FINAL AGENDA

November 6-7, 2023

Westin Tysons Corner | Tysons, VA + Virtual

The 13th Annual

BATTERY SAFETY SUMMIT

Implementing Lithium-ion Battery Safety to Meet Increasing Energy Demands

2023 CONFERENCE PROGRAMS

CHEMISTRY FOR SAFETY

- Chemistry & Materials for Next-Generation Batteries
- Increasing Efficiency & Thermal Stability

ENGINEERING FOR SAFETY

- Battery Management Systems and Charging Safety
- Forensics & Post-Incident Diagnostics & Testing

REGULATORY SAFETY

- Transportation Safety & Regulation

With constantly increasing market demands for higher-energy density cells globally, it is critical that advances in chemistry and engineering for next-generation batteries have a significant focus on safety. With streams focusing on both materials and engineering for safety, the **Battery Safety Summit** will bring together the key players from around the world to present the latest R&D advancements for integrating and implementing LIB safety to meet ever-increasing energy demands.

FINAL DAYS TO REGISTER!

CORPORATE SPONSOR:

AMIONX

Cambridge EnerTech

CambridgeEnertech.com/Battery-Safety

MONDAY, NOVEMBER 6

7:30 am Registration and Morning Coffee

NEXT-GENERATION BATTERIES

8:50 Organizer's Welcome Remarks
Victoria Mosolgo, Conference Producer, Cambridge EnerTech

8:55 Chairperson's Remarks
Anil Mane, PhD, Principal Materials Science Engineer, Applied Materials Division, Argonne National Laboratory

9:00 Cell Pouch Corrosion
Benjamin Christian, Tech Specialist, Battery Development, General Motors Co.
Corrosion for can neutral cells is a known industry challenge without well-understood failure mechanisms or test procedures. In this presentation, we will explore the failure mechanisms associated with can neutral corrosion, the pros and cons for cell polarity selection, and the importance of designing for both electrical and corrosion protection.

9:30 Safety Related to Solid State Li-metal Batteries
Mickael Dollé, PhD, Professor, Department of Chemistry, Université de Montréal
This talk will go into safety related to solid state Li-metal natteries.

10:00 Networking Coffee Break

10:30 Enovix BrakeFlow Technology: A Breakthrough in Next-Gen Battery Safety
Jonathan Doan, PhD, Vice President, Research and Development, ENOVIX
The Enovix stacked cell architecture, which uses a silicon anode, upends the conventional paradigm and enables both an increase in energy density, and a high level of abuse tolerance to reduce the risks of an internal short due to its BrakeFlow technology. With BrakeFlow incorporated, instead of a sudden catastrophic release of energy, the battery is designed to discharge safely and slowly.

11:00 Battery Safety in the Future is Higher Energy, Lower Nickel and Cobalt Free
Matthew Bierman, PhD, Commercial Director, TexPower EV Technologies
Conventional wisdom tells us that cobalt is required in high-energy electric vehicle batteries, but is it true? All battery companies are trying to reduce their cobalt usage in a stepwise fashion. TexPower EV Technologies, Inc. leapfrogs this iterative process with zero-cobalt battery technology that does not sacrifice energy, power, safety, or any other performance metrics. The future of EVs is longer range, more affordable and cobalt-free.

11:30 SafeCore - An Internal Fuse to Help Prevent Thermal Runaway
Bill Davidson, COO, Amionx
SafeCore was developed for the U.S. Army to prevent thermal runaway in lithium-ion battery packs that soldiers wear on the battlefield. A SafeCore enabled battery pack is able to sustain a direct hit from a rifle at point blank range without going into thermal runaway. SafeCore is a thin coating that is applied to the current collector using existing equipment in a battery factory used to coat the active material.

11:45 Enjoy Lunch on Your Own

SODIUM-ION BATTERIES

12:55 pm Chairperson's Remarks
Anil Mane, PhD, Principal Materials Science Engineer, Applied Materials Division, Argonne National Laboratory

1:00 Beyond Li-ion Battery Chemistries Based on Organic Electrode Materials
Yan Yao, PhD, Professor, Electrical Engineering, University of Houston
The quest for cheaper, safer, higher-density, and more resource-abundant energy storage has driven significant battery innovations. In the context of materials development for next-generation batteries, organic battery electrode materials have emerged as an exciting option complementary to inorganic materials. In this presentation, I will emphasize the unique advantages of organic battery materials in emerging beyond Li-ion battery technologies such as solid-state batteries, multivalent metal batteries, and aqueous batteries.

