

Thomas P. Whitehill-Nigl

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RESEARCH EXPERIENCE

Cuberg

Senior R&D Scientist

San Leandro, CA

Aug 2021–Aug 2024

- Led a 16-member cross-functional corrective action team to determine underlying root causes of failing baseline cells using an 8D framework, restoring test platform to 100% of original cycle life performance
- Directed integration of metallized polymer current collectors into baseline cell design and reduced thermal runaway events by 67%
- Sourced, characterized, and evaluated 16 cathode formulations, consisting of eight cathode active materials and two conductive carbons, to decrease cell DCIR by 580% and retain 400 C/2 1D cycles above 80% capacity retention
- Supported three external cathode production runs in a dry room environment and conducted quality control audits using internally developed cathode supplier quality agreements
- Created 7 external supplier agreements each containing 67 technical specifications and tolerances tailored to the external cathode toll coater and cathode formulation
- Demonstrated compatibility of high electrode loadings and carbon nanotubes with proprietary electrolyte system via cathode formulation DOE
- Developed dQ/dV peak tracking Python script to determine the extent of NMC cathode degradation via decreasing height of the H2-H3 peak
- Published internal report detailing quantified differences in mean and standard error of 14 physical and electrochemical electrode properties across two suppliers using JMP
- Conducted weekly safety audits of wet laboratory for 2 years
- Mentored three junior individual contributors and five co-op students

Pennsylvania State University, Dept. of Materials Science and Engineering

Research Associate

University Park, PA

Aug 2016–Jun 2021

- Created materials characterization course material for 40 students and led hands-on instruction on DSC, TGA, SEM, EDX, XRD, AFM, and DMA
- Synthesized and characterized solid-state fluoride electrolyte powders using XRD for open-circuit potential measurements of 4 binary alloy systems, resulting in 4 publications
- Probed interfacial properties of liquid metal cathodes during fission product recovery using electrochemical impedance spectroscopy and SEM-EDX
- Communicated electrochemistry and battery research through 2 conference talks, 3 poster presentations, and an invited podcast episode

Gachon University, Dept. of Chemical Engineering

Research Assistant

Seongnam, South Korea

Jul 2015–Aug 2015

- Collaborated with battery scientist to initialize computational models of Li-ion cathode material

AMBRI, Inc.

Battery Cell Analysis Co-op

Cambridge, MA

Jan 2014–Jul 2016

- Established an in-house powder processing facility to reduce operating costs by \$40,000
- Documented ceramic processing with 7 video SOP's; trained 3 co-op students with documentation

TECHNICAL SKILLS

Experimental: Electrochemical cell cycling (Bio-Logic), cyclic voltammetry, electrochemical impedance spectroscopy, coulometry, electrodeposition, chronoamperometry, galvanostatic charge-discharge measurements

Programming & Software: JMP, Python EC-Lab, Origin, ThermoCalc, MATLAB, LaTeX

Characterization: XRD, SEM, EDX, TGA, DSC, Ultrasonic scanning, Pycnometry, ICP-OES, XRF, DTA

EDUCATION

Pennsylvania State University

Doctor of Philosophy (Ph.D.), Materials Science and Engineering

Thesis: Measurements of Thermochemical Properties of Alloys for Applications in Energy Systems

University Park, PA

Aug 2016–Jun 2021

Northeastern University

Bachelor of Science, Chemical Engineering, *cum laude*

Boston, MA

Sep 2011–May 2016

RELATED ACTIVITIES

Pennsylvania State University

President, Science Policy Society

University Park, PA

2018-2020

- Raised \$12,500 through an awarded microgrant and collegiate institute sponsorships
- Discussed electrochemistry research with Congressional staff members and non-governmental organizations to promote increased funding for basic and applied research

