

Exponent®
Engineering & Scientific Consulting

Garrett Grocke, Ph.D.

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Professional Profile

Dr. Grocke is a chemical engineer by training, specializing in electrochemistry and materials engineering. He has extensive research experience in the construction, characterization, and functional control of semiconducting and energy storage materials. He is well-versed in battery assembly and testing, as well as the design and fabrication of custom experimental apparatuses.

At Exponent, Garrett uses these skills to provide assistance to clients in design evaluation, qualification, and failure analysis of products for a wide variety of applications including consumer and commercial electronics, medical devices, and electric vehicles. Garrett's experience includes fire investigations in battery-containing home goods, micromobility, and electric vehicles (EV), assisting in guidance for product recalls, supporting litigation and regulatory matters, as well as proactive efforts contributing to safety in design of battery-containing products.

Dr. Grocke has experience in numerous analytical techniques including X-ray computed tomography (CT) and 2-D X-ray analysis, battery cell teardown analysis, electrochemical impedance spectroscopy (EIS), cyclic and linear sweep voltammetry (CV and LSV), UV-visible spectroscopy (UV-Vis), thermogravimetric analysis (TGA), microscopy, and X-ray scattering techniques.

Prior to joining Exponent, Dr. Grocke's graduate research focused on the synthesis and characterization of novel organic semiconductors and battery active materials with mixed ionic-electronic conduction, with applications in sensors, thermoelectrics, and renewable energy storage systems. Additionally, his research at Argonne National Laboratory focused on the synthesis of high-anisotropy functional nanomaterials, with applications in catalysts, energy storage, and magnetic materials.

Academic Credentials & Professional Honors

Ph.D., Molecular Engineering, University of Chicago, 2022

M.S., Chemical Engineering, Northwestern University, 2012

B.S., Chemical Engineering, Northwestern University, 2011

William Rainey Harper Dissertation Fellowship, 2021

Licenses and Certifications

Certified Fire and Explosion Investigator (CFEI)

Certified Vehicle Fire Investigator (CVFI)

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Fire Investigation 1A (Cause and Origin), California Office of State Fire Marshal (CA)

Prior Experience

Research Scientist, Energy Systems Division, Argonne National Laboratory, 2013-2016

Patents

Chen, X.; Grocke, G. L.; Vajda, V.; Zhou, Z. US Patent US 10,196,757 B1: Integrated System for Nanofiber Production, February 2019.

Publications

Zhang, H.; Grocke, G. L.; Rose, G.; Rowan, S. J.; Patel, S. N. "Tailoring Polymer Polarity to Regulate Disulfide Accessibility in Redox-Active Particles for Organic Batteries," ACS Macromolecules, 2024, 57 (21), 10410-10417.

Zhang, H.; Grocke, G. L.; Rose, G.; Rowan, S. J.; Patel, S. N. "Thiadiazole Disulfide Cross-Linked Poly(3,4-ethylenedioxythiophene) Nanoparticles: A Dual Redox Approach for Organic Cathode Batteries," ACS Chem. Mat., 2024, 36 (19), 9959-9969.

Zhang, H.; Grocke, G. L.; Kopfinger, S. S.; Wang, Y.; Brahmasandra, A.; Ewoldt, R. H.; Rowan, S. J.; Patel, S. N. "Organo-disulfide-based particles enable controlled stimulus-triggered cleaning of electrode surfaces," RSC Applied Polymers, 2024, 2, 1113-1123.

Grocke, G. L.; Dong, B. X.; Taggart, A. D.; Martinson, A. B. F.; Niklas, J.; Poluektov, O. G.; Strzalka, J., Patel, S. N. Structure-Transport Properties Governing the Interplay in Humidity-Dependent Mixed Ionic and Electronic Conduction of Conjugated Polyelectrolytes. ACS Polym. Au 2022, 2, 4, 275–286.

DiTusa, M. F.; Grocke, G. L.; Patel, S. N. Probing the evolution of conductivity and structural changes in vapor-F4TCNQ doped P3HT. Mol. Syst. Des. Eng., 2022,7, 788-797.

Grocke, G. L.; Zhang, H.; Kopfinger, S. S.; Patel, S. N.; Rowan, S. J. Synthesis and Characterization of Redox-Responsive Disulfide-Crosslinked Polymer Particles for Energy Storage Applications. ACS Macro Lett. 2021, 10 (12), 1637-1642.

Ma, T.; Kent, W.; Dong, B. X.; Grocke, G. L.; Patel, S. N. Continuously Graded Doped Semiconducting Polymers Enhances Thermoelectric Cooling. Appl. Phys. Lett. 2021.

Dong, B. X.; Nowak, C.; Onorato, J. W.; Ma, T.; Niklas, J.; Poluektov, O. G.; Grocke, G.; Ditusa, M. F.; Escobedo, F. A.; Luscombe, C. K.; Nealey, P. F.; Patel, S. N. Complex Relationship between Side-Chain Polarity, Conductivity, and Thermal Stability in Molecularly Doped Conjugated Polymers. Chem. Mater. 2021, 33, 741–753.

Ma, T.; Dong, B. X.; Grocke, G. L.; Strzalka, J.; Patel, S. N. Leveraging Sequential Doping of Semiconducting Polymers to Enable Functionally Graded Materials for Organic Thermoelectrics. Macromolecules 2020.

Kato, R.; Mirmira, P.; Sookezian, A.; Grocke, G. L.; Patel, S. N.; Rowan, S. J. Ion-Conducting Dynamic Solid Polymer Electrolyte Adhesives. ACS Macro Lett. 2020, 9 (4), 500–506.

Sharon, D.; Bennington, P.; Liu, C.; Kambe, Y.; Dong, B. X.; Burnett, V. F.; Dolejsi, M.; Grocke, G.; Patel, S. N.; Nealey, P. F. Interrogation of Electrochemical Properties of Polymer Electrolyte Thin Films with Interdigitated Electrodes. J. Electrochem. Soc. 2018, 165 (16), H1028–H1039.

Zhou, Z.; Grocke, G.; Yanguas-Gil, A.; Wang, X.; Gao, Y.; Sun, N.; Howe, B.; Chen, X. CoFe2/Al2O3/PMNPT Multiferroic Heterostructures by Atomic Layer Deposition. Appl. Phys. Lett. 2016, 108 (18), 182907.

Presentations

Understanding the Effect of External Fire Attack on Lithium-Ion Batteries. Presentation. IEEE International Symposium on Product Compliance Engineering, May 2025.

Water-Mediated Mixed Ionic-Electronic Conduction in Polythiophene-Derived Polyelectrolytes. Poster Presentation. American Physical Society, March Meeting 2019