

**Celina J. Mikolajczak, P.E.**  
**Senior Managing Engineer**

**Professional Profile**

Ms. Celina Mikolajczak is a Senior Managing Engineer in Exponent's Mechanical Engineering practice. A mechanical engineer with a background in thermal sciences and combustion by training, Ms. Mikolajczak has developed specialties in the areas of batteries, contact skin burns, smoldering ignition and combustion of fabrics, fire hazards related to oxygen systems, metal burning, and fire investigation.

Ms Mikolajczak routinely assists industrial, government, and litigation clients with a wide range of battery projects including: cell and battery pack mechanical design evaluation and quality assessment, evaluation of electronic protection approaches, fault detection and mitigation, mechanical and thermal testing of cells and battery packs, abuse testing of cells and battery packs, fire suppression for battery fires, investigation of failed battery packs and cells, cell and battery pack manufacturing auditing, fire investigations of incidents involving batteries, and battery recall support. Ms. Mikolajczak works with lithium-ion, lithium polymer, lithium primary, nickel metal hydride, and lead acid cell chemistries. She works with batteries in a wide range of form factors, sizes, and applications, including batteries for consumer products such as laptops, cell phones, MP3 players, and toys, as well as batteries for automotive, aerospace, and stationary applications.

Ms. Mikolajczak also works with clients on projects involving a number of areas of specific expertise in the thermal sciences. She has conducted studies to assess heat exposure damage to industrial machinery, and the potential for skin burns resulting from contact with hot solid materials. She has conducted extensive research on the topic of smoldering ignition of fabrics, and has assessed fabric flammability. Ms. Mikolajczak has investigated the cause of fires in enriched oxygen environments, often involving metal combustion, and particularly the kindling chains that were associated with ignitions. She has also conducted research related to the combustion of lithium metal. Ms. Mikolajczak is a trained fire investigator, and has investigated the cause and origin of fires that have occurred in a variety of settings, including industrial structures, residential structures, automobiles, and wildlands.

Prior to joining Exponent, Ms. Mikolajczak was a Research Assistant at the Mechanical and Aerospace Engineering Department of Princeton University. She studied the pyrolysis chemistry of aromatic hydrocarbons, an area relevant to emissions from the burning of practical fuels, and designed and constructed a high temperature laminar flow reactor for investigation of the pyrolysis chemistry of aromatic fuels. As part of her graduate work, Ms. Mikolajczak taught mechanical design, introductory combustion, and mathematics classes. Prior to attending Princeton University, Ms. Mikolajczak was a Field Engineer with Schlumberger Well Services in Louisiana. In this capacity, she directed wireline-logging operations at customer well sites. The resulting logs were critical to client assessments regarding oil and gas production and capacity.

## **Academic Credentials and Professional Honors**

M.A., Mechanical and Aerospace Engineering, Princeton University, 1994

B.S., Engineering and Applied Science, California Institute of Technology (honors), 1991

National Aeronautics and Space Administration (NASA) Group Achievement Award 2011 as a participant of the EMU Long-Life Battery Team for outstanding contributions of the Long-Life Battery Team in developing the first successful Lithium-ion battery for the Extravehicular Mobility

Member of the Underwriters Laboratory Standards Technical Panel for UL 1642, The UL Standard for Safety of Lithium-ion Batteries Testing and UL 2054, The UL Standard for Safety of Commercial and Household Battery Packs Testing

Sigma Xi, Scientific Research Honor Society; Guggenheim Fellowship in Engineering, Princeton University, 1992; Summer Undergraduate Research Fellowship, California Institute of Technology, 1988, 1989

## **Licenses and Certifications**

Registered Professional Mechanical Engineer, California, #M032733

Hazardous Waste Operations and Emergency Response Training, in accordance with Cal-OSHA Title 8 GISO 5192 & 29CFR1910.120

Fire Investigation Classes as offered by the California State Fire Marshal: 1A—Cause and Origin, 1B—Techniques of Fire Investigation

## **Languages**

French

## **Publications**

Turner GG, Stepan J, Mikolajczak CJ. Safety considerations when designing portable electronics with electric double-layer capacitors (supercapacitors). Proceedings, 2011 IEEE Symposium on Product Compliance Engineering, Product Safety Engineering Society, October 2011.

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>

Parker D, Mikolajczak C, Lange R. Considerations regarding hybrid and electric vehicle safety. ESV Technical Paper Series, paper 11-0117, June 2011.

Parker D, Mikolajczak C. Lithium ion batteries—More different than they seem. Michigan Defense Trial Counsel (MDTC) e-letter, Issue No. 6, May 2011.

