Save $200! Register by August 2

THE 10th ANNUAL BATTERY SAFETY SUMMIT

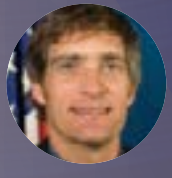
Implementing Lithium-Ion Battery Safety to Meet Increasing Energy Demands

October 22-25, 2019
Alexandria, VA • Westin Alexandria

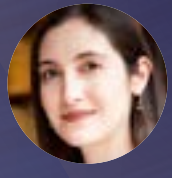
October 22	October 23	October 24	October 25
TECHNICAL PACK			
Chemistry & Materials	Diagnostics & Monitoring	BMS & Charging	Post-Incident Investigations
INFRASTRUCTURE PACK			
Transportation Safety	Consumer Safety	Recycling & Repurposing	

The Battery Safety Summit celebrates 10 years with 7 meetings over 4 days with 2 parallel packs all focused on 1 theme for lithium battery safety.

Including Distinguished Faculty

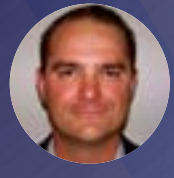


Thomas Barth,
National Transportation Safety Board



Summer R. Ferreira,
Sandia National Laboratories

Kevin Fok,
LG Chem Power, Inc.

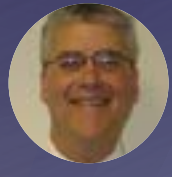


Eric Frederickson,
Call2Recycle, Inc.

Judith Jeevarajan,
Underwriters Laboratory, Inc.

George A. Kerchner,
Wiley Rein LLP

Naoki Matsumura,
Intel Corporation



Kevin L. McNesby,
US Army Research Laboratory

Wolfgang Schade,
Fraunhofer Heinrich Hertz Institute

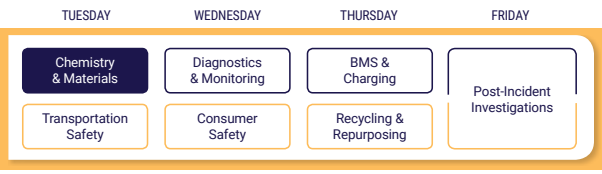
Brian Sisk,
A123 Systems

CORPORATE SPONSOR
ULVAC

Cambridge EnerTech

CambridgeEnertech.com/Battery-Safety

Increasing Efficiency and Thermal Stability of Lithium-Ion Batteries



Advances in Material, Chemical, and Electrochemical Engineering

A revolutionary paradigm is required to design new stable anode, cathode, and electrolyte chemistries, as well as engineer separator materials that provide lithium-ion batteries with higher energy, higher power, longer lifetime, and superior safety. Coordinated efforts in fundamental research and advanced engineering are needed to effectively combine new materials, electrode architectures, and manufacturing technologies.

TUESDAY, OCTOBER 22

7:00 am Registration and Morning Coffee

ELECTROCHEMISTRIES

8:30 Organizer's Welcome
Mary Ann Brown, Executive Director, Conferences, Cambridge EnerTech

8:35 Chairperson's Opening Remarks
Alevtina White-Smirnova, PhD, Associate Professor, Chemistry and Applied Biological Sciences, Materials Engineering and Science Program, South Dakota School of Mines and Technology; Director, NSF IUCRC Center for Green Solid-State Electric Power Generation and Storage

8:40 Pushing the Energy Limits of Lithium-Ion Batteries Through Fluorinated Materials
Joseph Sunstrom, PhD, Senior Applications Development Chemist, Daikin-America

9:10 Electrolyte Chemistries with Responsive Polymers for Thermal Safety in Li-Ion Batteries
Mark E. Roberts, PhD, Associate Professor and Graduate Coordinator, Department of Chemical & Biological Engineering, College of Engineering, Computing and Applied Sciences, Clemson University

9:40 Accelerating Development of High-Nickel Cathodes
Dee Strand, PhD, CSO, Wildcat Discovery Technologies
High-nickel cathodes can deliver improved energy density relative to today's materials. However, these materials suffer from poor lifetime and durability. Variations in electrode composition can impact the performance of the material. This presentation highlights parameters that can accelerate implementation of high-nickel cathodes in applications. The presentation focuses on approaches other than compositional changes to the NMC811 to improve cycle life in high-loading electrodes.

10:10 Networking Coffee Break

10:30 Tuning Salt Structures Enabled Cycling Stability of Lithium and Lithium-Ion Batteries
Xiao-Guang Sun, PhD, Research Scientist, Chemical Sciences Division, Oak Ridge National Laboratory
The degradation of lithium-ion batteries (LIBs) mainly results from electrolyte reactions at the electrodes and the formation of solid electrolyte interphases (SEIs). One of the effective ways to improve battery cycling performance is to use sacrificial additives that can form thin and stable SEIs to prevent continual electrolyte reactions. This talk will present how to tune salt structures as additives to improve cycling stability of LIBs.

11:00 Delayed Voltage Increase in LiFePO4/Graphite Li-Ion Cells During Fixed Resistive Load Over-Discharge
Kyle Crompton, PhD, Scientist, Power and Energy Division, Naval Surface Warfare Center, Crane Division
A rapid voltage increase has been observed in a LiFePO4/graphite Li-ion cell several hours after the application of a fixed resistive load meant to over-discharge the cell. 3-electrode measurements indicated that the cell voltage increase is driven by a rapid anode potential decrease after the anode is at the copper oxidation potential for about 4 hours. SEM/EDS and XPS data indicate that the PF6-anion in the electrolyte is involved in the decrease of anode potential, likely undergoing an oxidative breakdown on the surface of the anode.

11:30 Presentation to be Announced

Sponsored by ULVAC

12:00 pm Luncheon Presentation *(Sponsorship Opportunity Available)* **or Enjoy Lunch on Your Own**

12:30 Session Break

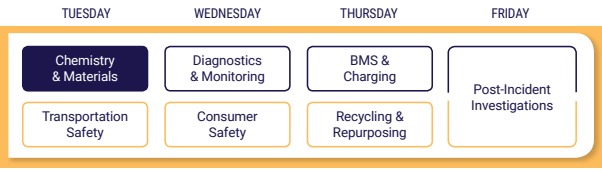
SOLID-STATE

2:00 Chairperson's Remarks
Dee Strand, PhD, CSO, Wildcat Discovery Technologies

2:05 FEATURED PRESENTATION: High-Voltage Stable Solid-State Li-Ion Electrolytes Derived from Li-Based Garnet-Type Structure
Venkataraman Thangadurai, PhD, Professor and Associate Head, Department of Chemistry, University of Calgary
Li-based garnet-type structure solid Li-ion electrolytes have drawn much attention in commercialization in next-generation robust, stable, and high-power energy density all-solid-state Li batteries. In this talk, crystal structure-composition Li-ion conductivity relationship in Li-stuffed garnets will be presented, together with chemical and electrochemical stability with elemental Li and high-capacity electrodes.

2:35 Material Designs for Lithium Polymer Batteries with High Energy Density
Yuan Yang, PhD, Assistant Professor, Applied Physics and Applied Mathematics, Columbia University
PEO-based polymer electrolyte is attractive for solid-state batteries as they are easy to process and compatible with current manufacturing processes. However, PEO has poor stability above 4V and poor ionic conductivity at room temperature. In this talk, I will present a recent study to improve the interfacial stability between PEO and 4V cathode (e.g. LiCoO2) and to enhance ionic conductivity of PEO electrolyte by manipulating the arrangement of ceramic solid electrolyte inside. 4V PEO-based lithium battery with long cycle life is achieved.