1:30 Safety Analysis and Heat Generation Measurement during Cycling of Sodium-ion Batteries (SIBs)
Ijaz Mohsin, Batteries Calorimetry & Safety, Karlsruhe Institute of Technology
Despite safer battery material, battery thermal management could be a key to safer post lithium technology. Na0.53MnO2 & Na3V2(PO4)3/C based materials as cathode and coconut shell-derived hard carbon as anode were studied in this work. The safety-related parameters, including the heat generation during charging, discharging, and thermal abuse tests, have been executed by the means of sophisticated calorimetry instruments.

2:00 Sodium-ion Batteries
Hao Liu, PhD, Assistant Professor, Chemistry, SUNY Binghamton
This talk will go into sodium-ion batteries and their promise as a more affordable alternative. Sodium-ion safety will also be discussed.

2:30 Networking Refreshment Break

SOLID-STATE BATTERIES

3:00 Solid-State Battery Safety: From Calorimetry to Characterization
Nathan Johnson, PhD, Postdoctoral Appointee, Sandia National Laboratories
The validity of improved safety often attributed to solid-state batteries has recently been investigated. Key findings indicate reaction pathways exist in SSBs which can release significant heat. That heat release may result in temperatures approaching, and in some cases exceeding those seen in thermal runaway of conventional Li-ion batteries. In this talk, characterization of abused SSB materials will be examined and correlated to differential scanning calorimetry heat flows.

3:30 Materials Design against Li-dendrite for Safer Fast-Cycling Solid-State Batteries
Xin Li, PhD, Associate Professor, School of Engineering and Applied Sciences, Harvard University
Solid-state battery is a promising next-generation battery technology. However, Li-dendrite across the solid electrolyte layer is one major safety concern. Electrolyte and electrode materials can exhibit a broad distribution of capabilities to suppress Li-dendrite growth, especially through the new mechanism of dynamic voltage stability. The talk will focus on strategies to design materials and battery devices for enhanced safety against Li-dendrite at fast charge and discharge.

4:00 Vapor Phase Modification of Battery Materials: Li-metal, Cathodes and Solid Electrolytes
Anil Mane, PhD, Principal Materials Science Engineer, Applied Materials Division, Argonne National Laboratory
Complete solid-state lithium-ion batteries has attracted attention due to safety, high-energy density and higher operating voltages. We are working on surface-interface engineering and stabilizing battery materials such as Li-metal, solid electrolytes, and high-voltage cathode materials via cost effective and salable precursor vapor phase processing method. Here will present latest encouraging results and learning that will be helpful for both battery research community, as well as battery manufacturers.

4:30 Welcome Reception in the Exhibit Hall with Poster Viewing

5:15 Dinner Tutorial Registration

5:30 Dinner Tutorials
TUT2: Li-ion Battery Safety and Thermal Runaway*
Instructor:
Ahmad A. Pesaran, PhD, Chief Energy Storage Engineer, National Renewable Energy Laboratory
*Separate registration required. See tutorial page for more information.

TUESDAY, NOVEMBER 7

7:30 am Registration and Morning Coffee

SAFE & EFFICIENT CHARGING

8:50 Organizer's Remarks

8:55 Chairperson's Remarks

Naoki Matsumura, Principal Engineer, Intel

9:00 Enhancement of Battery Sustainability by Charging Algorithms — Part 1

Naoki Matsumura, Principal Engineer, Intel

Li-ion batteries are used in many industries, such as consumer electronics, electric vehicles, and internet-of-things. With the substantially increasing demand, sustainable battery technologies are desired. This talk explains several battery algorithms: adaptive charging, situational charging, context-based battery charging, etc. All algorithms extend battery longevity and require less battery replacement, thus contributing to sustainability enhancement.

9:30 Enhancement of Battery Sustainability by Charging Algorithms — Part 2

Jagadish Singh, Analog Engineer, Intel Corp.

Li-ion batteries are used in many industries, such as consumer electronics, electric vehicles, and internet-of-things. With the substantially increasing demand, sustainable battery technologies are desired. This talk explains several battery algorithms: adaptive charging, situational charging, context-based battery charging, etc. All algorithms extend battery longevity and require less battery replacement, thus contributing to sustainability enhancement.

10:00 Blending Physics and Machine Learning for Battery Optimal Control and Monitoring

Dong Zhang, PhD, Director, Energy Systems Controls Laboratory, University of Oklahoma

Dynamic modeling, state estimation, and optimal control of Lithium-ion batteries are the primary challenges in battery management. While model-based algorithms have made a significant leap, the integration of battery data offers further insights into this highly-coupled and intricate electrochemical system. Mathematically, combining machine learning with physics is a trending approach for discovering unknown dynamics. This talk highlights the application of physics-informed neural network and imitation learning in improving performance of batteries.