Hayes T, Mikolajczak C, Megerle M, Wu M, Gupta S, Halleck P. Use of computed tomography scanning for defect detection in lithium-ion batteries. *Battery Power* 2011 Mar/April; 15(2):14–17.

Caswell G, Aghassi E, Mikolajczak C, Zemach K. Autonomous maintenance and health monitoring of rechargeable batteries. *Advancing Microelectronics, IMAPS – International Microelectronics and Packaging Society*, 2011 Jan/Feb; 20–24.

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: *Linden's Handbook of Batteries*, 4<sup>th</sup> Edition. Reddy T (ed), McGraw Hill, 2011.

Caswell G, Aghassi E, Mikolajczak C, Zemach K. Autonomous maintenance and health monitoring of rechargeable batteries. *DfR Solutions Newsletter* 2010 Nov/Dec.

Mikolajczak C. Safety issues related to large format lithium ion cell construction. *Batteries 2010 Cannes-Mandelieu, French Riviera*, September 29–October 1, 2010.

Mikolajczak C, Godithi R, Kislitsyn M, Wu M. Assessment of large format lithium-ion cells using CT scanning and destructive physical examination. *Proceedings, Space Power Workshop, Manhattan Beach, CA*, April 19–22, 2010.

Mikolajczak C, Harmon J, Gopalakrishnan P, Godithi R, Hayes T, Wu M. From lithium plating to cell thermal runaway: A combustion perspective. *Proceedings, 27<sup>th</sup> International Battery Seminar & Exhibit for Primary & Secondary Batteries, Small Fuel Cells, and Other Technologies, Fort Lauderdale, FL*, March 15–18, 2010.

Hayes T, Mikolajczak C, Horn Q. Key manufacturing practices and techniques to achieve high quality Li-ion cells. *Proceedings, 27<sup>th</sup> International Battery Seminar & Exhibit for Primary & Secondary Batteries, Small Fuel Cells, and Other Technologies, Fort Lauderdale, FL*, March 15–18, 2010.

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

Mikolajczak C, Harmon J, Gopalakrishnan P, Godithi R, Wu M. From lithium plating to lithium-ion cell thermal runaway. *NASA Aerospace Workshop, Huntsville, AL*, November 2009.

Godithi R, Mikolajczak C, Harmon J, Wu M. Lithium-ion cell screening: Non-destructive and destructive physical examination. *NASA Aerospace Workshop, Huntsville, AL*, November 2009.

Mikolajczak C, Harmon J, Wu M. Lithium plating in commercial lithium-ion cells: Observations and analysis of causes. Proceedings, Batteries 2009 the International Power Supply Conference and Exhibition, French Riviera, September 30–October 2, 2009.

Harmon J, Godithi R, Mikolajczak C, Wu M. Computed tomography imaging as applied to primary cell evaluation. Battery Power Products Technology 2009; 13(5):15.

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.

Hayes T, Mikolajczak C, Megerle M, Wu M, Gupta S, Halleck P. Use of CT scanning for defect detection in lithium ion batteries. Proceedings, 26th International Battery Seminar & Exhibit for Primary & Secondary Batteries, Small Fuel Cells, and Other Technologies, Fort Lauderdale, FL, March 16–19, 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.

Mikolajczak CJ, Taylor PM. A method for assessing the potential for a dermal burn hazard from malfunctioning consumer electronic devices. Journal of Burn Care and Research 2008; 29(2):338–345.

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, 25<sup>th</sup> International Battery Seminar & Exhibit for Primary & Secondary Batteries, Small Fuel Cells, and Other Technologies, Fort Lauderdale, FL, March 17–20, 2008.

Mikolajczak CJ, Moore CD. The aircraft cargo hold environment: The implications of a fire on lithium-ion battery shipments. IEEE AESS Systems Magazine 2002 Oct; 23–28.

Mikolajczak CJ, Moore CD. The aircraft cargo hold environment: The implications of a fire on lithium-ion battery shipments. Proceedings, 17<sup>th</sup> Annual Battery Conference on Applications and Advances, Long Beach, CA, pp. 209–214, 2002.

Mikolajczak CJ, Wornat MJ, Vernaglia BA, Kalish MA. Detection of Benz[f]indene among the pyrolysis products of coal and anthracene. Energy Fuels 1999; 13(5):1092–1096.

Mikolajczak CJ, Wornat MJ, Dryer FL, Fringer OB, Held TJ. A flow reactor study of 1-Methyl-Naphthalene pyrolysis using a new condensed species sampling probe. Fall Technical

Meeting, East, States Sec. Combustion Institute, Hilton Head, SC, pp. 183–186, December 1996.