Increasing Efficiency and Thermal Stability of Lithium-Ion Batteries



Advances in Material, Chemical, and Electrochemical Engineering

3:05 All-Solid-State Lithium-Ion Battery Based on Antiperovskite Glass-Ceramic Electrolytes

Alevtina White-Smirnova, PhD, Associate Professor, Chemistry and Applied Biological Sciences, Materials Engineering and Science Program, South Dakota School of Mines and Technology; Director, NSF IUCRC Center for Green Solid-State Electric Power Generation and Storage

A relatively new class of solid-state lithium halide electrolytes with antiperovskite crystal structure has been tested to alleviate safety concerns related to conventional lithium-ion batteries and provide broad temperature range for safe battery operations. The absence of phase transformations in the range of 25-100° C and the observed electrochemical stability in the presence of lithium metal makes these materials particularly promising for a new generation of all-solid-state lithium-ion or lithium metal batteries.

3:35 Networking Refreshment Break

4:00 Materials and Batteries by Design for Enhanced Battery Safety

Vilas G. Pol, PhD, Associate Professor, Chemical Engineering, Purdue University

ViPER (Vilas Pol's Energy Research) laboratory at Purdue University focuses its research activities on the development of high-capacity electrode materials, their engineering for longer cycle life and improved battery safety. The talk will demonstrate how tailored spherical, solid, dense carbon particle anodes could make Li-ion batteries safer via distributing current uniformly during charging, minimizing excess SEI formation, and dendritic growth.

4:30 Cobalt-Based Heusler Alloy for Multiple Applications

Bishnu R. Dahal, PhD, Postdoctoral Researcher, Department of Physics, South Dakota State University

Several cobalt-based Heusler alloys have been studied for various applications. Co2TiGe is one of the predicted ferromagnetic Weyl semimetals. In this talk, I will present weak localization and small anomalous Hall conductivity in half-metallic Co2TiGe thin films. The longitudinal resistivity shows semi-metallic behavior. Negative longitudinal magnetoresistance is observed from 5 to 300 K. The measured anomalous Hall conductivity decreases with increasing temperature.

5:00 PANEL DISCUSSION: Bridging the Academia and Industry Gap for Next-Generation Safe LIBs

Improvements in LIBs are the result of intense collaboration between academia and industry. As applications become more demanding, there is the risk of abuse. Scientific literature includes many reports describing material designs with superior and safe performance. However, a considerable gap needs to be filled if we wish these laboratory-based achievements to reach commercialization.

Moderator: Dee Strand, PhD, CSO, Wildcat Discovery Technologies

Panelists to be Announced

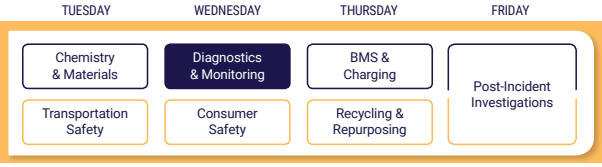
5:30 Close of Increasing Efficiency and Thermal Stability of Lithium-Ion Batteries and Dinner Workshop Registration

6:00 – 9:00 Dinner Workshop*

W1: How to Qualify Your Batteries to Prevent Failures & Thermal Events

**Separate registration required. See page 11 for details.*

Diagnostics & Model Analysis Reveal Safety Strategies



Predicting Lithium-Ion Battery Energies

Accurate diagnostic tests and models are critical for predicting and controlling complex electrochemical, thermal, and mechanical behavior of lithium-ion batteries (LIBs). As research & development aims to create higher energy density LIBs, these models and tests must also advance. The Diagnostics & Model Analysis Reveal Safety Strategies meeting continues this vital dialogue to integrate and implement LIB safety to meet ever-increasing energy demands.

WEDNESDAY, OCTOBER 23

7:00 am Registration and Morning Coffee

THERMAL RUNAWAY

8:00 Chairperson's Remarks
William Q. Walker, PhD, Aerospace Technologist, NASA-Johnson Space Center

8:05 FEATURED PRESENTATION: Modeling, Validation, and Detection of Thermal Runaway from Cell Swelling and Gas Evolution
Anna G. Stefanopoulou, PhD, William Clay Ford Professor of Technology; Director, Energy Institute, University of Michigan
A low order electrothermal model with three tunable parameters was developed and calibrated to capture the thermal runaway evolution during an internal short event. The model includes the cell swelling behavior due to the gas evolution and it matches the experimentally measured force on nickel manganese cobalt oxide pouch cells at two different levels of state of charge, leading to a rupture and quick thermal runaway if fully-charged, or a slow, self-discharge process if half-charged. This model's prediction of force measurement enables a higher confidence in the detection and subsequent isolation of cells undergoing thermal runaway.

8:35 Combustion and Explosion Characteristics of Gases Vented from Li-Ion Batteries
Mathias Henriksen, MSc, Research Associate, Faculty of Technology, Natural Sciences and Maritime Sciences, University of South-Eastern Norway
This presentation will address the combustion and explosive properties of gases vented from Li-ion batteries. The main focus will be the solvent used in the electrolyte, with results from both experiments and simulation. Combustion properties obtained from simulations of vented gas mixtures will also be presented.

9:05 Modeling Thermal Runaway Propagation - Effect of Venting
Elisabeth Kolp, MSc, Research Associate, Electrical and Computer Engineering, Institute for Electrical Energy Storage Technology, Technical University of Munich
Simulating thermal runaway propagation of a lithium-ion battery system, the heat generation of a cell is taken into account, although recently published results showed that the vented gas carries more heat. The talk will introduce our model approach of thermal runaway propagation in a battery system, how to consider the venting process, and the effect of venting on the propagation.

9:35 Utilizing Fractional Thermal Runaway Calorimetry (FTRC) Results for Assembly-Level Thermal Analysis
William Q. Walker, PhD, Aerospace Technologist, NASA-Johnson Space Center
Fractional thermal runaway calorimetry (FTRC) is a new NASA-developed testing technique designed to quantify the total energy yield of lithium-ion (Li-ion) battery thermal runaway (TR) while simultaneously tallying the fractions of energy released through the cell casing and the ejecta material. Correct representation of the energy yield and the associated division thereof is critical to accurate thermal modeling of battery assembly-level response to thermal runaway events. Here we show how to utilize FTRC results in a practical, quick-turnaround, thermal analysis.

10:05 Grand Opening Coffee Break in the Exhibit Hall with Poster Viewing

10:45 Linking External Risks to Internal Events: A High-Speed X-Ray Imaging Approach
Donal Finegan, PhD, Battery Researcher, Vehicle Electrification, National Renewable Energy Laboratory
High-speed X-ray imaging in concert with single-cell calorimetry is used to link internal failure phenomena to external risks during thermal runaway of 18650 Li-ion cells. Through an extensive matrix of over 200 abuse tests, the location of failure initiation, as well as choice of materials used inside the cells, were shown to significantly affect the failure mechanisms and risks associated with thermal runaway. This work has profound implications for 'worst-case' abuse testing techniques and selection of materials for safe high-performance Li-ion systems.

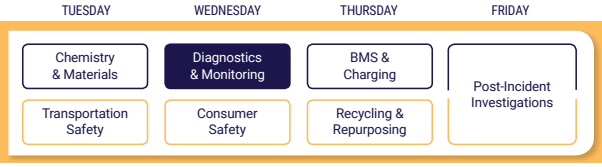
11:15 Theoretical and Numerical Methods for Prediction of Li-Ion Cell Temperature Distribution During Thermal Runaway
Ankur Jain, PhD, Associate Professor, Mechanical and Aerospace Engineering, The University of Texas at Arlington
This presentation summarizes research on developing theoretical and numerical techniques for predicting temperature rise in Li-ion cells due to non-linear heat generation in thermal runaway. These methods contribute towards cell safety through proactive prediction of thermal state of the cell in adverse conditions. These methods range from a theoretical non-dimensional number with predictive capability to complex numerical simulations for predicting thermal runaway propagation in battery packs.

