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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 synthesis, characterization, and functional control of semiconducting and energy storage materials. He is also 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.

Dr. Grocke has experience in numerous analytical techniques for electronic and polymeric materials characterization including 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

## 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.

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## Publications

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**

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