### **Published Abstracts of Presentations**

Mikolajczak CJ, Swart J. Lithium ion batteries: Assessment and investigation. IEEE Product Safety Engineering Society, Santa Clara Valley Chapter Meeting, Santa Clara, CA, November 2005.

Mikolajczak CJ, Livesey CE, Guran S, Wornat MJ. A high temperature laminar flow reactor for the pyrolysis of polycyclic aromatic hydrocarbons. 27<sup>th</sup> International Symposium on Combustion, Boulder, CO, July 1998.

### **Selected Invited Presentations**

Mikolajczak C. Energy storage and what's new in batteries, Renewable Energy and Shale Gas—From Innovation to Joules, Symposium in Association with the Top 500 Innovators Polish Scholar Program at Stanford University, October 20–21, 2011.

Mikolajczak C, Kahn M, White K, Long RT. Lithium-ion battery storage and use hazards: Protection Strategies Research Planning Workshop. Proceedings, Lithium Ion Battery Storage Hazard Assessment Workshop, August, 2011.

<http://www.nfpa.org/categoryList.asp?categoryID=260&URL=Research/Fire%20Protection%20Research%20Foundation/Reports%20and%20proceedings>

Mikolajczak C. Comparison of safety considerations for consumer electronic and large format cell battery packs. The Battery Show, San Jose, CA, October 5–7, 2010.

Mikolajczak C, Hayes T, Wu M. Lithium-ion cell faults & HEV cells. 2009 EV Li-Ion Battery Forum (Shanghai), Post-Conference Workshop, September 4, 2009.

Mikolajczak C, Stewart S, Harmon, J, Horn, Q, White K, Wu M. Mechanisms of latent internal cell fault formation. Extended talk at the Extended Battery Life Workshop Meeting, Taipei, Taiwan, October 22, 2008.

Mikolajczak C, Wu M. Toward detection of internal cell faults prior to thermal runaway: Summary and update. The Extended Battery Life Workshop Meeting, Redmond, Washington, DC, July 15, 2008.

Mikolajczak C, Wu M. Toward detection of internal cell faults prior to thermal runaway: Update. The Extended Battery Life Workshop Meeting, Milpitas, CA, April 21, 2008.

Mikolajczak CJ, Slee D, Wu M. Improving lithium ion battery safety. Presented at the Extended Battery Life Working Group Meeting, Tokyo, Japan, February 7, 2007.

Mikolajczak CJ. Causes of Li-Ion internal cell faults. Presented at the IEEE 1625 Meeting, San Jose, CA, November 15, 2006.

Mikolajczak CJ. Causes of Li-ion internal cell faults. Presented at the Portable Rechargeable Battery Association Membership Meeting, Dallas, TX, October 12, 2006.

Mikolajczak CJ, Hayes T, Megerle MV, Wu M. Li-Ion internal cell faults. Presented at the Extended Battery Life Working Group Meeting, San Jose, CA, October 4, 2006.

Mikolajczak CJ, Moore D. The aircraft cargo hold environment: The implications of a fire on Lithium-Ion battery shipments. 17<sup>th</sup> Annual Battery Conference on Applications and Advances, Long Beach, CA, January 2002.

Mikolajczak CJ, Fringer OB, Held TJ, Wornat MJ, Dryer FL. A new condensed species sampling probe for flow reactor studies of polycyclic aromatic compounds. 26<sup>th</sup> International Symposium on Combustion, Naples, Italy, July 1996.

### **Technical Reports**

Mikolajczak C, Kahn M, White K, Long RT. Lithium-ion batteries hazard and use assessment. Final Report to the Fire Protection Research Foundation, July 2011.

Harmon J, Gopalakrishnan P, Putzeys O, Mikolajczak CJ. US FAA-style flammability assessment of lithium-primary battery packs packed with and contained in equipment (UN3091), PHMSA-2009-0095-0209.1, April 2010.

Harmon J, Gopalakrishnan P, Mikolajczak C. US FAA-style flammability assessment of lithium-ion batteries packed with and contained in equipment (UN3481). US Government Docket ID: PHMSA-2009-00095-0117, PHMSA-2009-00095-0119.1, PHMSA-2009-00095-0119.2, and PHMSA-2009-00095-0120.1, March 2010.

Mikolajczak CJ, Wagner-Jauregg A. US FAA-style flammability assessment of lithium ion cells and battery packs in aircraft cargo holds. Exponent Failure Analysis Associates, Inc., April 2005; PHMSA-RSPA-2004-19886-0044.

Anderson L, Mikolajczak CJ, Long RT, Paustenbach D. A review of CBHF proposed Technical Bulletin 603. Exponent, April 2003.