10:30 Networking Coffee Break in the Exhibit Hall with Poster Viewing

CELL MONITORING

11:00 Development, Demonstration, and Performance of Li-ion/EDLC in-Electrode Hybrids for High Power Application in Pouch Cell Prototype Devices

Alexander Roberts, PhD, Associate Professor, Institute for Clean Growth and Future Mobility, Coventry University

With increasing demands in application, balance between power and energy requirements at cell level is increasingly difficult to satisfy, particularly in respect of higher power. This work demonstrates hybridization of battery and EDLC in-electrode with active materials from both present in both electrodes, as opposed to one electrode from each as seen in lithium-ion capacitors, enabling the tuning of power and energy to application and also increasing in lifetime.

11:30 Examination and Modeling of Thermal Runaway on Li-ion Battery Impact of Chemistry, SOC, and Aging

Sara Abada, PhD, Research Engineer, Modeling of Electrochemical Storage Systems, IFP Energies Nouvelles

Thermal Runaway (TR) of LiBs is the key to safety. It involves multi-scale phenomena ranging from internal physic-chemical mechanisms to battery components including safety features (CID, pressure disk, vent) and further to thermal propagation. At IFPEN, a Multiphysics Multiscale model is developed to be able to simulate the cell behavior under different initiation events (overheating, overcharging, short circuiting). The impacts of chemistry, SOC, and aging are studied.

12:00 pm Presentation to be Announced

Abdelaziz Abdellatif, PhD, Project Manager & Scientific Researcher, Lithium ion Batteries, ZSW

12:30 Enjoy Lunch on Your Own

THERMAL STABILITY

1:55 Chairperson's Remarks

Christina Lampe-Onnerud, PhD, Founder and CEO, Cadenza Innovation

2:00 Enhancing Battery Safety with Higher Operating Temperatures

Brian McCarthy, PhD, CTO, EC Power

This talk will explore a potential future where lithium-ion cells are intentionally engineered for higher operating temperatures and so revolutionize battery safety. By delving into cutting-edge advancements like solid-state batteries, which inherently thrive at elevated temperatures, we contemplate the possibility of harnessing higher operating temperatures as a design advantage rather than a limitation. We will also discuss the role that next-generation thermal management systems could play to facilitate this future.

2:30 Passive Cooling Impact on Increasing Efficiency & Thermal Stabilities of Batteries

Mohammad Moghimi Ardekani, Associate Professor of Clean Energy Technologies, Department of Engineering, Staffordshire University

Latent heat thermal energy storage (LHTES) systems using phase change materials (PCMs) have appeared as promising solutions for energy storage when harnessing renewable energy sources in a wide range of engineering applications. The present study focuses on the design of horizontal shell-and-tube PCM-based LHTES systems capable of simultaneous charging and discharging in solar domestic hot water (SDHW) applications.

3:00 Networking Refreshment Break in the Exhibit Hall with Poster Viewing

SAFETY ANALYSIS

3:30 Evaluation of Electronic Conductivity of Lithium-ion Battery Negative Electrode Slurry via AC Impedance Analysis

Naomichi Miyairi, Product Engineer, Tech Marketing, Hioki USA

We report a novel impedance analysis method for quantifying the conductivity of electrons flowing through conductive materials in a lithium-ion battery electrode slurry. This method consists of a novel algorithm that identifies three key indicators for the negative electrode slurry and describes the electrical properties of the electrode slurry. We demonstrated excellent correlation between our algorithm and experimental data derived from Nyquist (Cole-Cole) curves.

4:00 Fault Tree Analysis for Passive Propagation Resistant Lithium-ion Battery Design

Michael Jones, Naval Undersea Warfare Center Division Newport

Key design elements are necessary to eliminate risk of propagation. Fault Tree Analysis (FTA) was applied to development of a Passive Propagation Resistant (PPR) Lithium-ion battery system to drive design via probabilistic risk assessment. By characterizing the phenomena associated with single cell failure and propagation fault modes, each cause was designed out by employing multiple layers of fault-tolerant defense, allowing for safe & reliable shipboard deployment.

4:30 Deploying Energy Storage Systems Safely in Urban Environments

Christina Lampe-Onnerud, PhD, Founder and CEO, Cadenza Innovation

Safety has historically been deprioritized, resulting in energy storage systems that cannot respond in time to prevent catastrophic explosions and fires. However, safe lithium chemistry-agnostic battery deployment and operation is achievable and essential (particularly in urban areas, where electricity demands are the greatest and safety is paramount) to propel the clean energy storage solutions that will enable the successful transformation from fossil fuel dependence.

