Brian M. May, Ph.D.

Senior Staff Consultant

Dr. Brian May is a chemist with over 10 years of experience. He specializes in lithium-ion batteries (amongst other battery chemistries) and has performed risk assessments and failure analyses from the consumer device level to large scale applications such as grid energy storage systems. Dr. May also has experience in the testing and analysis of batteries for performance and safety, as well as other electrochemical testing.

In addition to his work related to batteries, Dr. May has provided valuable insights as related to materials in a wide variety of applications. He has performed characterization on consumer products, to determine composition, morphology, and chemical, thermal, and mechanical properties. Dr. May has also investigated a number of incidents related to chemical compatibility and conducted reverse engineering to determine consumer product formulations.

Additional areas of practice include fire investigations, in which batteries and other chemical processes have been alleged to be involved. Furthermore, Dr. May has also served as technical lead in matters related to intellectual property.

His background encompasses a wide array of characterization techniques, such as microscopy, X-ray diffraction, computed tomography (CT), spectroscopy, and separations. Dr. May is also well versed in experimental design and execution, data interpretation, and communication of findings. He has published in peer-reviewed journals and given several presentations on his work to both technical and lay audiences.

Dr. May received his Ph.D. in chemistry from the University of Illinois at Chicago. His dissertation focused on developing techniques to characterize the chemical reactions occurring within lithium-ion batteries that control the energy storage functionality. Prior to that, he received his B.S. in chemistry from Loyola University Chicago, where he conducted research into the enzymatic processes that govern glycogen synthesis in bacteria and starch in plants.

Contact Information

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Areas of Specialization

- Batteries and Energy Storage
- Electrochemistry
- Failure Analysis
- Analytical Chemistry
- Material Compatibility
- Fire Investigation
- Intellectual Property
- Data Visualization
- Safety
- Lab & Industrial Services
- Toxin Exposure
- Product Deformulation

Project Experience Highlights

Batteries

- Battery Energy Storage System (BESS) Fires – Characterized exemplar batteries for electrochemical properties and examination of internal features, by CT and physical teardown.
- Nickel metal hydride battery pack fires – Examined the internal chemistry and construction of battery cells to determine failure mechanisms that resulted in fires.

Fire/Explosion

- Chemical plant explosion – Performed analysis and testing to determine cause of an explosion that occurred in a specialty chemical manufacturing plant.
- Research lab explosion – Investigated the cause of an explosion in a research laboratory by developing and testing hypotheses related to the synthesis and properties of an energetic material.

Chemical Interactions

- Personal injury from chemical reaction – Determined the cause of an injury-causing chemical reaction by examining samples collected from the site and analyzing possible contaminants
- Herbicide application – Investigated whether an inadvertent herbicide application left any traces remaining and whether there was any impact to nearby fruit-bearing trees.
- Chemical disinfectant exposure – Investigated the root cause of an incident where livestock was exposed to chemical disinfectant and sustained injuries.
- Stainless steel appliance corrosion – Characterized type of corrosion present on stainless steel appliances in industrial kitchen and offered solutions to restore items rather than perform a costly replacement.
- Accelerated aging study – Established the environment for an accelerated aging study of polymeric piping materials

Materials Characterization

- Catalytic material characterization – Identified noble metal catalyst at the nano and sub-nano scale within porous ceramic particles
- Collapsed swimming pool – Performed X-ray diffraction analysis on precipitate obtained from a subsurface pool deck drain to determine the source of water contributing to the heaving and ultimate failure of a pool deck.
- Aluminum beverage can failure – Performed failure analysis on aluminum beverage cans, identifying leak sites via microscopic investigation and chemical analysis.

Environmental Monitoring

- Apartment air quality monitoring – Monitored the air inside of a living unit for toxins and humidity following a tenant complaint.

Education

- Ph.D., Analytical Chemistry, University of Illinois at Chicago
- B.S., Chemistry with an Emphasis in Biochemistry, Loyola University Chicago

Professional Affiliations/Honors

- **ASM International**
  Member, Failure Analysis Society
  Chair – Batteries and Energy Storage Session, IMAT 2024
- **National Association of Fire Investigators**
  Member
- **Materials Research Society**
  Member
- **Electrochemical Society**
  Member
- **Journal of Solid State Ionics**
  Ad Hoc Reviewer, 2017
- **National School on Neutron and X-Ray Scattering**
- **Denver X-Ray Conference**
  Robert L. Snyder Student Travel Award, 2015

Positions Held

- **Engineering Systems Inc., Aurora, Illinois**
  Senior Staff Consultant, 2026-Present
  Staff Consultant, 2018-2025
- **University of Illinois at Chicago**
  Research Assistant, 2015-2018
  Teaching Assistant, 2013-2014
- **Loyola University Chicago**
  Undergraduate Research Assistant, 2012-2013

Continuing Education/Certifications

- Mycometer Surface Fungi Sampling & Analysis Proficiency Training Program
- IATA Dangerous Goods Certification
- National Association of Fire Investigators Investigation Training Program

Selected Publications/Presentations

Publications

"Origin of Rapid Delithiation in Secondary Particles of $LiNi_{0.80}Co_{0.15}Al_{0.05}O_2$ and $LiNi_yMn_zCo_{1-y-z}O_2$ Cathodes," M.W. Wolfman, **B.M. May**, et al. Advanced Energy Materials 13, 2023, 2300895.