RESEARCH PUBLICATIONS AND PATENTS

11. McEldrew, Michael; Burke, Lauren Nicole; **Whitehill-Nigl, Thomas Patrick**; Huynh, Vicky Thi; Garg, Aaron R.; Nanda, Sanjay; Wang, Richard. 2024. Lithium-metal rechargeable electrochemical cells with liquid electrolytes and single-crystal nickel-manganese-cobalt. U.S. Patent 20240213540, filed December 22, 2023, and issued June 27, 2024.
10. **Nigl, T. P.**; Lichtenstein, T.; Kong, Y.; Kim, H. Electrochemical Separation of Alkaline-Earth Elements from Molten Salts Using Liquid Metal Electrodes. *ACS Sustain. Chem. Eng.* 8(39), 2020, 14818-14824.
9. Lichtenstein, T.; **Nigl, T. P.**; Kong, Y.; Kim, H. Recovery Limit of Alkaline Earths Into Liquid Bi in Ternary LiCl-KCl-BaCl₂/SrCl₂ Electrolytes at 500°C. *J. Electrochem. Soc.* 167(10), 2020, 102501.
8. Gesualdi, J.; **Nigl, T. P.**; Lichtenstein, T.; Smith, N. D.; Kim, H. Thermodynamic Properties of Ba-Pb Alloys Determined by Emf Measurements Using Binary CaF₂-BaF₂ Electrolyte. *J. Electrochem. Soc.* 166(8), 2019, D268-D275.
7. Smith, N. D.; Orabona, N.; Lichtenstein, T.; Gesualdi, J.; **Nigl, T. P.**; Kim, H. Thermodynamic properties of Sr-Sb alloys via emf measurements using solid CaF₂-SrF₂ electrolyte. *Electrochim. Acta.* 305, 2019, 547-554.
6. Cogswell, C.; **Nigl, T. P.**; Stavola, A.; Wolek, A.; Wang, Y.; Zummo, J.; Lin, Y.; Chinn, R.; Choi, S. Generation and Use of a Pure Titanium Pillared MCM-36 Structure as a High Efficiency Carbon Dioxide Capture Platform and Amine Loaded Solid Adsorbent. *Microporous Mesoporous Mater.* 280, 2019, 151-156.
5. **Nigl, T. P.**; Lichtenstein, T.; Smith, N. D.; Gesualdi, J.; Kong, Y.; Kim, H. Thermodynamic Properties of Strontium-Lead Alloys Determined by Electromotive Force Measurements. *J. Electrochem. Soc.* 165, 2018, H991-H998.
4. Lichtenstein, T.; **Nigl, T. P.**; Smith, N. D.; Kim, H. Electrochemical deposition of alkaline-earth elements (Sr and Ba) from LiCl-KCl-SrCl₂-BaCl₂ solution using a liquid bismuth electrode. *Electrochim. Acta.* 281, 2018, 810-815.
3. Kundu, J.; Michaelson, A.; Baranov, P.; Chiumiento, M.; **Nigl, T.**, Young, M. J.; Carrier, R. L. Interphotoreceptor Matrix Based Biomaterial: Impact on Human Retinal Progenitor Cell Attachment and Differentiation. *J. Biomed. Mater. Res.* 106 (2), 2018, 891-899.
2. **Nigl, T. P.**; Smith, N. D.; Lichtenstein, T.; Gesualdi, J.; Kumar, K.; Kim, H. Determination of Thermodynamic Properties of Alkaline Earth-Liquid Metal Alloys Using the Electromotive Force Technique. *J. Vis. Exp.* 129, e56718, doi:10.3791/56718, 2017.
1. Lichtenstein, T.; Gesualdi, J.; **Nigl, T. P.**; Yu, C. T.; Kim, H. Thermodynamic Properties of Barium-Antimony Alloys Determined by Emf Measurements. *Electrochim. Acta.* 251, 2017, 203-211.

- Cuberg Inventor Award, 2023
- Intercollege Graduate Student Outreach Achievement Award, 2020
- Roy G. Post Foundation Scholarship, 2018
- Coppola Graduate Student Excellence Award for Service and Leadership, 2018
- ARPA-E Energy Summit Graduate Fellow, 2018
- NSF Graduate Research Fellowship Honorable Mention, 2017
- George Schenck Teaching Assistant of the Year Award, 2017
- 3M Science and Technology Fellow in Material Sciences, 2016