5:00 Close of Conference

INCREASING EFFICIENCY & THERMAL STABILITY

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5:00 Close of Conference

BATTERY MANAGEMENT SYSTEMS & CHARGING SAFETY

MONDAY, NOVEMBER 6

7:30 am Registration and Morning Coffee

OEM PERSPECTIVES ON BATTERY SAFETY

8:50 Organizer's Opening Remarks

Craig Wohlers, Executive Director, Conferences, Cambridge EnerTech

8:55 Chairperson's Remarks

Gabriel Torres, Director of Product Management, Sionic Energy

9:00 Cell Safety for Commercial Vehicles

Dragoljub Vrankovic, PhD, Manager, Team Cell Technology, Daimler Truck

Battery Electric Trucks can be the future backbone of the transport industry — combining maximum energy efficiency with good flexibility. Daimler Truck AG has proven with a number of projects and products on a global scale how capable these electric trucks can be. This presentation will investigate the special needs of batteries and cells for commercial vehicles with a special focus on the safety aspects.

9:30 Impact & Learnings from the GM EV First Responder Training Program

Ryan Hickey, Advanced Battery Thermal Engineer, Global Product Group, General Motors

Over the past year and a half, General Motors, OnStar, and the Illinois Fire Service Institute have traveled across North America training thousands of first and second responders on electric vehicles. This program was hands-on training in order to get the key questions answered for our first and second responders to stay safe. In addition, learnings, impact, and next steps for the program will be presented.

10:00 Networking Coffee Break

10:30 Safety First in Second-Life Battery Energy Storage Systems: A Wholistic Value-Chain Approach to Maximizing System Performance and Minimizing Operational Risk for Energy Storage Systems Utilizing First- and Second-Life Batteries

Jeremy Bedine, Product Head, Volvo Energy

This talk will provide a high-level overview of the BESS product lifecycle, and it will lay out the total value chain from design and development, site engineering and deployment, digitization, remote monitoring, field service, and asset management. It will illustrate how safety and risk management are woven into each of these value chain components.

THERMAL RUNAWAY MITIGATION

11:00 The Fundamentals of Lithium Battery Safety

John Zhang, PhD, CTO/CSO, Polypore International LP

In this study, we will present our recent investigation in the field: incidents and thermal electrochemical mitigation (modeling) to address the intrinsic fundamentals of Li-ion safety. From the fundamental understandings, we developed various methods including Ceramic Coated Separator and tested various Li-ion batteries; some of the them are 50Ah NMC Li-ion batteries.

11:30 Advanced Battery Sensing for Early Detection of Battery Thermal Runaway Events Honeywell

Chavonne Yee, Director, Standards and Regulations, Electrification, Sensing & Safety Technologies, Honeywell

A Thermal Runaway event is a serious safety issue. Government around the globe such as China & India are enacting stringent regulations of a 5-minute thermal runaway event warning. Early detection of battery degradation indicative of pending thermal runaway provides additional time for battery system level countermeasures.

12:00 pm Enjoy Lunch on Your Own

THERMAL RUNAWAY MITIGATION

12:55 Chairperson's Remarks

Dragoljub Vrankovic, PhD, Manager, Team Cell Technology, Daimler Truck

1:00 Thermal Stability of Li-ion Batteries — An Electrolyte Perspective

Gabriel Torres, Director of Product Management, Sionic Energy

Thermal runaway (TR) in Li-ion batteries refers to uncontrollable exothermic reactions triggered by elevated temperatures. As the temperature of the battery rises, the exothermic reactions further heat up the cell, creating a positive feedback cycle. Despite recent safety monitoring advances in battery management systems (BMS), the prevention of thermal runaway remains a challenge. The talk will provide insights into delaying/mitigating TR in large format Li-ion cells using advanced electrolyte designs.

1:30 Evaluating the Safety of Next-Generation Energy Storage Cells

Chuanbo Yang, PhD, Senior Engineer Energy Storage, Energy Conversion & Storage Systems Center, National Renewable Energy Laboratory

The safety of next-generation batteries is not yet understood. With the support of the ARPA-E EVs4ALL program, NREL and UT Austin are working to develop a quantitative understanding of the thermal runaway process and associated risks for next-generation cell materials.

2:00 Comparing Safety-Relevant Parameters of Failing Batteries with Different Cell Chemistry

Christiane Essl, Researcher, Battery Safety, VIRTUAL VEHICLE Research GmbH

Battery failing behavior is influenced by several factors. One factor is the cell chemistry. In this presentation, results of failing state-of-the-art automotive cells will be presented and discussed. The focus will be on the comparison of NMC and LFP cells. The results will be compared in the categories: thermal behavior, vent gas production, and vent gas composition before, during, and after thermal runaway.