"Forensic Evidence of Arc Tracking as an Ignition Source," T.J. Bajzek, E.A. Burns, R.P. Baron, **B.M. May**, J.P. Sommer, 2023 IEEE International Symposium on Product Compliance Engineering (ISPCE), 1-3.

"Evaluation of Chemical and Structural Homogeneity in Single Particles of $Li_{1-x}Ni_{0.33}Mn_{0.33}Co_{0.33}O_2$," W.J. Judge, **B.M. May**, K. Kumar, M.F. Wolfman, D.A. Shapiro, Z. Cai, M.V. Holt, J. Cabana, Journal of Physical Chemistry C 126 (2022), 16082-16089.

"The Implications of Post-Fire Physical Features of Cylindrical 18650 Lithium-Ion Battery Cells," T Nagourney, J. Jordan, L. Marsh, D. Scardino, **B.M. May**, Fire Technology 57 (2021), 1707-1722.

"Effect of Synthetic Parameters on Defects, Structure, and Electrochemical Properties of Layered Oxide $LiNi_{0.80}Co_{0.15}Al_{0.05}O_2$," **B.M. May**, et al., Journal of the Electrochemical Society 165 (2018), A3537-A3543.

"Facet-Dependent Rock-Salt Reconstruction on the Surface of Layered Oxide Cathodes," H. Zhang, **B.M. May**, et al., Chemistry of Materials 30 (2018), 692-699.

"Nanoscale Detection of Intermediate Solid Solutions in Equilibrated Li_xFePO_4 Microcrystals," **B.M. May** et al., Nano Letters 17 (2017), 7364-7371.

"Visualization of Electrochemical Reactions in Battery Materials with X-ray Microscopy and Mapping," M. Wolf, **B.M. May**, J. Cabana., Chemistry of Materials 29 (2017), 3347-3362.

"Conserved Residues of the Pro103-Arg115 Loop are Involved in Triggering the Allosteric Response of the Escherichia Coli ADP-Glucose Pyrophosphorylase," B.L. Hill, J. Wong, **B.M. May** et al., Protein Science 24 (2015) 714-728.

Presentations

"Oh CELL no!" An Examination into the degradation of Li-Ion Batteries," **B.M. May**, presented at IEEE Symposium on Product Compliance Engineering, Bloomington, MN, October 2024.

"Not Worth a Nickel! A Nickel Metal Hydride Battery Failure Investigation," **B.M. May**, presented at International Materials, Applications, and Technologies Annual Meeting, Detroit, MI, October 2023.

"Nanoscale Detection of Intermediate Solid Solutions in Equilibrated Li_xFePO_4 Microcrystals,"**B.M. May**, presented at the Advanced Light Source User Meeting, Berkeley, CA, October 2018.

“Determination of Reaction Mechanism Within Single Particle Layered Oxide Materials for Li-Ion Batteries Using Operando Diffraction Mapping,” **B.M. May** et al., presented at the Materials Research Society Fall Meeting, Boston, MA, November 2017.

“Visualization of Phase Transformations in Lithium Ion Cathode Materials: Pushing the Limits of Resolution,” **B.M. May**, presented at the Advanced Photon Source User Seminar, Argonne, IL, July 2017.

“Operando Microdiffraction Mapping of Single Particle Cathode Materials,” M. Wolf, **B.M. May**, et al., presented at the Denver X-ray Conference, Chicago, IL, August 2016.

“X-ray Nanodiffraction Study of the Delithiation Mechanism of $LiFePO_4$ Single Particles,” **B.M. May** et al., presented at the Materials Research Society Spring Meeting, Phoenix, AZ, March 2016.

“Portfolio of X-ray Imaging Tools for Studies of Battery Materials: Development and Scientific Insight.” **B.M. May** et al., presented at the Energy Frontier Research Centers Principal Investigators' Meeting, Washington, D.C., October 2015.

“X-ray Nanodiffraction Study of the Delithiation Mechanism of $LiFePO_4$ Single Particles,” **B.M. May** et al., presented at the Electrochemical Society Meeting, Chicago, IL, May 2015.