

Exponent®
Engineering & Scientific Consulting

Quinn Horn, Ph.D., P.E.

Principal Engineer | Materials Science and Electrochemistry
Natick
+1-508-652-8571 | qhorn@exponent.com

Professional Profile

Dr. Horn consults in the areas of metallurgy and electrochemistry and frequently addresses issues related to corrosion analysis, battery manufacturing, and battery science. In the field of metallurgy, he consults on topics related to failure analysis, corrosion, material degradation, and material selection.

In the field of battery technology, Dr. Horn's work addresses a broad range of issues including material selection and testing, cell design, cell manufacturing, performance degradation, accelerated life testing, and due diligence technology evaluation. He has extensive experience developing characterization techniques for understanding discharge reactions and degradation mechanisms in a wide range of battery systems including lithium-ion, lithium-primary, nickel-metal hydride, nickel cadmium, lead-acid, and alkaline primary cells.

Prior to joining Exponent, Dr. Horn held positions as a Principal Scientist at Physical Sciences Inc. (PSI), and as a Staff Technology Engineer at Energizer/Eveready Battery Company. At PSI, Dr. Horn designed, developed, and tested high-energy and high-power electrodes for lithium-ion batteries. At Energizer, Dr. Horn was responsible for the Microscopy and Materials Group, where he conducted failure analysis studies to solve problems related to battery failures and battery manufacturing issues.

Dr. Horn is a Research Affiliate at the Massachusetts Institute of Technology, where he collaborates with researchers in the Electrochemical Energy Laboratory on projects related to electric vehicles and new gas diffusion electrodes for metal-air batteries and fuel cells.

Academic Credentials & Professional Honors

Ph.D., Metallurgical and Materials Engineering, Michigan Technological University, 1998

M.S., Metallurgical Engineering, Michigan Technological University, 1995

B.S., Metallurgical Engineering, Michigan Technological University, 1993

Iron and Steel Society's Young Leaders Award, 1997-1998

DeVleig Academic Fellowship, 1997

Department of Defense Research Fellow, 1994-1997

Forging Industry Education and Research Foundation's Forging Achievement Award, 1992

© 2026 Exponent, Inc. All Rights Reserved

Licenses and Certifications

Professional Engineer, Maryland, #38382

Academic Appointments

Research Affiliate, Mechanical Engineering, Massachusetts Institute of Technology

Prior Experience

Principal Scientist, Physical Sciences Inc., 2002-2004

Staff Technology Engineer, Eveready/Energizer Battery Company, 1998-2002

Professional Affiliations

Materials Research Society, 2001-present

Electrochemical Society, 1999-present

Tau Beta Pi, 1992-present

Alpha Sigma Mu, 1991-present

ASM/TMS, 1991-present

Patents

Patent 7,709,139: Three Dimensional Battery, May 4, 2009 (with K. White, E. Salley and J. Lennhoff), May 4, 2010.

Patent 7,332,247: Electrode for an Electrochemical Cell and Process for Making the Electrode, February 19, 2008.

Patent 7,229,944: Fiber Structures Including Catalysts and Methods Associated with the Same, June 12, 2007 (with Y. Shao-Horn and J. Kurpiewski).

Patent Application 12/193,482: Carbon Foam Based Three Dimensional Batteries and Methods, filed August 18, 2008 (with K. White and A. Newman).

Publications

Book Chapters

Horn Q, Hayes T, Slee D, White K, Harmon J, Godithi R, Wu M, Megerle M, Singh S, Mikolajczak C. Methodologies for Battery Failure Analysis. In: Handbook of Batteries (4th edition), Thomas Reddy (ed), McGraw-Hill, October 2010.

Publications

Han B, Harding JR, Goodman JKS, Cai Z, Horn QC. End-of-Charge Temperature Rise and State-of-Health Evaluation of Aged Lithium-Ion Battery. 2022 December, Energies 16 (1), 405.

Cohn AP, Hayes TA, Harding JR, Horn QC. The Low-Voltage Limits of Lithium-Ion Batteries—Overdischarge and Degradation from a Safety Perspective, 2022 October, ISTFA 2022, 47-50.

Harding JR, Han B, Madden SB, Horn QC. Examining the performance of implantable-grade lithium-ion cells after overdischarge and thermally accelerated aging. 2022 February, Energies 15 (4), 1405.

Ponchaut NF, Colella F, Spray R, Horn Q. Thermal management modeling for avoidance of thermal runaway conditions in lithium-ion batteries. Lithium Ion Batteries in Electric Drive Vehicles, 2016 May, 175, 75.