2:30 Networking Refreshment Break

3:00 Eliminate Thermal Runaway Risk Using Ultrasound BMS

Srdjan Mutabdzija, Head Product Development UBMS, Titan Advanced Energy Solutions

Titan's technology fundamentally changes how the industry manages batteries. Instead of estimating state-of-battery based on external parameters, ultrasound BMS prognoses thermal runaway events based on morphological changes in battery cells. In addition to safer battery management, more accurate state-of-charge and state-of-health leads to better battery utilization.

BATTERY MANAGEMENT SYSTEM SAFETY

3:30 BEV Safety Solutions with Composite Battery Enclosures and Underbody Battery Protection

Gero Mimberg, Manager Thermal Systems, Kautex Textron GMBH

Our Pentatonic battery system is our latest innovation for the electric vehicle market. Constructed of thermo-composites or composite-metal hybrid. The system offers numerous benefits over its steel and metal counterparts including reduced weight, a simplified bill of material and thus improved competitiveness. We capitalize on our decades of testing expertise in areas such as fire, leak tests and crash when designing and producing composite battery systems.

CHARGING INNOVATION

4:00 Fast Charging of Lithium-ion Batteries with Monitoring and Controlling the Internal Physical States

Weihan Li, Young Research Group Leader, RWTH Aachen University

In this program, we will present our work in fast charging algorithm design based on monitoring and controlling the internal physical states, using electrochemical models, control algorithms, and machine learning.

4:30 Welcome Reception in the Exhibit Hall with Poster Viewing

5:15 Tutorial Registration

5:30 Dinner Tutorials

TUT2: Li-ion Battery Safety and Thermal Runaway*

Instructor: Ahmad A. Pesaran, PhD, Chief Energy Storage Engineer, National Renewable Energy Laboratory

**Separate registration required. See tutorial page for more information.*

TUESDAY, NOVEMBER 7

7:30 am Registration and Morning Coffee

FORENSIC ANALYSIS

8:50 Organizer's Opening Remarks

Craig Wohlers, Executive Director, Conferences, Cambridge EnerTech

8:55 Chairperson's Remarks

Judy Jeevarajan, PhD, Vice President and Executive Director, Electrochemical Safety Research Institute, UL Research Institutes

9:00 Fire, Smoke, and Emissions Characteristics for Lithium-ion during Thermal Runaway

Judy Jeevarajan, PhD, Vice President and Executive Director, Electrochemical Safety Research Institute, UL Research Institutes

The components and fire and smoke during thermal runaway of lithium-ion cells and modules have been characterized at different SOC, and for different cell formats, sizes and chemistries. In addition, large cell formats have been studied at various SOC for characterization of particulate emissions. The results of the research studies will be presented.

9:30 Progress and Limits with Plastic Current Collectors

Eric Darcy, PhD, Battery Technical Discipline Lead, Power Systems, NASA Johnson Space Center

Cathode metallized polyester current collectors (PCC) show very consistent tolerance to nail penetration in 18650 and 21700 cell designs from one manufacturer. These designs achieve 233 Wh/kg (622 Wh/L) and 251 Wh/kg (684 Wh/L), respectively. In contrast, a 21700 achieving 272 Wh/kg and 724 Wh/L is consistently driven into TR with the same nail penetration test. Have we reached a specific energy limit for the PCCs?

10:00 Navigating a Battery Recall: Managing Risk and Protecting Your Brand Name

Troy Hayes, PhD, Principal Engineer, Materials & Corrosion Engineering, Exponent

In a battery recall assessment, OEMs should act to minimize the risk to consumers while providing sound technical solutions to potentially replace batteries. This talk will discuss the recall process and important considerations, including: CPSC interactions, root cause analysis, future failure predictions, risk analysis to determine if a recall is warranted, recall scope limitation through traceability, and ensuring that replacement products resolve the issue at hand, and minimize future risk.

10:30 Networking Coffee Break in the Exhibit Hall with Poster Viewing

ABUSE TOLERANCE, ADVANCED TESTING, AND SIMULATION

11:00 Science of Lithium-ion Battery Safety: Diagnostics and Modeling

Ahmad A. Pesaran, PhD, Chief Energy Storage Engineer, National Renewable Energy Laboratory

To design safer lithium-ion batteries for electric vehicles, a combination of experiments, diagnostic techniques, and multiphysics modeling tools are needed to understand how various abuses, such as mechanical crush, lead to electrical and thermal failures. NREL's Battery Abuse Diagnostics Laboratory can test and diagnose batteries under various abuse conditions, such as dynamic impact, and provides data as input to safety models, providing guidance to design safer cells and modules.

11:30 Predicting Thermal Runaway in Electric Vehicle Car Crash Simulations

Vidyu Challa, PhD, Reliability Manager, ANSYS, Inc.

Kevin Kong, PhD, Senior Applications Engineer, ANSYS, Inc.