Mikolajczak CJ, Moore D. A study of passenger aircraft cargo hold environments. Exponent Failure Analysis Associates, Inc., May 2001.

Mikolajczak CJ, Taylor P, Heberer C. Cell phone usage at gasoline stations. Exponent Failure Analysis Associates, Inc., December 1999.

## **Project Experience**

Conducted numerous failure analysis investigations of lithium ion, lithium polymer, nickel metal hydride, lead acid, and lithium primary batteries. In many instances the failed batteries have been severely damaged, and investigation methods were developed to identify the point of failure so that changes could be made in manufacturing processes to prevent further failures.

Conducted design reviews and quality evaluations of lithium ion and lithium polymer cells and battery packs.

Conducted battery manufacturing audits.

Developed an approach to lithium-ion battery cell internal fault detection.

Designed and conducted mechanical and thermal tests for battery packs.

Conducted numerous studies related to fire and transport safety of lithium ion batteries and batteries of other chemistries.

Prepared and presented material for Consumer Product Safety Commission meetings discussing whether various products should or should not be recalled due to a potential safety hazard.

Conducted studies on smoldering ignition of fabrics and upholstered furnishings. These studies have focused on the effect of alkali metal ion concentration within the fabric and substrate fibers, and have included developing fabrics with controlled alkali metal ion concentrations and cigarette ignition propensity values.

Conducted contact burn hazard assessments on a variety of consumer electronic devices where field failures were causing exterior surfaces to heat. The assessments were conducted to determine whether a field failure would pose a burn hazard to a consumer. Examples of the devices examined include: mobile phones, MP3 players, plug in air fresheners, and computer accessories.

Studied apparel fabric flame ignition behavior to determine whether specific items of clothing complied with various flammability standards.

Investigated the cause of fires in enriched oxygen environments, and particularly the kindling chains that were associated with ignitions. In some cases, these fires have involved the ignition of metal components such as medical oxygen regulators.

Conducted fire cause and origin investigations on fires that have occurred in a variety of settings including residential, commercial, industrial, laboratory, vehicle, and wild-land locations. Some identified causes have included arson, overheating equipment, electrical arcing, candles, and sparks caused by friction.

## Professional Affiliations

- The Combustion Institute (member)
- American Society of Mechanical Engineers (member)
- National Fire Protection Association (member)

## Deposition / Trial Testimony

### Depositions

*IPSCO Steel, Inc. v. Mannesmann Dematic Corporation, et al.*, United States District Court of the Southern District of Iowa, Davenport Division, Case No. 3:99-CV-90095, April 5, 2001.

*Roy D. Williams, et al. v. Allied Healthcare Products, Inc., et al.*, Circuit Court of the Seventeenth Judicial Circuit in and for Broward County, Florida, Case No. 99-011250 CACE 14, September 12, 2002.

*Industrial Risk Insurers v. TTI, Inc.*, September 26, 2002.

*Patrick Ellwood, et al. v. McLaughlin Renovation, et al.*, California Superior Court, County of Alameda, CSR No. 11748, April 29, 2003.

*Jason and Suzie Schechterle, et al. v. Ford Motor Company, et al.*, California Superior Court, In and for the County of Maricopa, Case No. CV2003-003427, March 2, 2004.

*Patrick Ellwood, et al. v. McLaughlin Renovation, et al.*, California Superior Court, County of Alameda, CSR No. 11748, October 13, 2004.

*Patrick Ellwood, et al. v. McLaughlin Renovation, et al.*, California Superior Court, County of Alameda, CSR No. 11748, October 25, 2004.

*Patrick Ellwood, et al. v. McLaughlin Renovation, et al.*, California Superior Court, County of Alameda, CSR No. 11748, November 10, 2004.

*Michigan Basic Property Insurance Association v. Dell, Inc., and Philips Electronics Corporation*, State of Michigan in the Circuit Court for the County of Charlevoix, 04-214-20-NP, January 25, 2005.

*Kassie Claughton v. Demko Parker, LLC dba Michael's Mufflers; DOES 1-50, Inclusive*, Superior Court of the State of California, County of Santa Clara, Case No. 1-04-CV-027320, January 7, 2008.

*Claudine Goodman v. Skywest Airlines, Inc., et al.*, California Superior Court, County of Los Angeles, Southwest District Redondo Beach, Case No. YC055443, February 18, 2009.

*Michael Zapata v. Powerstride Battery Co. dba American Battery Co.; DOES 1-10, Inclusive,*  
Superior Court of the State of California, County of San Mateo, Case No. CIV 493073, March  
7, 2011.