Ponchaut N, Marr K, Colella F, Somandepalli V, Horn Q. Thermal runaway and safety of large lithium-ion battery systems. Proceedings of the The Battcon, 2015 May, 17.1-17.10.

Ponchaut NF, Colella F, Spray R, Horn Q. Thermal management modeling for avoidance of thermal runaway conditions in lithium-ion batteries. SAE Technical Paper, 2014.

Somandepalli V, Marr K, Horn Q. Quantification of combustion hazards of thermal runaway failures in lithium-ion batteries. SAE International Journal of Alternative Powertrains 3 (2014-01-1857), 98-104.

Hanzlik J, Patel J, Kurtz S, Horn Q, Shkolnikov Y, Ochoa J, Pavri B, Greenspon A. Why are implantable cardioverter-defibrillators and pacemakers being revised today? Medical Device Materials IV 2013; 57-62.

Somandepalli V, Marr K, Horn Q. Catastrophic failures in lithium-ion battery packs used in EV and hybrid vehicles. Society of Automotive Engineers, 2013 World Congress, Detroit, MI, April 16-18, 2013.

Somandepalli V, Marr K, Horn Q. Explosion hazards due to failures of lithium-ion batteries. Proceedings, American Institute of Chemical Engineers, 2012 Spring National Meeting, 9th Global Congress on Process Safety, San Antonio, TX, April 28-May 1, 2013.

Mikolajczak C, Harmon J, White K, Horn Q, Wu M. Detecting lithium-ion cell internal faults in real time. Power Electronics Technology, March 2010.

Smith M, Garcia, R, Horn, Q. The effect of microstructure on the galvanostatic discharge of graphite anode electrodes in LiCoO2-based rocking-chair rechargeable batteries. Journal of the Electrochemical Society 2009 Nov; 156 (11) A896-A904.

Stewart S, Horn Q, Mikolajczak C, White K, Budiansky N, Wu M. Optimizing design, charging algorithm, and predicting useful life by electrochemical modeling. Proceedings, 9th International Advanced Automotive Battery & EC Capacitor Conference, Long Beach, CA, June 10-12, 2009.

Mikolajczak C, Harmon J, Stewart S, Arora A, Horn Q, White K, Wu M. Mechanisms of latent internal cell fault formation: Screening and real time detection approaches. Proceedings, Space Power Workshop, Manhattan Beach, CA, April 20-23, 2009.

Mikolajczak C, Stewart S, Harmon, J, Horn, Q, White K, Wu M. Mechanisms of latent internal cell fault formation and opportunities for detection. Proceedings, 2008 NASA Aerospace Battery Workshop, Huntsville, AL, November 18-20, 2008.

Mikolajczak C, Stewart S, Harmon, J, Horn, Q, White K, Wu M. Mechanisms of latent internal cell fault formation. Proceedings, 9th BATTERIES Exhibition and Conference, Nice, France, October 8-10, 2008.

White KC, Horn Q. Lithium Ion Cell Overcharge in the Absence of Battery Management Unit Failure, 2008 August, ECS Meeting Abstracts, 1283.

Mikolajczak C, Harmon J, Hayes T, Megerle M, White K, Horn Q, Wu M. Li-ion battery cell failure

analysis: The significance of surviving features on copper current collectors in cells that have experienced thermal runaway. Proceedings, 25th International Battery Seminar & Exhibit for Primary & Secondary Batteries, Small Fuel Cells, and Other Technologies, Fort Lauderdale, FL, March 17-20, 2008.

Horn Q, Shao-Horn Y. Morphology and spatial distribution of ZnO Discharge product in commercial Zn/MnO2 AA batteries. Journal of the Electrochemical Society 2003 May; 150 (5) A652-A658.

Shao-Horn Y, Osmialowski S, Horn Q. Nano-FeS2 for commercial Li/FeS2 primary batteries. Journal of the Electrochemical Society 2002 Nov; 149(11):A1499-A1502.

Shao-Horn Y, Osmialowski S, Horn Q. Reinvestigation of cathodic discharge mechanisms in lithium-FeS2 cells at ambient temperatures. Journal of the Electrochemical Society 2002 Dec; 149 (12) A1547-A1555.

Shao-Horn Y, Horn Q. Chemical, structural and electrochemical comparison of natural and synthetic FeS2 pyrite in lithium cells. Electrochimica Acta 2001; 46:2613.