11:45 Sponsored Presentation *(Opportunity Available)*

12:15 pm Luncheon Presentation *(Sponsorship Opportunity Available)* **or Enjoy Lunch on Your Own**

12:45 Session Break

Diagnostics & Model Analysis Reveal Safety Strategies



Predicting Lithium-Ion Battery Energies

NON-INVASIVE TESTING

1:30 Chairperson's Remarks
Summer R. Ferreira, PhD, Principal Member of Technical Staff, Power Sources R&D, Sandia National Laboratories

1:35 FEATURED PRESENTATION: 2nd Life Batteries and Optical Sensors for Battery Safety Issues
Wolfgang Schade, PhD, Head, Department Fiber Optical Sensor Systems, Fraunhofer Heinrich Hertz Institute; Head, Department Applied Photonics, IEPT, Clausthal University of Technology

2:05 Battery Safety from Material to the Cell by *in situ* Synchrotron Characterizations
Xiang Liu, PhD, Visiting Scientist, Electrochemical Energy Storage Group, Chemical Sciences and Engineering, Argonne National Laboratory
In this presentation, the effect of battery components on safety will be discussed: for example, the concerns of high-nickel cathode; the safety effect of the separator (PP/PE/PP, polyamine, PET, etc.); and the safety consideration of silicon content anode. Advanced synchrotron X-ray-based XRD and XAS will be employed for various *in situ* measurements. Possible ways to improve battery safety will also be discussed.

2:35 Refreshment Break in the Exhibit Hall with Poster Viewing

MODELING

3:15 Rigorous Approaches to Quantifying Cell Failure to Enable Large-Scale Failure Modeling—Materials, Mechanics, and Electrochemistry
Summer R. Ferreira, PhD, Principal Member of Technical Staff, Power Sources R&D, Sandia National Laboratories
Using 18650-format commercial lithium-ion (Li-ion) cells, we explore the abuse response and materials property changes in whole cell and cell materials during failure. Findings are used with materials property-informed thermal models to approach quantitative measures of heat release in order to provide useful information on the potential thermal response of commercially relevant Li-ion chemistries during energetic failure events.

3:45 Modeling Anchored by Key Tests to Establish Driving Design Factors for Safe, High Power/Voltage Batteries
Eric C. Darcy, PhD, Battery Technical Discipline Lead, Propulsion and Power Division, NASA-Johnson Space Center
Through a large team effort involving design, simulation, and subscale testing, we've established key design features that drive the safety and performance of high-performing and high-power battery designs for spacecraft applications. Trades between efficient thermal management for meeting high-power discharge operating requirements and thermal isolation necessary for protecting adjacent cells from a thermal runaway cell have led us to interesting results.

4:15 Predictive Health and Safety Models to Manage Large-Scale Battery Deployments
Dania Ghantous, MS, Vice President Technology and Co-Founder, Qnovo
Existing systems are ineffective in predicting safety failures because they rely on lagging indicators, such as capacity. These failures are caused by the presence of defects introduced during manufacturing, assembly, transportation, and use of counterfeit cells and may be catastrophic in nature. Our adaptive algorithms use ion diffusion as the primary diagnostic measurement to detect the presence of defects and prevent potential failures.

4:45 Welcome Reception in the Exhibit Hall with Poster Viewing

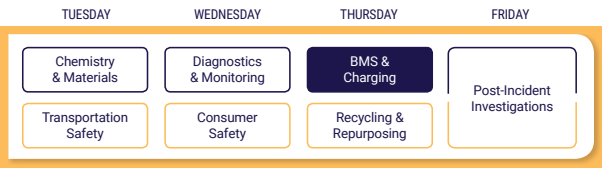
5:30 Dinner Workshop Registration

6:00 Close of Diagnostics & Model Analysis Reveal Safety Strategies

6:00 – 9:00 Dinner Workshop*

W2: Too Hot to Handle: Key Differences in Thermal Runaway Behavior and Failure Analysis of High Voltage Li-Ion Cells
**Separate registration required. See page 11 for details.*

Optimizing Battery Management Systems & Charging Strategies



Lithium-Ion Battery Engineering Leading to Safer Batteries and Faster Charging

Optimizing battery management systems and charging are vital to successful battery integration. Creating versatile and well-designed battery management systems in a fast charge battery is one of the top hurdles battery engineers face. Hear from expert scientists as they provide insight on how to extend the life of their battery packs and decrease charging time.

THURSDAY, OCTOBER 24

7:00 am Registration

7:30 Continental Breakfast Breakout Discussion Groups*
**See website for details.*

BATTERY MANAGEMENT SYSTEMS FOR SAFETY

8:30 Chairperson's Remarks
Rengaswamy (Srini) Srinivasan, PhD, MD, Applied Physics Laboratory, The John Hopkins University

8:35 Validation of BMS Functional Safety by Means of Virtual Failure Injection and Hardware-in-the-Loop
Stefan Butzmann, PhD, Associate Professor, Faculty of Engineering, University of Wuppertal
With increasing share of electromobility and renewable energies, Functional Safety of BMS will become even more important than it is already today. Due to the rising complexity of battery systems, the design and validation of BMS regarding Functional Safety will also require higher effort. The presented tool helps to minimize these efforts without losing validity.

9:05 Impedance-Based Battery Management System for Safety Monitoring of Lithium-Ion Batteries
Rengaswamy (Srini) Srinivasan, PhD, MD, Applied Physics Laboratory, The John Hopkins University
This BMS ensures battery safety and efficiency by tracking and acting on emerging mismatches and electrical and thermal abnormalities in each individual cell without adding cost, volume, weight or power, compared to conventional BMS. Predicting a mismatch is essential for a battery's safety and efficiency. Data for batteries with intentionally calendar-aged and over-discharged cells convincingly demonstrate that such BMS cannot identify cell mismatches and emerging failures. In contrast, the multifrequency impedance-based BMS tracks identify and act on changes in the internal state of each cell continuously in real time, including battery charging, discharging, and at rest.

9:35 Safety Behaviors of Lithium-Ion Battery Upon Mechanical Abusive Loading
Jun Xu, PhD, Professor, Mechanical Engineering and Engineering Science, University of North Carolina Charlotte
This talk presents an overview of a series of our recent work on safety behaviors of lithium-ion battery upon mechanical abusive loading from experiment, multiphysics modeling, and simulation. The proposed multiphysics model, as well as development methodology, lay a solid foundation towards design, evaluation, monitoring, and protection of lithium-ion batteries.

10:05 Coffee Break in the Exhibit Hall with Poster Viewing

PREVENTING FAILURE

10:35 Lithium Plating: A Critical Side Reaction in Lithium-Ion Cells
Thomas Waldmann, PhD, Accumulators Materials Research, ZSW
This presentation will detail the following: How lithium plating affects lifetime and safety; how to predict lithium plating; how to avoid lithium plating; and how to select charging protocols to avoid lithium plating.

11:05 Chemical and Mechanical Degradation and Mitigation Strategies for Si Anodes
Partha Mukerjee, PhD, Associate Professor, Mechanical Engineering, Purdue University
Atomistic and mesoscopic models are used to analyze cracking and stresses produced during charge of Si nanoparticles covered by a thin SEI film. Mechanical stresses coupled to chemical effects are investigated with classical molecular dynamics simulations and with a mesoscopic model. Rupture of the surface film is the main cause of capacity fade and damage evolution is strongly influenced by the structure of the solid film.

11:35 Battery Management Systems Toward Safer Batteries
Thomas Hoeger, Naval Surface Warfare Center

12:05 pm Sponsored Presentation *(Opportunity Available)*

12:35 Luncheon Presentation *(Sponsorship Opportunity Available)* **or Enjoy Lunch on Your Own**

1:05 Session Break

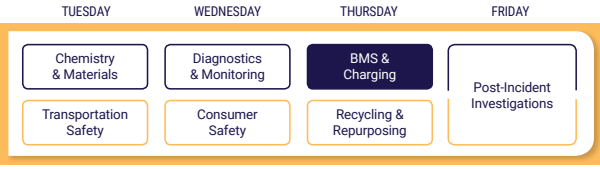
BMS FOR A VARIETY OF APPLICATIONS

2:00 Chairperson's Remarks
Naoki Matsumura, Senior Technologist, Intel Corporation

2:05 Special Considerations in Battery Management for Industrial Application
Yevgen Barsukov, PhD, Head of Algorithm Development, Battery Management Systems, Texas Instruments, Inc.
This presentation will cover these topics: SOH, SOC, degradation, and lifespan, as well as introduce new Texas Instruments gauge and protector devices that support up to 7 serial cells and are especially suitable for high-power industrial applications.

