Exponent®
Engineering & Scientific Consulting

Keith Beers, Ph.D., P.E., CFEI, CQE, CVFI

Practice Director and Principal Engineer | Materials Science and Electrochemistry
Menlo Park
+1-650-688-7166 | kbeers@exponent.com

Professional Profile

Dr. Beers's areas of expertise include battery technology and polymer science. He has significant experience in the design, qualification, performance, reliability, safety, and failure analysis of batteries of varying formats, chemistries, and applications. Additionally, he has a specialized understanding of polymeric materials used in electrochemical and filtration systems, and the associated transport phenomena. He routinely solves complex technical problems related to the reliability and end-use performance of battery-powered consumer products, medical devices, energy storage systems, vehicles, and military and industrial equipment. Dr. Beers also leads product recall investigations and provides litigation support for intellectual property and product liability matters.

In his battery consulting practice, Dr. Beers assists clients with issues related to the full life cycle of battery-containing products, ranging from the early design and qualification of batteries to the analysis of field returns for safety and performance issues. During the product development stage, he utilizes a variety of methods to assist clients such as quality assessments, risk assessments (e.g., FMEA), non-standard testing tailored to end-use, accelerated aging, and forced thermal runaway testing. He has experience with a number of battery chemistries including more traditional systems (e.g., lead acid, nickel metal hydride, nickel cadmium, alkaline, lithium-ion, primary lithium metal, etc.) and technologies that are in development for commercial applications (e.g., sodium-ion, solid state, high mass loading silicon anodes, etc.). He also has experience providing technical consulting during due diligence assessments, as well as consulting related to the Inflation Reduction Act (e.g., Section 45X). For his work in this area, he utilizes a variety of testing including: X-ray CT scanning, cell teardowns, full cell cross sections, reference electrode testing, charge / discharge cycling, electrochemical impedance spectroscopy (EIS), imaging techniques (SEM, FIB, TEM), chemical analysis techniques (FTIR, Raman, EDS, GC-MS), and mechanical and thermal testing. He is also a current and past member of various standards committees related to batteries and battery safety.

In the field of polymer science, Dr. Beers consults on topics ranging from materials compatibility, small molecule migration and transport, adhesion, failure analysis, and polymers used in electrochemical and filtration applications. He has contributed to technology and product development, and the evaluation and mitigation of performance-based risk. Prior to joining Exponent, he researched fuel cell membranes, semi-crystalline polymer membranes, battery separators, filtration membranes, ion-exchange resins, solid polymer electrolytes, and polymer binders.

Academic Credentials & Professional Honors

Ph.D., Chemical Engineering, University of California, Berkeley, 2012

B.S., Chemical Engineering, University of Colorado, Boulder, 2007

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Licenses and Certifications

Professional Engineer Chemical, California, #6695

ASQ Certified Quality Engineer (CQE)

Certified Fire and Explosion Investigator (CFEI)

Certified Vehicle Fire Investigator (CVFI)

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

Prior Experience

Graduate Student Research Assistant, Lawrence Berkeley National Laboratory, 2008-2012

Summer Intern, Oceanit, Summer 2007

Undergraduate Researcher, University of Colorado, 2006-2007

Summer Undergraduate Researcher, Hawaii Natural Energy Institute, Summer 2005

Professional Affiliations

Standards Committee Participation (Current and Past)

• UL TC 2596 - Technical Committee for Thermal and Mechanical Performance of Battery Enclosure Materials

• SAE Micromobility Battery Standards Committee Member

• IEEE P1725 Working Group (Standard for Rechargeable Batteries for Cellular Telephones) Member

Professional Affiliations

Institute of Electrical and Electronic Engineers – IEEE

• IEEE Senior Member

• IEEE Product Safety Engineering Society Member

American Society for Quality – ASQ

• ASQ Member

Society of Automotive Engineers – SAE

• SAE Member

National Association of Fire Investigators - NAFI

• NAFI Member

Publications

Ha Y, Licht RB, Bogart TD, Beers KM. Bridging the gap between academic and industry Li-ion battery research. Frontiers in Batteries and Electrochemistry 2024; 2:1287887.

Beers KM, Wong DT, Jackson AJ, Wang X, Pople JA, Hexemer A, Balsara NP. Effect of crystallization on proton transport in model polymer electrolyte membranes. Macromolecules 2014; 47(13):4330-4336.

Chen X, Wong DT, Yakovlev S, Beers KM, Downing KH, Balsara NP. Effect of morphology of nanoscale hydrated channels on proton conductivity in block copolymer electrolyte membranes. Nano Letters 2014; 14(7):4058-4064.

Beers KM, Yakovlev S, Jackson AJ, Wang X, Hexemer A, Downing KH, Balsara NP. Absence of Schroeder's paradox in a nanostructured block copolymer. Journal of Physical Chemistry B 2014; 118(24):6785-6791.