Horn Q, Heckel R, Nassaralla C. The effect of magnesium additions on the evolution of PH3 gas from FeSi75 alloys. Proceedings, 56th Electric Arc Furnace Conference, New Orleans, LA, November 1998.

Horn Q, Heckel R, Nassaralla C. Microstructural study of granulated ferrosilicon with 75wt% silicon. Proceedings, INFACON 8 Meeting, Beijing, China, June 1998.

Horn Q, Heckel R, Nassaralla C. Reactive phosphide inclusions in commercial ferrosilicon. Metallurgical Transactions 1998 April; 29B (2) 325-329.

Horn QC. Correlation between microstructure, phosphine evolution and spontaneous crumbling in iron-silicon alloys. 1998, Michigan Technological University.

Horn Q, Heckel R, Nassaralla C. Interaction of ferrosilicon alloys with the environment. Proceedings, Japan-U.S. Joint Seminar for Clean Steel for the 21st Century. Iguchi Y (ed), pp. 97-102, Futtsu, Chiba, Japan, April 25-27, 1996.

Hackney S, Lillo T, Kedia R, Horn Q, Plichta M. Edge instabilities in thin plates studied by in situ transmission electron microscopy. Ultramicroscopy 1993; 51:81-89.

Kedia R, Lillo T, Horn Q, Plichta M, Hackney S. Edge instabilities in thin plates with spatial variations in thickness. Scripta Metallurgica 1993; 28(3):269-274.

Selected Presentations

Horn Q. Failure modes unique to large format cells and battery systems. NAATBatt Annual Meeting and Symposium, San Diego, CA, January 21-23, 2014.

Horn Q. Review of battery technology and safety. Canadian Arson and Fire Investigator's Educational Symposium and Seminar, Niagara Falls, Ontario, September 17-19, 2013.

Horn Q, White K. Characterization of degradation and failure modes in lithium-ion cells. Invited Presentation, Microscopy and Microanalysis 2013 Meeting, Indianapolis, IN, August 6, 2013.

Somandepalli V, Marr K, Horn Q. Catastrophic failures in lithium-ion battery packs used in EV and hybrid vehicles. Society of Automotive Engineers, 2013 World Congress, Detroit, MI, April 16-18, 2013.

Somandepalli V, Marr K, Horn Q. Explosion hazards due to failures of lithium-ion batteries. American Institute of Chemical Engineers, 2012 Spring National Meeting, 9th Global Congress on Process Safety,

San Antonio, TX, April 28-May 1, 2013.

Spray R, Forman J, Horn Q, Shah K, White K. Towards an accessible methodology for measurement of cell performance with aging. 30th Annual International Battery Conference, Fort Lauderdale, FL, March 2013.

White K, Horn Q. Predicting long term lithium-ion battery performance through the application of chemical kinetics. MD&M West Meeting, Anaheim, CA, February 14, 2013.

White K, Somendapalli V, Mahr K, Horn Q. Combustion properties of Li-ion battery vent gases. IEEE Product Safety Symposium, Portland, OR, November 2012.

Somandepalli V, Marr K, Horn Q. Combustion properties of Li-ion battery vent gases. 29th International Battery Seminar and Exhibit, Fort Lauderdale, FL, March 2012.

Horn Q. Performance and reliability of batteries for medical device applications. Invited presentation at the MD&M West Meeting, Anaheim, CA, February 15, 2012.

White K, Horn Q. Quantifying lithium-ion battery safety. IEEE Product Safety Symposium, San Diego, CA, November 2011.

Horn Q. Characterizing performance and determining reliability for batteries. Invited presentation at the MD&M Minneapolis Meeting, Minneapolis, MN, November 1, 2011.

Horn Q, White K, Spray R. Mapping thermal stability of lithium-ion cells. Invited presentation at the Dow-Kokam Advanced Battery Technology Exchange, Lee's Summit, MO, October 20, 2011.

Horn Q, Qi Y. Materials for li-ion batteries: Structures, performance, and durability. Short course taught at the 219th Electrochemical Society Meeting, Montreal, Canada, May 1, 2011.

Horn Q, White K. Cell overcharge in the absence of battery management unit failure. Presented at the Electric Vehicle Lithium-Ion Battery Forum, Beijing, China, August 25, 2010.

Horn Q, White K, Singh S. Assessing thermal stability of commercial lithium-ion cells. Presented at the International Meeting on Lithium Batteries, Montreal, Canada, July 2, 2010.