2:35 Power Electronic-Based Active Battery Energy Management Solutions for E-Transportation and Autonomous E-Mobility
Sheldon Williamson, PhD, Professor, University of Ontario
Fundamental topologies of power electronic converters, specifically utilized for bidirectional current flow in cell balancing applications, will be discussed. The design, implementation, and testing/validation of an active cell equalization circuit for a traction Li-ion battery pack will also be presented.

Optimizing Battery Management Systems & Charging Strategies



Lithium-Ion Battery Engineering Leading to Safer Batteries and Faster Charging

FAST CHARGING & INFRASTRUCTURE

3:05 Battery Cycle Life Extension by Charging Algorithm

Naoki Matsumura, Senior Technologist, Intel Corporation

IOT devices expect Li-ion batteries to have a long cycle life because they may be used in areas where battery replacement is not easy. This session talks about a method to extend battery cycle life through a battery charging algorithm. This is expected to reduce the cost of ownership as it enables less battery replacement.

3:35 Refreshment Break in the Exhibit Hall. Last Chance for Poster Viewing.

4:15 Fast Charging of Lithium-Ion Batteries at All Temperatures

Chao-Yang Wang, PhD, William E. Diefenderfer Chair Professor, Director, Electrochemical Engine Center (ECEC), Co-Director, Battery & Energy Storage Technology (BEST) Center, The Pennsylvania State University

Range anxiety is a key reason that consumers are reluctant to embrace electric vehicles (EVs). To be truly competitive with gasoline vehicles, EVs should allow drivers to recharge quickly anywhere in any weather, like refueling gasoline cars. However, none of today's EVs allow fast charging in cold or even cool temperatures due to the risk of lithium plating, the formation of metallic lithium that drastically reduces battery life and even results in safety hazards. Here, we present an approach that enables 15-minute fast charging of Li-ion batteries in any temperatures (even at −50 °C) while still preserving remarkable cycle life (4,500 cycles, equivalent to >12 y and >280,000 miles of EV lifetime), thus making EVs truly weather-independent.

4:45 How a Sustainable Charging Infrastructure Can be Built

Uwe Kirchner, Senior Expert, PMM ATV Application Engineering, Infineon Technologies Austria AG

This talk will cover key aspects that must be covered to build a successful charging infrastructure.

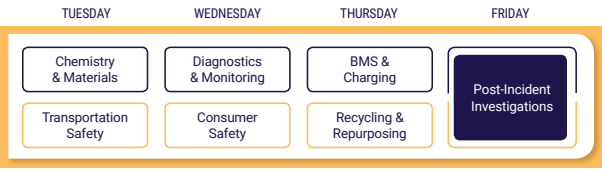
5:15 Close of Optimizing Battery Management Systems & Charging and Dinner Workshop Registration

5:30 – 8:30 Dinner Workshop*

W3: Active Battery Energy Management Systems & Charging

**Separate registration required. See page 11 for details.*

Post Incident Forensics & Investigations



Determining Cause, Reducing Risk & Guiding Safety Regulations

As the energy capacity of new batteries increases, the risk of battery fires and explosions also increases. Although battery safety incidents are rare, they are a serious cause for concern. When incidents happen, court cases can follow. It is important to understand what causes these malfunctions so that they can be prevented in the future. Scientific findings from pre- and post-investigations can help determine the cause and guide safety regulations.

FRIDAY, OCTOBER 25

7:00 am Registration

7:30 Continental Breakfast Breakout Discussion Groups*
See website for details.

BATTERY FIRES & INVESTIGATIONS

8:45 Chairperson's Remarks
Michael Stichter, PhD, Mechanical Engineer, Failure Analysis, ARCCA

8:50 Why Lithium-Ion Batteries Fail, And What to Do About It
Michael Stichter, PhD, Mechanical Engineer, Failure Analysis, ARCCA
In this presentation, we will be discussing the forensic investigation of battery fires – the investigation process, preservation of evidence, etc., as well as how forensic engineers determine the various causes of battery failures or fire. Numerous case studies will be included.

9:20 Laser-Synchronized Imaging of Explosions
Kevin L. McNesby, PhD, Team Leader, Detonation Science Team, Energetics Technology Branch, Lethality Division, Weapons and Materials Research Directorate, US Army Research Laboratory
The presentation focuses on methods of imaging explosions of solid energetic materials using camera-synchronized laser illumination. The techniques presented allow for mapping of temperature, pressure, chemical species, and energy deposition during and following detonations of explosives, using high-speed cameras as the main diagnostic.

9:50 NTSB Investigations of EV Crashes and Incidents with Battery Fires
Thomas Barth, PhD, Senior Accident Investigator and Biomechanics Engineer, Office of Highway Safety Board, National Transportation Safety Board
The National Transportation Safety Board has conducted several investigations of electric vehicle crashes and incidents that involved fires and stranded energy of the high voltage battery. The investigations focused on the emergency response, secondary response, and stranded energy. This presentation will summarize the investigations and current issues being developed for a NTSB Special Report on Electric Vehicle Battery Fire Safety.

10:10 Networking Coffee Break

10:45 Tools of the Trade: Battery Fire Forensics
Mike Eskra, CFEI, CFI, PMP, President, Eskra Technical Products, Inc.
Many times, after a fire, there may be remains of a battery that is suspect to be causal to the fire. Unfortunately, these remains are often only partial remnants of the original battery. Certain techniques, such as X-ray, CT scans, and witness reports are used to identify the device the battery was used in, and the battery, to allow for exemplar acquisition and testing. This talk will discuss techniques utilized to identify specific battery manufacturers, defects, and failure modes to assist in validating origin and cause.

11:05 Case Study Panel Discussion: Forensics of a Drone Fire
Moderator: Mike Eskra, Eskra Technical Products, Inc.
Panelists: Matthew Wagenhofer, PhD, PE, FORCON International
C.J. Flaherty, PE, CFEI, FORCON International
Paula Ralston, Research Specialist, Eskra Technical Products, Inc.
Every case has at least one Plaintiff and one Defendant. In this scenario, there was one Plaintiff, one targeted Defendant, and a secondary Defendant. What are the requirements to develop the case through reporting and subsequent depositions, trials, and/or settlements?
· Mike Eskra, Plaintiff - Gather facts, evidence, possible site exam. Test hypothesis and eliminate hypotheses that don't work, while staying within a budget of 5% of the initial loss.
· Matthew Wagenhofer, Targeted Defendant - Looking for facts or information to disprove or weaken the Plaintiff's case.
· C.J. Flaherty - Secondary Defendant - Looking for facts or information to disprove or weaken the Plaintiff's case or strengthen own defense.
· Paula Ralston - Plaintiff - Defense's first line - "It wasn't ours": Find solid evidence to show what burned up and what battery was involved.

12:15 pm Sponsored Presentation *(Opportunity Available)*

12:45 Luncheon Presentation *(Sponsorship Opportunity Available)* **or Enjoy Lunch on Your Own**

1:15 Session Break

CONSUMER ELECTRONIC FORENSIC INVESTIGATIONS

2:00 Chairperson's Remarks
Joe Nowikowski, Division Manager, Rimkus Consulting Group, Inc.

2:05 Investigation of Heat Transfer in Li-Ion Battery Pack of a Hoverboard
Ankur Jain, PhD, Associate Professor, Mechanical and Aerospace Engineering, The University of Texas at Arlington
Several recent hoverboard fires have been attributed to the Li-ion battery pack. This presentation summarizes experimental and numerical investigation of heat transfer in the battery pack. By disassembling a hoverboard, cell temperature measurements are carried out in extreme operating conditions. A novel cooling approach that uses relative air flow is demonstrated. Numerical simulations are shown to be in good agreement with measurements. These results contribute towards safer battery packs for hoverboards.

