering, Drexel University, 2021

S.B., Chemical Engineering, Massachusetts Institute of Technology (MIT), 2012

National Science Foundation Graduate Research Fellow, 2018 – 2021

Prior Experience

Chemical Engineer, Lockheed Martin Advanced Energy Storage (formely Sun Catalytix), 2012-2016

Professional Affiliations

The Electrochemical Society—ECS

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Patents

US Patent 10,461,352: Concentration management in flow battery systems using an electrochemical balancing cell, October 2019 (Loretz J, Duffey K, Lee S)

US Patent 10,388,978: Methods for determining state of charge and calibrating reference electrodes in a redox flow battery" August 2019 (Morris-Cohen A, Duffey K, Hays PF, Lee S)

Publications

Harris, K.C., Lee, S.E., Panetti, G.P., "Perspective—Toward a More Inclusive Electrochemistry Community: Reducing Gender Inequity is a Team Effort" J. Electrochem. Soc, 2022; 169(3) 037502

Lee, S.E., Tang, M.H., "Asymmetric Interdigitated Electrodes for Amperometric Detection of Soluble Products" J. Electrochem. Soc, 2021; 168 (5), 057519

Lee, S.E., Harris, K.C., Siboonruang, T., Tang, M., "A Reaction Engineering Approach to Nonaqueous Battery Lifetime" Joule. 2021; 5: 1-13

Lee, S.E., Harris, K.C., Nguyen, A., Tang, M., "Chemical Compatibility of Battery Electrolytes with Rapid Prototyping Materials and Adhesives". Ind. Eng. Chem. Res. 2020; 59: 15948–15954

Harris, K.C., Lee, S.E., Lees, C., Tang, M.H., "Review: Mechanisms and Consequences of Chemical Cross-Talk in Advanced Li-Ion Batteries", Journal of Physics: Energy, 2020; 2(3): 032002

Lee, S.E., Tang, M.H., "Reliable Reference Electrodes for Nonaqueous Sodium-Ion Batteries", J. Electrochem. Soc, 2019; 166 (14): A3260-A3264

Lee, S.E.,Tang, M.H.,, "Electroactive decomposition products cause erroneous intercalation signals in sodium-ion batteries", Electrochemistry Communications, 2019; 100: 70-73

Lees, C.M., Lansing, J.L., Morelly, S.L., Lee, S.E., Tang, M.H., "Ni- and Sb-Doped SnO2 Electrocatalysts with High Current Efficiency for Ozone Production via Electrodeposited Nanostructures", J. Electrochem. Soc, 2018; 165(16): E833-E840

Kozuch, S., Lee, S.E., Shaik. S. "Theoretical Analysis of the Catalytic Cycle of a Nickel Cross- Coupling Process: Application of the Energetic Span Model". Organometallics, 2009; 28 (5): 1303-1308

Presentations

Lee S, Tang M "Application of Asymmetric Interdigitated Electrode Arrays to in-Situ Analysis of Soluble Electrolyte Degradation Products". Oral Presentation, Electrochemical Society Pacific Rim Meeting on Electrochemical and Solid-State Science. Virtual, 2020

Lee S, Tang M, "In-Situ Characterization of Electrolyte Degradation Products with Lithographically Patterned Electrode Arrays". Invited Talk, Gordon Research Seminar. Ventura, CA 2020

Lee S, Tang M. "In-Situ Characterization of Electrolyte Degradation Products with Lithographically Patterned Electrode Arrays". Oral Presentation, Electrochemical Society Fall Meeting. Atlanta, GA, 2019.

Lee S, Tang M. "Study of Surface Interactions in Sodium-Ion Batteries Using Modified Carbon Films". Oral Presentation, AiCHE Annual Meeting. Pittsburgh, PA, 2018

Lee S, Tang M. "Functional Carbon Surfaces for Stable Sodium-Ion SEI Formation". Poster Presentation, Electrochemical Society Fall Meeting. National Harbor, MD. 2017