Horn Q. Inside the battery: Understanding why good batteries go bad. Invited keynote presentation, Teradyne Users Group Conference, Hilton Head, SC, May 3, 2010.

Horn Q, White K. Characterizing performance and determining reliability for batteries in medical device applications. Presented at ASM Materials and Processes for Medical Devices, Minneapolis, MN, August 13, 2009.

Horn Q. Battery involvement in fires: Cause or effect? Invited seminar, International Association of Arson Investigators- Massachusetts Chapter, Auburn, MA, March 19, 2009.

Horn Q, White K. Advances in characterization techniques for understanding degradation and failure modes in lithium-ion cells: Imaging of internal microshorts. Invited presentation, International Meeting on Lithium Batteries 14, Tianjin, China, June 27, 2008.

Horn Q, White K. Novel imaging techniques for understanding degradation mechanisms in lithium-ion batteries. Presented at the Advanced Automotive Battery Conference, Tampa, FL, May 13, 2008.

Horn Q. Application of microscopic characterization techniques for failure analysis of battery systems. Invited presentation, San Francisco Section of the Electrochemical Society, March 27, 2008.

Horn Q. Technological challenges in portable energy storage. Invited presentation, 5th Global Technology Symposium at Stanford, Palo Alto, CA, January 31, 2008.

Horn Q, White K. Understanding lithium-ion degradation and failure mechanisms by cross-section analysis. Presented at the 211th Electrochemical Society Meeting, Chicago, IL, Spring 2007.

Hayes T, Horn Q. Methodologies of identifying root cause of failures in li-ion battery packs. Invited presentation, 24th International Battery Seminar and Exhibit, Fort Lauderdale, FL, March 2007.

White K, Newman A, Boehme J, Middleton C, Pawle R, Middleton E, Lennhoff J, Horn Q, Shao-Horn Y. Anode and cathode templated three-dimensional lithium-ion batteries based on nano-fibrous electrodes. Invited presentation, 208th Electrochemical Society Meeting, Los Angeles, CA, Fall 2005.

Horn Q. Lithium-ion batteries with three-dimensional electrode architectures. Invited presentation, Energizer Battery Company, Westlake, OH, May 3, 2005.

Horn Q, Kurpiewski J, Shao-Horn Y. Engineered electrodes and membrane electrode assemblies for PEM fuel cells. Presented at the ASME Congress, Anaheim, CA, November 15, 2004.

Lennhoff J, Rose A, Hunter A, Harris G, Horn Q. Storage of ammonia in metal organic frameworks. Invited presentation, Nano Materials for Defense Applications Meeting, Maui, HI, February 2004.

Horn Q, White K, Shao-Horn Y, Lennhoff J. Three dimensional lithium ion batteries based on non-woven carbon fabrics. Presented at the 204th Electrochemical Society Meeting, Orlando, FL, Fall 2003.

Horn Q, Shao-Horn Y. Morphology and spatial distribution of ZnO discharge product in commercial Zn/MnO2 AA batteries. Presented at the International Battery Association/Hawaii Battery Conference Joint Meeting, Waikola Beach Resort, HI, January 2003.

Horn Q, Heckel R, Nassaralla C. The effect of magnesium additions on the evolution of PH3 gas from FeSi75 alloys. Presented at the 56th Electric Arc Furnace Conference, New Orleans, LA, November 1998.

Horn Q, Heckel R, Nassaralla C. Microstructural study of granulated ferrosilicon with 75wt% silicon. Presented at the INFACON 8 Meeting, Beijing, China, June 1998.

Horn Q, Heckel R, Nassaralla C. Reactive phosphides in commercial ferrosilicon. Presented at the Iron and Steel Making Conference, Chicago, IL, April 1997.

Horn Q, Heckel R, Nassaralla C. Interaction of ferrosilicon alloys with the environment. Presented at the Japan-U.S. Joint Seminar for Clean Steel for the 21st Century, Futtsu, Chiba, Japan, April 25-27, 1996.

Seminars and Short Courses

"Investigating the Potential Involvement of Batteries in Fires"

- IAAI International 67th Training Conference, April 24-29, Orlando, Florida, 2016.
- IAAI Hawaii Chapter Training Seminar, August 10-12, Honolulu, Hawaii, 2016.
- New York State Office of Fire Prevention and Control 42nd Arson Seminar, New York State Academy of Fire Sciences, November 2-4, 2016.
- UK Association of Fire Investigators Annual Training Conference, Chesam, Bucks, UK, January 30-31, 2017.