Battery Thermal runaway testing is expensive and destructive and is generally done in a limited manner. Simulation tools can be used to complement and reduce physical testing. This talk will present a workflow from single cell experiments to full crash modeling.

12:00 pm Enjoy Lunch on Your Own

1:55 Chairperson's Remarks

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2:00 Thermal Propagation Analysis of the Breakdown Voltage Using a Test Bench with Simplified Multi-Cell Setup

Bjoern Mulder, Researcher, University of Stuttgart

This study investigates the impact of the thermal propagation reaction on the breakdown voltage inside a battery. Single thermal runaway cell tests in an autoclave yielded a gas composition, which was recreated omitting particles. The specific Paschen's law equation for this gas was obtained. Using venting gas from a battery module, the breakdown voltage with and without particles was compared.

2:30 Application of Calorimetry and Computed Tomography to Failure Behaviors of Lithium-ion Batteries under Different States of Charge

Sophie Lee, Senior Associate Consultant, Exponent

Accelerating Rate Calorimetry (ARC) was applied to study the influence of lithium-ion battery energy and state of charge (SOC) on the thermal behavior and failure mode. Characteristic events were found to occur at much lower temperatures and faster rates with increased cell SOC. X-ray Computed Tomography (CT) and cell teardown were then carried out to understand the failure mechanisms and reveal the fingerprints of cells failure at different SOCs.

3:00 Networking Refreshment Break in the Exhibit Hall with Poster Viewing

BATTERY SAFETY BEYOND LITHIUM

3:30 Right to Repair: A Summary of Current Initiatives and Their Impact on the Battery Industry

John Copeland, Principal Engineer—Cell & Battery Testing, Element Materials Technology

"Right to Repair" initiatives were born out of consumer and independent repair shop frustration with devices that were either not feasible to repair due to their design or the required tools and spare parts were not available from the manufacturers. Some manufacturers have concerns that safety might be compromised by improper repairs. This presentation will sample current legislative efforts and review pros and cons of implementation in the battery industry.

4:00 PANEL DISCUSSION: Battery Safety: The Promise versus Reality

Moderator: Brian Barnett, PhD, President, Battery Perspectives

The roadmap to 2030 offers many opportunities, but not without major safety challenges. A panel of experts will discuss forecasts for 2030, providing insights about opportunities, challenges, barriers, and key factors shaping the 2030 roadmap to safer batteries.

Panelists:

Thomas Barth, PhD, Senior Accident Investigator & Biomechanics Engineer, Office of Highway Safety, National Transportation Safety Board

Troy Hayes, PhD, Principal Engineer, Materials & Corrosion Engineering, Exponent

Eric Darcy, PhD, Battery Technical Discipline Lead, Power Systems, NASA Johnson Space Center

5:00 Close of Conference

FORENSICS & POST-INCIDENT DIAGNOSTICS & TESTING

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10:00 Navigating a Battery Recall: Managing Risk and Protecting Your Brand Name

Troy Hayes, PhD, Principal Engineer, Materials & Corrosion Engineering, Exponent

In a battery recall assessment, OEMs should act to minimize the risk to consumers while providing sound technical solutions to potentially replace batteries. This talk will discuss the recall process and important considerations, including: CPSC interactions, root cause analysis, future failure predictions, risk analysis to determine if a recall is warranted, recall scope limitation through traceability, and ensuring that replacement products resolve the issue at hand, and minimize future risk.

10:30 Networking Coffee Break in the Exhibit Hall with Poster Viewing

ABUSE TOLERANCE, ADVANCED TESTING, AND SIMULATION

11:00 Science of Lithium-ion Battery Safety: Diagnostics and Modeling

Ahmad A. Pesaran, PhD, Chief Energy Storage Engineer, National Renewable Energy Laboratory

To design safer lithium-ion batteries for electric vehicles, a combination of experiments, diagnostic techniques, and multiphysics modeling tools are needed to understand how various abuses, such as mechanical crush, lead to electrical and thermal failures. NREL's Battery Abuse Diagnostics Laboratory can test and diagnose batteries under various abuse conditions, such as dynamic impact, and provides data as input to safety models, providing guidance to design safer cells and modules.

11:30 Predicting Thermal Runaway in Electric Vehicle Car Crash Simulations

Vidyu Challa, PhD, Reliability Manager, ANSYS, Inc.

Kevin Kong, PhD, Senior Applications Engineer, ANSYS, Inc.

Battery Thermal runaway testing is expensive and destructive and is generally done in a limited manner. Simulation tools can be used to complement and reduce physical testing. This talk will present a workflow from single cell experiments to full crash modeling.