2:35 Hoverboards Case Study
Vidyu Challa, PhD, Technical Director, ANSYS-DfR Solutions

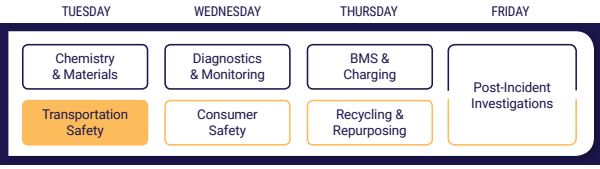
3:05 New Investigation – Recycled Batteries in Shipment
Joe Nowikowski, Division Manager, Rimkus Consulting Group, Inc.
This talk will focus on a real-world investigation on recycled batteries in shipment. The methods of determining safety incidents will be discussed.

3:35 PANEL DISCUSSION: E-Cigarette Case Study
Although rare, lithium-ion battery safety incidents can happen. This panel dives into how the lessons learned from these safety incidents and subsequent litigation lead to new battery standards and regulations.
Moderator: Joe Nowikowski, Division Manager, Rimkus Consulting Group, Inc.

4:35 Conference Wrap-Up

4:45 Close of Battery Safety Summit

Lithium Battery Transportation Safety



Guidelines to Safely Ship Batteries by Air, Land, and Sea

TUESDAY, OCTOBER 22

7:00 am Registration and Morning Coffee

LITHIUM BATTERY TRANSPORTATION REGULATIONS

8:30 Organizer's Welcome
Victoria Mosolgo, Conference Producer, Cambridge EnerTech

8:35 Chairperson's Opening Remarks
Bob Richard, President, Hazmat Safety Consulting

8:40 What You Need to Know About the Lithium Battery Test Summary Document
Bob Richard, President, Hazmat Safety Consulting
Effective 1 January 2020, manufacturers and subsequent distributors of cells or batteries and equipment powered by cells and batteries manufactured after 30 June 2003 must make available the test summary as specified in the UN Manual of Tests and Criteria, Revision and Amend. 1, Part III, Sub-section 38.3, paragraph 38.3.5. This presentation will address how to comply with the new requirement and discuss a publicly available test summary management system that is being developed to assist the shipping community.

9:10 Lithium Batteries and Transport Regulations: What Are the Next Big Changes?
George A. Kerchner, Senior Regulatory Analyst, Wiley Rein LLP

9:40 Developing Effective Section II Training
David Anderson, Director, Transportation Logistics, Logistics and Maritime Operations, ProteQ
The key to section II training is for a company to develop proper work aids for use on the job. Once developed, the work aids must be updated as regulations and the battery mix.

10:10 Networking Coffee Break

TESTING TO ENSURE SAFE TRANSPORT

10:30 Safety Testing of Commercial Lithium-Ion Batteries and Failure Modes Analysis
Romeo Malik, M.Tech., Research Assistant, WMG, University of Warwick
In this study, a comprehensive comparison of thermal runaway mechanisms for two different cathode types, Li(Ni0.3Co0.3Mn0.3)O2 and Li(Ni0.8Co0.15Al0.05)O2 is explored. Both the chemistries were studied for different states of charge, and the various abuse scenarios that lead to thermal runaway is investigated. Abuse tests include mechanical abuse, electrical abuse, and thermal abuse. The physicochemical characterization was performed on cells, prior to and after abuse.

11:00 Safety of Li-Ion Cells at Various States of Charge
Judith Jeevarajan, PhD, Research Director, Electrochemical Safety, Underwriters Laboratory, Inc.
The current transportation regulations for cargo compartments in passenger and cargo aircraft require that Li-ion rechargeable cells and batteries should be shipped at states of charge that are 30% or lower. There is very little data that can be found in the literature on the extent of a cell or battery's reaction to an off-nominal condition at different states of charge. This study included a set of tests where Li-ion cells of various capacities, formats, and chemistries were subjected to external short and heat at various states of charge between 0 to 100%. The results will be presented.

11:30 Sponsored Presentation *(Opportunity Available)*

12:00 pm Luncheon Presentation *(Sponsorship Opportunity Available)* **or Enjoy Lunch on Your Own**

12:30 Session Break

SAFE SHIPPING FOR AIR, LAND AND SEA

2:00 Chairperson's Remarks
Kheim Trad, PhD, Researcher, Energy Technology, VITO

2:05 A Fail-Safe Solution for the Safety of Lithium Batteries
Sean Luo, PhD, Research Lead, R&D, Pyrophobic Systems Ltd.
A battery housing made from intumescent fire-retardant polymer composites with one or more holes as self-sealing venting outlet(s) can vent to relieve the pressure and quench a thermal runaway event at the earliest stage. Then porous char formed from the intumescent fire-retardant material when exposed to the heat generated in the thermal runaway embed the runaway battery and contain the thermal runaway within a "dead cell".

2:35 Safe Transport of Lithium Batteries by Air (SABATAIR) Project Results
Kheim Trad, PhD, Researcher, Energy Technology, VITO
The European project, SABATAIR, is focusing on the assessment of the packaging tests which are being drafted to the packages dedicated to the transport of lithium batteries by air. The project will also give some risk assessment guidelines to air transport operators to safely transport lithium batteries.

3:05 NTSB Investigations of EV Crashes and Incidents with Battery Fires
Thomas Barth, PhD, Senior Accident Investigator and Biomechanics Engineer, Office of Highway Safety Board, National Transportation Safety Board
The National Transportation Safety Board has conducted several investigations of electric vehicle crashes and incidents that involved fires and stranded energy of the high voltage battery. The investigations focused on the emergency response, secondary response, and stranded energy. This presentation will summarize the investigations and current issues being developed for a NTSB Special Report on Electric Vehicle Battery Fire Safety.

3:35 Networking Refreshment Break

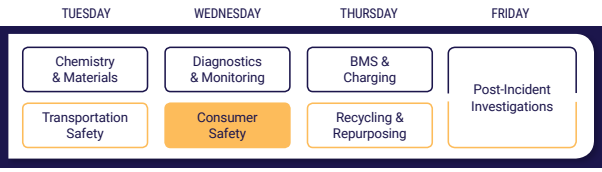
4:00 Passive Single Cell Thermal Runaway Limited Large Battery Systems – Maritime
Lars Ole Valøen, PhD, CTO, Corvus Energy
Corvus Energy has developed and deployed more than 100 MWh of large, modular Li-ion battery systems for maritime & sub-sea usage. Different systems have been developed for vehicle ferries, supply vessels, and fast passenger ferries. The different systems use different cell technologies, proving that cell level thermal runaway limitations are possible for a number of different cell technologies.

4:30 PANEL DISCUSSION: Regulations & Infrastructure – What Is Being Done to Keep Battery Transportation Safe?
Moderator: Bob Richard, President, Hazmat Safety Consulting
Panelists: George A. Kerchner, Senior Regulatory Analyst, Wiley Rein LLP
Lars Ole Valøen, PhD, CTO, Corvus Energy
Thomas Barth, PhD, Senior Accident Investigator and Biomechanics Engineer, Office of Highway Safety Board, National Transportation Safety Board
Kheim Trad, PhD, Researcher, Energy Technology, VITO

5:15 Close of Lithium Battery Transportation Safety and Dinner Workshop Registration

6:00 – 9:00 Dinner Workshop*
W1: How to Qualify Your Batteries to Prevent Failures & Thermal Events
Separate registration required. See page 11 for details.

Lithium-Ion Battery Consumer Safety



Science, Strategies, and Standards

Lithium-ion battery (LIB) technologies and applications are rapidly evolving with expanding uses by consumers – from cell phone and medical devices, to electric vehicles and stationary solar storage, to name a few. Fires or explosions caused by these batteries are uncommon, but the consequences can be devastating. Designing LIB safety is difficult but not impossible. Scientific findings from pre- and post-investigations can help guide safety standards. Cambridge EnerTech's Lithium-Ion Battery Consumer Safety meeting convenes forensic scientists, fire-safety investigators, regulatory authorities, OEMs, and battery manufacturers to facilitate dynamic discussions of integrating LIBs safely into our mobile society.

