



**Exponent**<sup>®</sup>  
Engineering & Scientific Consulting

## Kevin White, Ph.D.

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### Professional Profile

Dr. White's core discipline is chemistry with emphasis on electrochemistry and its application to battery systems. He has extensive experience in electrochemical energy conversion, chemical/material interactions and diffusion and migration based mass transport in liquids and solids.

Dr. White's specialties include battery science and interfacial chemistry / electrochemistry. He addresses challenges related to battery technology, including: battery-device relationships, cell design, manufacturing and evaluation, performance degradation, cell safety, accelerated lifetime testing, failure analysis, due diligence technology evaluation, and litigation support. His skills are applied to a range of cell chemistries including: lithium-ion, lithium primary, lead acid, nickel-metal hydride, nickel cadmium, and alkaline primary.

Dr. White has extensive experience consulting across multiple industries utilizing small and large format batteries including the consumer electronics, electrified clothing, medical device, industrial equipment, power tool, automotive, aerospace, and energy storage industries. He has developed particular experience with complex large format battery failure analysis and battery related safety recalls through direct involvement with several high profile incidents.

Prior to joining Exponent, Dr. White was a Principal Research Scientist at Physical Sciences Inc. (PSI). His research and development efforts focused on novel architectures and materials for advanced lithium ion batteries, chemistry, and coatings for corrosion inhibition in harsh environments and novel polymer processing techniques. His research yielded a patent for an electrochemical energy device with power density characteristic of electrochemical capacitors and energy density characteristic of lithium ion batteries, and patent applications for a high energy metal oxide/conducting polymer composite cathode system for lithium ion batteries and novel structural electrode designs for lithium-ion batteries. In addition, Dr. White advanced anti-corrosion coatings for mild steel reinforcement in concrete for marine environments and the processing of polymers in functional, application driven nanoscale geometries.

Dr. White is a former NASA Fellow and former Chairman of the New England Section of the Electrochemical Society.

### Academic Credentials & Professional Honors

Ph.D., Electrochemistry, University of Wyoming, 2000

B.S., Chemistry, Michigan State University, 1993

Visiting Scholar, University of Sao Paulo, Brazil, 1999

NASA Space Grant Fellowship, 1996-1997

## Professional Affiliations

Member of the Electrochemical Society, 1996-present

New England Section of the Electrochemical Society, 2005-present

## Patents

United States Patent 7,709,139 B2: Three Dimensional Battery, May 4 2010.

Patent Application No. 20100124702: High Energy Composite Cathodes for Lithium-ion Batteries, Published June, 2010.

Patent Application No. 20090291368: Carbon Foam Based Three-Dimensional Batteries and Methods, Published November 2009.

## Publications

Stark Goodman J, Miller JT, Kreuzer S, Forman J, Wi S, Choi J, Oh B, White K. "Lithium-ion Cell Response to Mechanical Abuse: Three-point Bend", Journal of Energy Storage, Volume 28, April 2020

Mikolajczak C, Kahn M, White K, Long RT. "Lithium-ion Batteries Hazard and Use Assessment", The Fire Protection Research Foundation, July 2011.  
<http://www.nfpa.org/assets/files/PDF/Research/RFLithiumIonBatteriesHazard.pdf>

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.

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.

White K, Miller J, Lennhoff J. "Electrospun Nanofiber Reinforcement of Gossamer Space Structures", Nonwovens World 2004; 13(1):46.

Pope J, Sato T, Shoji E, Oyama N, White K, Buttry D. "Organosulfur/Conducting Polymer Composite Cathodes II", Spectroscopic determination of the protonation and oxidations of 2,5-Dimercapto-1,3,4-thiadiazole. Journal of the Electrochemical Society 2002; 149(7):A939.

White K, Buttry D. "An Electrochemical and FTIR Spectroscopic Study of the Aqueous Oxidation of Quadricyclane and Noritricyclanol", Journal of the Electrochemical Society 2000; 147(1):266.

## Presentations and Published Abstracts

White K, Clevenger J., "Navigating Lifetime Predictions & Accelerated Testing for Lithium-Ion Battery Cells", Exponent Webinar Series, October 2021

White K., "Lithium-ion Cell Basics – Construction to Failure", ENDS Public Workshop, Food and Drug Administration, Center for Tobacco Products, April 2017

White K., Forman J., "Accelerated Testing: Understanding Experimental Design and Error Propagation", Service Life Prediction of Exterior Plastics, Springer Publishing, 2015

White K., "Understanding and Avoiding Energetic Lithium-Ion Battery Failure", Next Generation Batteries, Battery Transportation Safety Workshop April 2015

White K., "Exploring the Unique Challenges for Plastics in Lithium-ion Battery Packs", ANTEC New Technology Forum: Advances in Batteries & Super-Capacitors, March 2015

White K. "Predicting Long Term Lithium-ion Battery Performance Through the Application of Chemical Kinetics", MedTech Innovate Seminars at MD&M West, February, 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.