12:30 pm Enjoy Lunch on Your Own

1:55 Chairperson's Remarks

Eric Darcy, PhD, Battery Technical Discipline Lead, Power Systems, NASA Johnson Space Center

2:00 Thermal Propagation Analysis of the Breakdown Voltage Using a Test Bench with Simplified Multi-Cell Setup

Bjoern Mulder, Researcher, University of Stuttgart

This study investigates the impact of the thermal propagation reaction on the breakdown voltage inside a battery. Single thermal runaway cell tests in an autoclave yielded a gas composition, which was recreated omitting particles. The specific Paschen's law equation for this gas was obtained. Using venting gas from a battery module, the breakdown voltage with and without particles was compared.

2:30 Application of Calorimetry and Computed Tomography to Failure Behaviors of Lithium-ion Batteries under Different States of Charge

Sophie Lee, Senior Associate Consultant, Exponent

Accelerating Rate Calorimetry (ARC) was applied to study the influence of lithium-ion battery energy and state of charge (SOC) on the thermal behavior and failure mode. Characteristic events were found to occur at much lower temperatures and faster rates with increased cell SOC. X-ray Computed Tomography (CT) and cell teardown were then carried out to understand the failure mechanisms and reveal the fingerprints of cells failure at different SOCs.

3:00 Networking Refreshment Break in the Exhibit Hall with Poster Viewing

BATTERY SAFETY BEYOND LITHIUM

3:30 Right to Repair: A Summary of Current Initiatives and Their Impact on the Battery Industry

John Copeland, Principal Engineer—Cell & Battery Testing, Element Materials Technology

"Right to Repair" initiatives were born out of consumer and independent repair shop frustration with devices that were either not feasible to repair due to their design or the required tools and spare parts were not available from the manufacturers. Some manufacturers have concerns that safety might be compromised by improper repairs. This presentation will sample current legislative efforts and review pros and cons of implementation in the battery industry.

4:00 PANEL DISCUSSION: Battery Safety: The Promise versus Reality

Moderator: Brian Barnett, PhD, President, Battery Perspectives

The roadmap to 2030 offers many opportunities, but not without major safety challenges. A panel of experts will discuss forecasts for 2030, providing insights about opportunities, challenges, barriers, and key factors shaping the 2030 roadmap to safer batteries.

Panelists:

Thomas Barth, PhD, Senior Accident Investigator & Biomechanics Engineer, Office of Highway Safety, National Transportation Safety Board

Troy Hayes, PhD, Principal Engineer, Materials & Corrosion Engineering, Exponent

Eric Darcy, PhD, Battery Technical Discipline Lead, Power Systems, NASA Johnson Space Center

5:00 Close of Conference

MONDAY, NOVEMBER 6

7:30 am Registration and Morning Coffee

TRANSPORTATION SAFETY AND STANDARDS

8:50 Organizer's Welcome Remarks
Victoria Mosolgo, Conference Producer, Cambridge EnerTech

8:55 Chairperson's Remarks
Thomas Barth, PhD, Senior Accident Investigator & Biomechanics Engineer, Office of Highway Safety, National Transportation Safety Board

9:00 Hazardous Materials Transportation Safety
William S. Schoonover, Staff Director, Pipeline and Hazardous Materials Safety Administration, US Department of Transportation

9:30 Building the Future with Energy Storage Codes and Standards
Kevin Fok, Director of Compliance, LG Energy Solution Vertech, Inc.
There has been significant growth of the renewable energy and energy storage market during the past several years. Energy storage systems are being installed in a variety of locations, including residential, commercial, and remote. One key factor in the successful deployment of systems is meeting the required codes and standards. This presentation discusses some of the key codes and standards for energy storage, as well as the continually developing landscape.

10:00 Networking Coffee Break

FIRE SAFETY

10:30 Update on NTSB Electric Vehicle Fire Investigations, and Observations on Hazards and Regulations
Thomas Barth, PhD, Senior Accident Investigator & Biomechanics Engineer, Office of Highway Safety, National Transportation Safety Board
NTSB investigations have included lithium-ion battery fires involving aircraft, transportation of hazardous materials, passenger vehicles, and battery electric buses. This presentation summarizes investigations focused on electric passenger vehicles and buses, provides a status of findings and recommendations concerning safety risks to emergency responders from lithium-ion battery fires in electric vehicles, and makes observations on responder hazards and regulations for electric vehicles.

11:00 How Should First Responders Handle Damaged Batteries Post-Incident?
Jimmy DeChant, HazMat Specialist, Colorado Springs Fire Department
Comprehensive review and assistance for industry and regulatory agencies in developing a standardized approach to the appropriate containment and mitigation of Li-ion batteries. First responders need to understand the risk, proper handling, and disposal of these devices. Appropriate transportation regulations and standards for damaged Li-ion devices need to be developed for large devices that do not meet special DOT permits, i.e. EV and ESS systems that have been damaged.