Jackson A*, Beers KM*, Chen XC, Hexemer A, Pople JA, Kerr J B, Balsara NP. Design of a humidity controlled sample stage for simultaneous conductivity and synchrotron X-ray scattering measurements. Review of Scientific Instruments 2013; 84:075114.

*Authors contributed equally.

Wong DT, Wang C, Beers KM, Kortright JB, Balsara NP. Mesoporous block copolymer morphology studied by contrast-matched resonant soft X-ray scattering. Macromolecules 2012; 45(22):9188-9195.

Beers KM, Balsara NP. Design of cluster-free polymer electrolyte membranes and implications on proton conductivity. ACS Macro Letters 2012; 1(10):1155-1160.

Patel SN, Javier AE, Beers KM, Pople JA, Ho V, Segalman RA, Balsara NP. Morphology and thermodynamic properties of a copolymer with and electronically conducting block: poly(3-ethylhexylthiophene)-block-poly(ethylene oxide). Nano Letters 2012; 12(9):4901-4906.

Beers KM, Hallinan DT, Wang X, Pople JA, Balsara NP. Counterion condensation in Nafion. Macromolecules 2011; 44(22):8866-8870.

Wang X, Beers KM, Kerr JM, Balsara NP. Conductivity and water uptake in block copolymers containing protonated polystyrene sulfonate and its imidazolium salt. Soft Matter 2011; 7(9):4446-4452.

Balsara NP, Beers KM. Proton conduction in materials comprising conducting domains with widths less than 6 nm. European Polymer Journal 2011; 47(4):647-650.

Wang X, Yakovlev S, Beers KM, Park MJ, Mullin SA, Downing KH, Balsara NP. Origin of slow changes in ionic conductivity of model block copolymer electrolyte membranes in contact with humid air. Macromolecules 2010; 43(12):5306-5314.

Turn SQ, Keffer V, Beers KM. Physiochemical analysis of selected biomass materials in Hawaii. Report prepared for the State of Hawaii Department of Business, Economic Development and Tourism, 2005.

Conference Presentations and Published Abstracts

Beers K, Loewen T, Grocke G, Shen B, Lisberg R, Yuen R, Rogers J, Wagner A, Dienemann L, Overholts A, Janicek B. Characterization of Commercial 46 mm Cells. Oral Presentation, Advanced Automotive Battery Conference (AABC), Las Vegas, NV. December 2024.

McGann J, Beers K. Rising from the Ashes – How Cell Qualification Emerges from Failure Analysis. PlugVolt Seminar 2024, San Jose, CA, July 2024.

Hirsh H, Holguin K, Loewen T, Grocke G, Lee S, Bhattacharya R, Dienemann L, Ha Y, Luu N, Bogart T, Beers K. Characterization of the Design and Performance of Commercialized Sodium-Ion Batteries. 245th Electrochemical Society Meeting, San Francisco, CA, 2024.

Ha Y, Grocke G, Luu N, Loewen N, Hirsh H, Bogart T, Beers K. Why Do Lithium Batteries Fail – A Case Study. Poster Presentation. 245th Electrochemical Society Meeting, San Francisco, CA, 2024.

Beers K, Garrett G, Garrett Grocke, Jeremiah Stepan, Yeyoung Ha, Talia Loewen, Norman Luu, Haley Hirsh, Tim Bogart. 2024 IEEE Symposium on Product Safety and Compliance Engineering (ISPCE), Chicago, IL 2024.

Beers K, Wright C, Aladro C. Key Challenges to the Safety Performance of Lithium-ion Battery. Panel Moderator, Lithium-ion Batteries Americas 2024, Las Vegas, NV 2024.

Barton J, Beers K. Debunking the Unsound Methodology for Determining Fire Causation in a Lithium-Ion Battery. Product Liability Advisory Council Spring Conference, Nashville, TN, April 2024. Grocke G, Bogart T, Faenza N, Beers K. Cell-Level Assessments for Mitigation of Battery Failures. Poster Presentation, Advanced Automotive Battery Conference (AABC), San Diego, CA, December 2023.

Hirsh H, Bogart T, Spray R, White K, Beers K. Experimental Approach for the Rational Design of Battery Packs. Poster Presentation, Advanced Automotive Battery Conference (AABC), San Diego, CA, December 2022.

Yan Y, Cai Z, Cohn A, Beers K, White K. Evaluating EV Battery Safety from a Cell Perspective: Advanced Methods and Case Studies. Poster Presentation, Advanced Automotive Battery Conference (AABC), San Diego, CA, December 2021.

Beers K, Spray R, Bogart T, Harding J, Faenza N. Lithium-ion Cell Failure Mechanisms and Mitigation Strategies. 2021 IEEE Symposium on Product Safety and Compliance Engineering (ISPCE), Virtual, September 2021.