White K. "Battery Standards, Regulations and Beyond", The Battery Show, Detroit, MI, November 2012.

White K. "Battery Standards, Industry Best Practices and Achieving True Battery Safety", Invited Speaker at the Electrochem Symposium on Batteries for Critical Applications, Boston, MA, April 2012.

White K, Horn Q. "Quantifying Lithium-ion Battery Safety", IEEE Product Safety Symposium, San Diego, CA, November 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.

Mikolajczak C, Harmon J, White K, Horn Q, Wu M. "Detecting Lithium-ion Cell Internal Faults in Real Time", Power Electronics Technology, March 2010.

White K, Horn Q, Singh S, Spray R. "Thermal Stability of Lithium-ion Cells as Functions of Chemistry, Design and Energy", Invited Presentation, International Battery Association Conference, Kona, HI, January 2010.

White K, Horn Q. Evaluating Performance, Reliability and Safety in Lithium-ion Battery Cells. IEEE International Conference on Technologies for Practical Robot Applications, Waltham, MA December 2009.

Horn Q, White K. "Characterizing Performance and Determining Reliability for Batteries in Medical Device Applications", ASM Materials and Processes for Medical Devices, Minneapolis, MN, August 13, 2009.

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.

White K, Horn Q. "Lithium-ion Cell Overcharge in the Absence of Battery Management Unit Failure", 214th Meeting of the Electrochemical Society, Honolulu, HI, October 2008; and 2008 Battery Power Conference, Dallas, TX, November 2008.

Myers T, White K, Xu T. "Did a Dust Explosion Occur? Microscopic and Thermogravimetric Techniques to Determine if Dust Participated in an Explosion Event", Proceedings, International Symposium on Fire Investigation Science and Technology, Cincinnati, OH, 2008; and Proceedings, Mary Kay O'Connor Process Safety Center Symposium, College Station, TX, 2008.

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", Advanced Automotive Battery Conference, Tampa, FL, May 13, 2008.

Horn Q, White K. "Understanding Lithium-ion Degradation and Failure Mechanisms by Cross-section Analysis", 211th Electrochemical Society Meeting, Chicago, IL, Spring 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.

White K, Horn Q, Newman A, Salley E, Lennhoff J. "Lithium-ion Batteries Based on Polymer Modified V<sub>2</sub>O<sub>5</sub> Cathode Materials", Presented at the 206th Electrochemical Society Meeting, Honolulu, HI, October 2004.

White K, Lennhoff J, Salley E, Horn Q, Pasco-Gardner S, Racoveanu A. "Advanced Materials for Battery Applications", Invited Speaker, 8th Electrochemical Power Sources R&D Symposium, Portsmouth, VA, July 2003.

White K, Horn Q, Salley E, Lennhoff J. "Three-dimensional Cathode Materials from Electrospinning", 204th Electrochemical Society Meeting, Orlando, FL, Fall 2003.

Horn Q, White K, Shao-Horn Y, Lennhoff J. "Three Dimensional Lithium-ion Batteries Based on Non-Woven Carbon Fabrics", 204th Electrochemical Society Meeting, Orlando, FL, Fall 2003.

White K, Salley E, Jayne K, Lennhoff J. "Application of Electrospinning to the Fabrication and Reinforcement of Gossamer Space Structures", Annual Technical Conference of The Fiber Society, Natick, MA, October 2002.

White K, Buttry D, Torresi R, Bruno R. "Novel V<sub>2</sub>O<sub>5</sub> Composites for Secondary Lithium-ion Battery Application", 196th Electrochemical Society Meeting, Honolulu, HI, October 1999.

White KC, Shouji E, Buttry DA. "New Approaches to Lithium-ion Battery Cathode Materials", 50th Pittsburgh Conference, Orlando, FL, 1999.

White K, Buttry D, Torresi R, Torresi S. "Sol-gel Synthetic Routes to Novel Lithium Ion Intercalation Materials", 217th National Meeting of the American Chemical Society, Anaheim, CA, March 1999.

White K, Buttry D. "Basic Electrochemistry of Some Highly Strained Hydrocarbons", 189th Meeting of the Electrochemical Society, Los Angeles, CA, May 1996.