WEDNESDAY, OCTOBER 23

7:00 am Registration and Morning Coffee

LIBs SAFETY: SCIENCE & STRATEGIES

8:00 Chairperson's Remarks
George A. Kerchner, Senior Regulatory Analyst, Wiley Rein LLP

8:05 Fundamental Investigations Toward Safe Electrochemical Energy Storage Systems
Amy Marschilok, PhD, University Instructional Specialist, Research Associate Professor, Materials Science and Engineering & Research Professor, Chemistry, Stony Brook University; Joint Appointee, Brookhaven National Laboratory
As applications for energy storage increase in complexity and diversity, the demands on the battery continue to grow for both consumer electronics and vehicle technologies. Fundamental investigations toward safe electrochemical energy storage systems will be highlighted in this presentation, with emphasis on complementary ex-situ, in-situ and operando characterization approaches to understand energy storage material/composite degradation modes and relationship to cell level safety.

8:35 Safety of Next Generation of Batteries
Grigorii Soloveichik, DSc, Program Director, Advanced Research Projects Agency-Energy, U.S. Department of Energy
The Advanced Research Projects Agency (ARPA-E) supports development of advanced high energy density batteries for fast growing automotive applications and grid-scale energy storage with emphasis on safety. In comparison with incumbent Li-ion batteries, increased safety is achieved by replacing flammable electrolytes with either non-flammable aqueous or solid (ceramic or polymer) electrolytes or by cell engineering. Trade-off between energy density, safety, manufacturability, and battery cost will be discussed.

9:05 Energy Density vs. Safety – Can We Improve Both?
Brian Sisk, PhD, Vice President, Cell Product Development, A123 Systems
Lithium-ion batteries have long been a winner in energy density thanks to innovation in materials research. However, these increases in energy density have also pushed the envelope in terms of safety. In this presentation, I will present a path to an inherently safe battery technology that breaks the tradeoff between energy density and safety. This battery technology, known as solid polymer electrolyte, suppresses thermal runaway by eliminating the flammable material. By making it impossible for lithium-ion batteries to burn, we can provide a future of safe, high-energy batteries.

9:35 Advanced Li-Ion Technology and Beyond at Saft
Joong Sun Park, PhD, Solid State Technical Manager, Saft America
Saft has successfully applied Li-ion electrochemistry to defense, space, and commercial applications which require very high power and safety. Saft is entering a new, dramatic growth stage including expansion into new markets and applications. Saft continues to develop new and safe electrochemistry including advanced LTO, Mn-phosphate, and solid-state. Recent advancements will be shown.

10:05 Grand Opening Coffee Break in the Exhibit Hall with Poster Viewing

LIBs SAFETY: EDUCATING THE CONSUMER

10:45 Educating Consumers on Lithium-Ion Battery Safety: Cradle to Grave
George A. Kerchner, Senior Regulatory Analyst, Wiley Rein LLP

11:15 PANEL DISCUSSION: Which Is More Difficult? Engineering a Safer LIB Battery or Educating the Consumer on Its Use?
Lithium-ion battery (LIB) technologies and applications are rapidly evolving and their use by consumers is widening. Higher energy plus increased use leads to higher risk. During this panel experts discuss where the "energy" should be applied: engineering or education?

Topics to be Discussed:

- Engineering stable electrochemistries
- Engineering reliant battery management systems
- Educating integrators in the consumer electronics market
- Educating consumers on use
- Experiences with high energy density

Moderator: George A. Kerchner, Senior Regulatory Analyst, Wiley Rein LLP
Panelists to be Announced

11:45 Sponsored Presentation *(Opportunity Available)*

12:15 pm Luncheon Presentation *(Sponsorship Opportunity Available)* **or Enjoy Lunch on Your Own**

12:45 Session Break

APPLICATIONS FROM MOBILE TO STATIONARY

1:30 Chairperson's Remarks
Kevin Fok, Director, Operations, LG Chem Michigan, Inc.

1:35 Need for Safer Standards and Regulations of Lithium-Ion Battery
Bhavya Kotak, MEng, Research Associate, The Lab of Professor Hans-Georg Schweiger, Safe Electromobility, University of Applied Science Ingolstadt
The application of Lithium-Ion Battery (LIB) is rapidly evolving from electronics like mobile phones to energy storage systems and electric vehicles. However, LIB is experiencing a significant number of fires and explosions due to various reasons such as mechanical abuse, overcharging, short circuit, and design and manufacturing flaws. Therefore, it is vital to increase the safety of LIB consumers and hence, necessary to enhance the standards to make them more reliable.

2:05 Mechanical Response of Lithium Ion Batteries to External Abusive Loads
Elham Sahraei, PhD, Assistant Professor, Director, Electric Vehicle Safety Lab (EVSL), Temple University
Li-ion batteries have found applications in air, ground, and sea vessels due to their high power and energy density, long cycle life, and low self-discharge rates. However, they contain hazardous materials and can go to thermal runaway or, in extreme cases, explode from mechanical failure due to a crash or mishandling. In this research, we investigated effects of mechanical deformation on Lithium-ion Battery Cells at different temperatures.

Lithium-Ion Battery Consumer Safety

Science, Strategies, and Standards

2:35 Refreshment Break in the Exhibit Hall with Poster Viewing

3:15 The Scalability of Accelerating Rate Calorimetry (ARC) with State of Charge and Capacity

Joshua Lamb, PhD, Principal Member of the Technical Staff, Power Sources R&D, Sandia National Laboratories

This work examines the results of accelerating rate calorimetry testing on different lithium-ion cathode chemistries (LCO, NCA, NMC, LFP), different formats (18650, pouch, large format cylindrical), and states of charge to understand how ARC results are impacted by both energy density and total energy. Also studied is how thermal runaway is impacted by energy in general, looking at both the total energy release during thermal runaway as well as the peak heating rates observed.

3:45 Ensuring Large-Scale Energy Storage Safety

Roger Lin, Vice President, Marketing, NEC Energy Solutions

As the presence of large-scale lithium-ion energy storage systems in the electric power grid begins to grow, proper design and operation protocols are needed for ensuring safe and reliable operation. This presentation will share NEC's best practices in the areas of product design and system integration with the entire industry to help ensure all energy storage systems meet safety requirements and minimize hazard to acceptable levels, and contribute to the creation of standards that ensure energy storage will be a ubiquitous, integral, and safe part of the power sector.

4:15 PANEL DISCUSSION: Energy Storage Systems: Codes and Standards

Codes and standards are continuing to be developed and implemented for energy storage systems. This panel discussion covers the latest developments in codes and standards for energy storage systems.

Topics to be Discussed:

- Recent developments in codes and standards
- Stakeholder perspectives
- Next steps

Moderator: Kevin Fok, Director, Operations, LG Chem Michigan, Inc.