11:30 Enjoy Lunch on Your Own

SAFETY THROUGHOUT THE BATTERY MARKET

12:55 pm Chairperson's Remarks
Bob Richard, PhD, President, Hazmat Safety Consulting, LLC

1:00 Safer Battery-Powered Consumer Products
Jay Kadiwala, Electrical Engineer, Directorate for Engineering Sciences, US Consumer Product Safety Commission
This talk will focus on an update on compliance recalls and incident data, emerging hazards and technology, voluntary standards activities, research testing, and data findings.

1:30 Maritime Battery Safety Specifics — How Do the Safety Requirements for Maritime Batteries Differ from Automotive and Land-Based ESS?
Lars Ole Valoen, PhD, CTO, Corvus Energy
Battery systems for the ocean space offer unprecedented savings per kWh of batteries installed. The harsh environment is, however, a significant risk factor together with the short period of collective experience and potentially drastic consequences of a battery failure. As a result, maritime safety must go beyond the present automotive and land-based ESS safety. A layered safety approach starting with a self-extinguishing battery system is therefore needed.

2:00 Safer Recycling
Richard 'Bo' Bodo, Senior Director, Training & Development, LiCycle
This presentation will discuss Li-Cycle's recycling approach — a low cost, safe, and environmentally friendly process — which recycles all types of Li-ion batteries with an unparalleled recovery rate of up to 95% of all materials.

2:30 Networking Refreshment Break

REGULATIONS & TRANSPORT

3:00 The United Nations Subcommittee on the Transport of Dangerous Goods Regulatory Update: Which New Regulations Are Expected for Lithium Batteries?
Bob Richard, PhD, President, Hazmat Safety Consulting, LLC
This presentation will address the latest lithium-battery transport regulatory changes, as well as those under development. The presentation will cover the lithium-battery hazard-based classification initiative that is under development and sure to have an impact. Bob Richard is a member of the UN Working Group on Lithium Battery Hazard Based Classification System, and he will bring us up to speed on what we can expect.

3:30 Use of Impingement Zone Mapping for the Development of Safe Transport Solutions
William Walker, CTO, KULR Technology
Impingement Zone Mapping (IZM) is a new blast plate technique developed by KULR to aid in the characterization of failure patterns in lithium-ion thermal runaway ejecta. By analyzing IZM data, the heat flux, time of event, and 3D model of the event can be determined. This allows for efficient and effective design of containment structures for Li-ion cells.

4:00 PANEL DISCUSSION: Regulations & Infrastructure — What Is Being Done to Keep Battery Transportation Safe?
Moderator: Bob Richard, PhD, President, Hazmat Safety Consulting, LLC
Panelists:
William S. Schoonover, Staff Director, Pipeline and Hazardous Materials Safety Administration, US Department of Transportation
William Walker, CTO, KULR Technology

4:30 Welcome Reception in the Exhibit Hall with Poster Viewing

5:15 Dinner Tutorial Registration

5:30 Dinner Tutorials
TUT2: Li-ion Battery Safety and Thermal Runaway*
Instructor:
Ahmad A. Pesaran, PhD, Chief Energy Storage Engineer, National Renewable Energy Laboratory
*Separate registration required. See tutorial page for more information.

TUTORIAL*

Monday, November 6 | 5:00-6:30pm

** separate registration required*

TUT2: Li-ion Battery Safety and Thermal Runaway

Instructor:

Ahmad A. Pesaran, PhD, Chief Energy Storage Engineer, National Renewable Energy Laboratory

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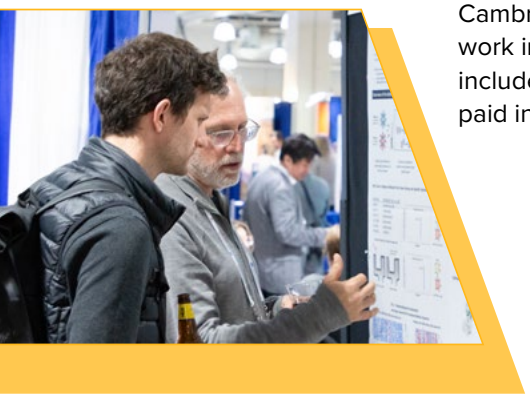

Cambridge EnerTech encourages attendees to gain further exposure by presenting their work in the poster sessions. To secure an onsite poster board and ensure your poster is included in conference materials, your submission must be received, and your registration paid in full by **September 29, 2023.**

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For Hotel reservations and more information, visit the travel page of CambridgeEnerTech.com/Battery-Safety

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POSTER DISCOUNT: $50

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