Beers K, Cai Z, Spray R, McGann J. Safety and Qualification Testing Considerations for Solid-State Batteries. Oral presentation, Solid-State Battery Summit, Virtual, August 2021.

Beers K, Licht R, Bogart T, Cohn A, Burke C, Cai Z, Horn Q, Spray R. Looking Under the Hood: Case Studies in 18650 Component and Performance Degradation. Oral presentation, NASA Aerospace Battery Workshop, Virtual, November 2020.

Beers K, Vickery J, Barry M, Spray R. Understanding How Testing Conditions Affect Hazard Quantification in Lithium-Ion Abuse Tests. Virtual Poster Presentation, Advanced Automotive Battery Conference (AABC), Virtual, November 2020.

Burke C, Licht R, Cohn A, Cai Z, Lee K, Godshaw J, Beers K, Adams R, Bogart T. Evaluating Internal Structural Changes in Commercial 18650's. Poster presentation, Advanced Automotive Battery Conference (AABC), Virtual, November 2020.

Beers K. Do's and Don'ts of Wearable Batteries. Oral presentation, WEAR, Virtual, October 2020.

Bassett K, Beers, K. Bridging Academic and Industrial Perspectives on Battery Testing and Design. Oral presentation, American Chemical Society Fall 2020 Virtual Meeting and Expo, Virtual, 2020.

Beers K, White K, Horn Q, Spray R, Licht R, Harding J, Faenza N. The Role of Temperature in Lithium-

ion Battery Failure. Oral presentation, Advances in Thermal Management, Virtual, August 2020.

Licht R, Cohn A, Beers K. The Effects of Cycling Protocols on Internal Cell Structure. Oral presentation, PlugVolt Battery Seminar 2019, Plymouth, MI, July 16, 2019.

Beers K, Licht R, Spray R, Burke C, Cohn A, Bogart T, Forman J, Rucker R, Godshaw J, Harding J, White K, Horn Q. Oral presentation, Testing Tools and Methodologies for Lithium-ion Cell Qualification. 2019 IEEE Symposium on Product Safety and Compliance Engineering (ISPCE), San Jose, CA, May 2019.

Beers K, Spray R, White K, Horn Q, Bogart T, Forman J, Licht R. Fundamentals of Lithium-ion Technology: Cell Safety and Performance. Oral presentation, 2018 Safety Summit San Diego (SSSD), San Diego, CA, October 2018.

Bogart T, Licht R, Beers K, Godshaw J, Rucker R, Forman J, White K. Understanding Degradation of Lithium-Ion Battery Performance. Poster presentation, Advanced Automotive Battery Conference (AABC), San Diego, CA, 2018.

Beers K, White K, Spray R, Horn Q, Harding J. Safety of Lithium-ion Batteries. Oral presentation, IEEE SCV Product Safety Engineering Society Meeting (PSES), Menlo Park, CA, 2017.

Beers K, Breitenkamp K, White K, McNulty J. The Do's and Don'ts of Wearable Device Design. Oral presentation, SMTA Dallas Expo & Tech Forum, Dallas, TX, March 2017.

Beers K, White K, Spray R. Failure Modes and Risk Mitigation Strategies for Batteries in Wearable Devices. Oral presentation, Medical Electronics Symposium, Portland, OR, September 2016

Chen C, Wong DT, Beers KM, Balsara NP. Morphology and proton transport in sulfonated block copolymer and mesoporous polymer electrolyte membranes. Oral presentation, National Meeting of the American Physical Society, Baltimore, MD, March 2013.

Beers KM, Jackson A, Balsara NP. Characterization of the disorder-order transition in hydrated block copolymers using humidity controlled SAXS. Poster presentation, Synchrotron Radiation in Polymer Science Conference, San Francisco, CA, March 2012.

Beers KM, Jackson A, Balsara NP. Disorder-order transitions in humidified block copolymer electrolytes studied by in situ SAXS. Oral presentation, National Meeting of the American Physical Society, Boston, MA, March 2012.

Wong DT, Beers KM, Wang C, Kortright J, Balsara, NP. Characterizing mesoporous block copolymers by resonant soft X-ray scattering. Oral presentation, National Meeting of the American Physical Society, Boston, MA, March 2012.

Beers KM, Wang X, Balsara NP. Characterization of a model polyelectrolyte membrane using a semi-crystalline block copolymer. Oral presentation, National Meeting of the American Physical Society, Dallas, TX, March 2011.

Wang X, Balsara NP, Beers KM, Park MJ. Conductivity and water content in asymmetrical sulfonated block copolymers. Oral presentation, National Meeting of the American Physical Society, Portland, OR, March 2010.