Panelists:

Adam Barowy, MS, Research Engineer I, Fire Research & Development, UL LLC

Matthew Paiss, Standards Representative, International Association of Fire Fighters

Additional Panelists to be Announced

4:45 Welcome Reception in the Exhibit Hall with Poster Viewing

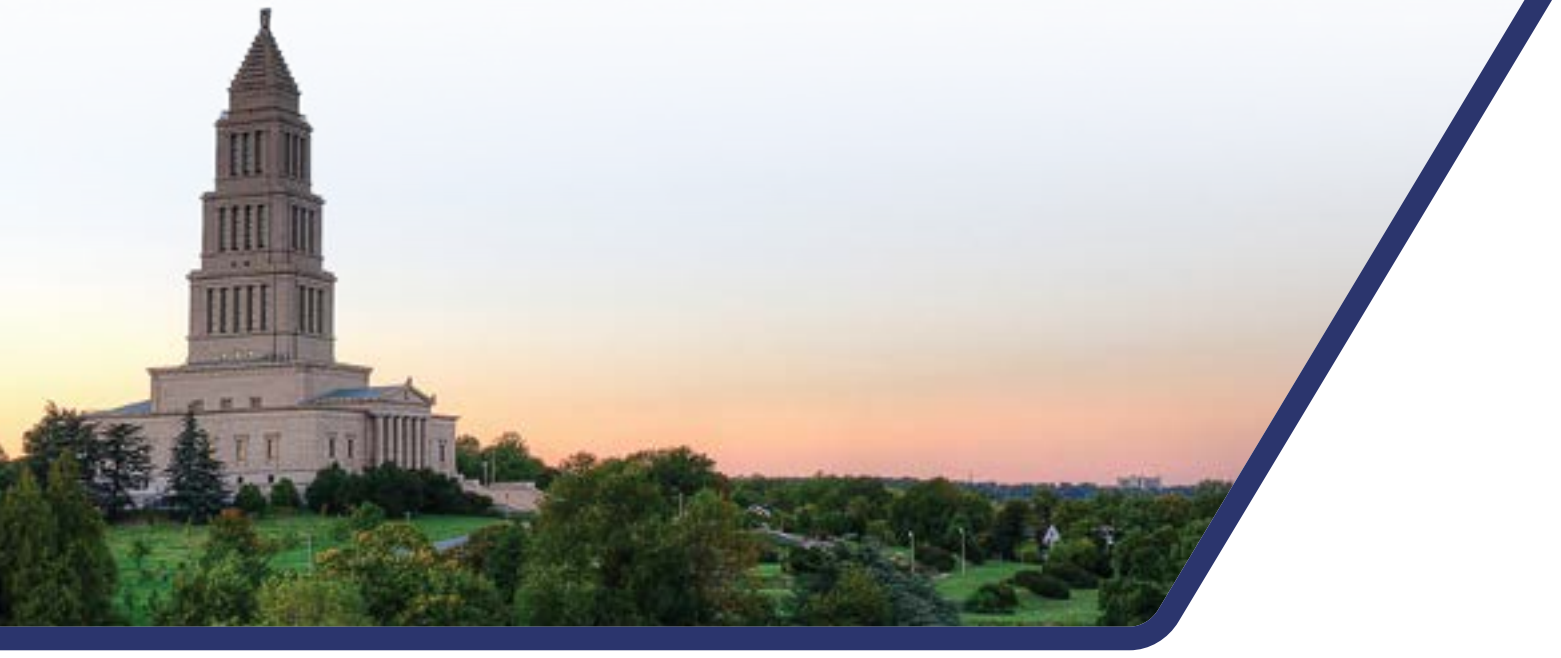
5:30 Dinner Workshop Registration

6:00 Close of Lithium-Ion Battery Consumer Safety

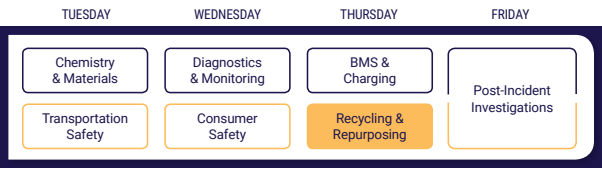
6:00 – 9:00 Dinner Workshop*

W2: Too Hot to Handle: Key Differences in Thermal Runaway Behavior and Failure Analysis of High Voltage Li-Ion Cells

Separate registration required. See page 11 for details.



Recycling & Repurposing Lithium-Ion Batteries



Economically Protecting the Environment, While Utilizing Retrieved Materials in the Fabrication of New Products

Currently, 97 percent of all lead acid batteries in the United States are recycled. The recycling of lead acid batteries is predominantly a business-driven initiative as they are nearly 100 percent recyclable and doing so is profitable. On the other hand, only between 20 and 40 percent of lithium-ion batteries are recycled in the United States. Lithium-ion batteries are not as readily recycled and the process of recycling them is not yet economic unless they contain cobalt.

THURSDAY, OCTOBER 24

7:00 am Registration

7:30 Continental Breakfast Breakout Discussion Groups*
**See website for details.*

INFRASTRUCTURE & OPPORTUNITIES FOR LITHIUM-ION BATTERY RECYCLING

8:30 Chairperson's Remarks
Eric Frederickson, Director, Quality & Process Excellence, Call2Recycle, Inc.

8:35 Opportunities and Challenges of Lithium-Ion Battery Recycling
Kunal Phalpher, Chief Commercial Officer, Business Development and Operations, Li-Cycle
This presentation will explore the opportunities and challenges of lithium-ion battery recycling. With the development of megafactories for lithium-ion batteries, there is a need to recycle these batteries at a 'mega' scale. Li-Cycle Technology™ meets this need. Li-Cycle Technology is a low-cost, safe, and environmentally friendly solution to the global end-of-life lithium-ion battery problem. The technology can recycle all types of lithium-ion batteries with unparalleled recoveries of 80-100%.

9:05 Understanding the Regulatory Framework and Operational Challenges of Lithium Battery Recycling
Eric Frederickson, Director, Quality & Process Excellence, Call2Recycle, Inc.
What do organizations who manufacture, distribute, or use lithium-based batteries do with them at the end of their useful life? Do they understand the regulatory obligations for managing and transporting lithium batteries for disposal or recycling? Are there processes in place to ensure that the functional challenges of meeting these obligations are met? This session provides practical guidance on how to navigate these challenges, presented by the country's leading consumer battery recycling stewardship organization.

9:35 The ReCell Center Approach to Lithium-Ion Battery Recycling
Jeff Spangenberger, Materials Recycling R&D Program Lead, Applied Materials Division, Argonne National Laboratory
The US government has determined that lithium-ion battery recycling is critical to its needs. The ReCell Center was thus created and, through collaboration with the national labs, universities, and industry, is researching technologies that will enable profitable recycling of lithium-ion batteries. This presentation will provide information about the center and how battery lifecycle stakeholders can participate.

10:05 Coffee Break in the Exhibit Hall with Poster Viewing

10:35 Lithium-Ion Battery Recycling Research at the ReCell Center
Linda Gaines, PhD, Transportation System Analyst, Energy Systems Division, Argonne National Laboratory
The U.S. Department of Energy has created the ReCell Center (and is offering a Recycling Prize) to develop an economical recycling process by the time large volumes of batteries from electric vehicles and other uses reach end of life. The work will be performed at lead-lab, Argonne National Laboratory, its partner labs, Oak Ridge and NREL, and several universities. This presentation will describe research projects in the center that focus on recovering usable cathode.

11:05 PANEL DISCUSSION: Energy Focused Battery Recycling Initiatives & Progress
Moderator: Linda Gaines, PhD, Transportation System Analyst, Energy Systems Division, Argonne National Laboratory
Panelists:
Kunal Phalpher, Chief Commercial Officer, Business Development and Operations, Li-Cycle
Eric Frederickson, Director, Quality & Process Excellence, Call2Recycle, Inc.
Jeff Spangenberger, Materials Recycling R&D Program Lead, Applied Materials Division, Argonne National Laboratory
This panel will dive into the newest lithium-ion battery recycling programs in the United States. The new battery recycling infrastructure that will be laid out in the US will also be discussed.

12:05 pm Sponsored Presentation *(Opportunity Available)*

12:35 Luncheon Presentation *(Sponsorship Opportunity Available)* **or Enjoy Lunch on Your Own**

1:05 Session Break

SAFETY OF RECYCLED LITHIUM-ION BATTERIES

2:00 Chairperson's Remarks
Steve Tolen, Chairman, SAE Secondary Battery Use Committee, President/CEO, Indie Power System

2:05 Critical Importance of Battery Raw Material Purity in Assuring Safety and Performance of EV Batteries
Marco Romero, President & CEO, Euro Manganese, Inc.
The evolution of lithium-ion battery formulations and cathode chemistry has been driven largely by a quest to achieve greater energy density, longer cycle life, lower production costs, and reduced dependence on scarce raw materials with vulnerable supply chains and questionable provenance, such as cobalt. In order to remain stable, reliable, and safe, some of these performance advancements have resulted in batteries that require meticulous and technically challenging production processes, and much purer raw materials, free of deleterious impurities. Mr. Romero's presentation will focus on the quest for purer battery raw materials, with specific emphasis on manganese used in NMC cathodes.

2:35 Addressing Safety for Low-Cost and Safety with End-of-Life Materials
Lauren Crandon, PhD, Researcher, OnTo Technology, LLC
This presentation will address three parts: (1) Elimination of hazards to make batteries safe for transport, which addresses half of the end-of-life liability (2) Reclamation of candidate materials with cathode-healing™ for less than $10/kg, and reclamation of the remaining materials to (3) make clean precursors with a value opportunity of $2-10/kg. For such a developed industry, the realities of a wholistic approach for sustainable (economic and otherwise) lithium-ion battery manufacturing are largely untapped. These approaches offer unique, scalable, patented methods to address it.

Recycling & Repurposing Lithium-Ion Batteries

Economically Protecting the Environment, While Utilizing Retrieved Materials in the Fabrication of New Products

SECOND USE BATTERIES

3:05 Facilitating Secondary-Use and Battery Recycling

Steve Tolen, Chairman, SAE Secondary Battery Use Committee, President/CEO, Indie Power System

From Consumer Electronics to Electric Vehicle applications, the design of a battery pack holds the greatest opportunity to reduce the cost of secondary use and to increase recycling rates. Improved data and tracking of batteries would facilitate resale and transportation of batteries. This will become increasingly important as more repurposers reassemble batteries, and counterfeit batteries begin entering the market. Better data could also materially reduce the cost of preparing batteries for secondary use. Design theory will be discussed, and examples shown as to how to reduce repurposing costs, increase recycling rates, and improve transportation and recycling safety.

3:35 Refreshment Break in the Exhibit Hall. Last Chance for Poster Viewing.

4:15 Value of LIB Secondary Use & Recycle

Jack Lifton, MS, Vice President, Business Development, Resource Conservation and Recycling Corporation, Pty Ltd.; CEO, Jack Lifton LLC

4:45 PANEL DISCUSSION: Ensuring Safety in Second Life Batteries

Repurposing lithium-ion batteries seems to be a great way to recycle batteries and keep materials in the market. With so many "owners" of the materials in a battery, who owns the responsibility in the event of a safety incident? How are repurposers ensuring safe second life batteries?

Moderator: Steve Tolen, Chairman, SAE Secondary Battery Use Committee, President/CEO, Indie Power System

Panelists:

Jack Lifton, MS, Vice President, Business Development, Resource Conservation and Recycling Corporation, Pty Ltd.; CEO, Jack Lifton LLC

Lauren Crandon, PhD, Researcher, OnTo Technology, LLC

Marco Romero, President & CEO, Euro Manganese, Inc.

5:15 Close of Recycling and Repurposing Lithium-Ion Batteries and Dinner Workshop Registration

5:30 – 8:30 Dinner Workshop*

W3: Active Battery Energy Management Systems & Charging

**Separate registration required. See page 11 for details.*

Dinner Workshops

OCTOBER 22 - 24 2019

TUESDAY, OCTOBER 22
6:00 – 9:00 PM

W1: How to Qualify Your Batteries to Prevent Failures & Thermal Events

Vidyu Challa, PhD, Technical Director, DfR Solutions

- Gain an understanding of lithium-ion battery failure mechanisms and the pathway to thermal runaway events
- Learn about the top causes of battery field failures, and the major areas where you need to have mitigation strategies
- Learn how cell design plays a critical role in battery safety and reliability, and what you can do from a design perspective to prevent these failures
- Learn the basic steps in a lithium-ion cell manufacturing process, and the process controls required to ensure cell safety and reliability
- Learn about the battery management system and its role in system safety
- Come away with a checklist of things you should do to qualify your cell manufacturer – pass down requirements, trust but verify (design, manufacturing, compliance-based testing, system-level tolerances, application-specific battery testing, battery management system, cell CT scans and teardowns and lastly, user education)

WEDNESDAY, OCTOBER 23
6:00 – 9:00 PM

W2: Too Hot to Handle: Key Differences in Thermal Runaway Behavior and Failure Analysis of High Voltage Li-Ion Cells

Matthew Glazer, PhD, PE, Managing Engineer, Materials and Corrosion Engineering Practice, Exponent

As higher voltage Li-ion cells become more prevalent in the market, a clearer understanding of these cells' post thermal runaway signatures is needed for effective failure analysis of events that occur during testing or in the field. In this talk, I will compare the thermal runaway behavior and post thermal runaway electrode morphology between 4.2V and 4.35V lithium-ion cells using both non-destructive and destructive techniques, and key lessons will be discussed to inform investigations of failed cells in the field.

THURSDAY, OCTOBER 24
5:30 – 8:30 PM

W3: Active Battery Energy Management Systems & Charging

Sheldon Williamson, PhD, Professor and NSERC Canada Research Chair in Electric Energy Storage Systems for Transportation Electrification, Department of Electrical, Computer and Software Engineering, University of Ontario

This tutorial will give attendees an overview of battery systems design. More closely it will cover key aspects of successful battery management systems and charging.

Sponsorship & Exhibit Opportunities

CET offers comprehensive sponsorship packages that can be customized to your company's objectives and budget. Sponsorship allows you to achieve your objectives before, during, and long after the event. Packages may include podium presentations, exhibit space and branding, as well as the use of delegate lists. Signing on early will maximize your exposure to qualified decision-makers and drive traffic to your website in the coming months.

Podium Presentations – *Available Within the Main Agenda!*

Showcase your solutions to a guaranteed, targeted audience through a 15- or 30-minute podium presentation during a specific conference program, breakfast, lunch, or separate from the main agenda within a pre-conference workshop. Package includes exhibit space, on-site branding, and access to cooperative marketing efforts by CET. For the luncheon option, lunches are delivered to attendees who are already seated in the main session room. Presentations will sell quickly, so sign on early to secure your talk!

Invitation-Only VIP Dinner/Hospitality Suite

Select specific delegates from the pre-registration list to attend a private function at an upscale restaurant or a reception at the hotel. From extending invitations, to venue to suggestions, CET will deliver your prospects and help you make the most of this invaluable experience.

One-on-One Meetings

Select your top prospects from the pre-conference registration list. CET will reach out to your prospects and arrange the meeting for you. A minimum number of meetings will be guaranteed, depending on your marketing objectives and needs. A very limited number of these packages will be sold.

Additional Opportunities Available for Sponsorship Include:

- Conference Tote Bags
- Literature Distribution (Tote Bag Insert or Chair Drop)
- Badge Lanyards
- Program Guide Advertisement
- Padfolios and more…

Exhibit

Exhibitors will enjoy facilitated networking opportunities with qualified delegates, making it the perfect platform to launch a new product, collect feedback, and generate new leads. Exhibit space sells out quickly, so reserve your booth today!

For additional information regarding sponsorship and exhibit space, please contact:

Companies A-O
Sherry Johnson
Sr. Business Development Manager
781-972-1359
sjohnson@cambridgeenertech.com

Companies P-Z
Nathaniel Dupler
Business Development Manager
781-247-6296
ndupler@cambridgeenertech.com

Hotel & Travel Information

Conference Hotel and Venue:
Westin Alexandria
400 Courthouse Square
Alexandria, VA 22314
T: 703-253-8600

Discounted Room Rate: $265 s/d
Discounted Room Rate Cut-off Date: September 25, 2019

Reservations:
Go to the travel page of CambridgeEnerTech.com/Battery-Safety/

Top Reasons to Stay at the Westin Alexandria

- Located a quick 5 miles from the Ronald Reagan National Airport (DCA)
- No daily commute as conference takes place right in the hotel!
- Just 1.5 miles from the charming Old Town Alexandria, with many shops and restaurants and the scenic Potomac River
- Complimentary wireless internet in your guestroom