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23<sup>RD</sup> ANNUAL

# **aabc** advanced automotive battery conference

**DECEMBER 11-14, 2023**

**SAN DIEGO, CA**

Town & Country Resort

## **2023** Conference Programs

**Pre-Conference Tutorials:** MONDAY, DECEMBER 11, 2023

**Symposia:** TUESDAY AND WEDNESDAY, DECEMBER 12 AND 13



CHEMISTRY



ENGINEERING



HEAVY DUTY



BATTERY  
MANUFACTURING



RECYCLING

**Conferences:** WEDNESDAY AND THURSDAY, DECEMBER 13 AND 14



xEV BATTERY  
TECHNOLOGY



RAW  
MATERIALS



BATTERY  
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December 11, 2023 | San Diego, CA

# Tutorials\*

MONDAY, DECEMBER 11 8:30-10:00 AM

## TUT1: In-Depth Analysis of the Chinese xEV Battery Industry

**Instructor:**

Mark H. L. Lu, PhD, Senior Industrial Analyst, Industrial Economics & Knowledge Center, Industrial Technology Research Institute

## TUT2: 21st Century Battery Raw Materials Global Market Overview

**Instructors:**

Andrew Miller, COO, Benchmark Mineral Intelligence

James Mills, Principal Consultant, Benchmark Mineral Intelligence

## TUT3: Cell Manufacturing

**Instructor:**

James Kaschmitter, CEO, SpectraPower LLC

## TUT4: Economics of Battery Material Development & Manufacturing

**Instructor:**

Thomas D. Gregory, Owner and Consultant, Borealis Technology Solutions LLC

MONDAY, DECEMBER 11 10:30 AM-12:00 PM

## TUT5: Solid-State Batteries

**Instructor:**

Venkataraman Thangadurai, PhD, Professor, Chemistry, University of Calgary

## TUT6: Science & Economics for Second-Life Batteries

**Instructors:**

Steven Chung, Co-Founder CEO, ReJoule

Antoni Tong, CEO, Smartville

Anthony Garbarino, Founder & CEO, Currents

With the rapid growth of electric vehicle production, it is essential to expand the strategies for repurposing and reusing second-life EV batteries. Second-life batteries refer to those that are no longer suitable for EV use but still possess a considerable amount of remaining capacity for other applications. Achieving widespread reuse of these batteries necessitates the interplay of policy, economics, and scientific advancements. This tutorial explores the crucial role played by these factors in enabling the broad reuse of EV batteries and maximizing the potential of second-life battery applications.

## TUT7: Li-ion Battery Safety and Thermal Runaway

**Instructor:**

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

## TUT8: Sustainability in the Automotive Battery Value Chain

**Instructors:**

Konstantin Born, Doctoral Candidate, Smith School of Enterprise and the Environment, University of Oxford

Kristi Disney Bruckner, Senior Policy Advisor, IRMA Initiative for Responsible Mining

Stefan Debruyne, Director of External Affairs, SQM International

Jarod Kelly, PhD, Principal Energy Systems Analyst, Systems Assessment Center, Argonne National Lab

Michael Wang, PhD, Group Center Director & Distinguished Fellow, Systems Assessment Center, Argonne National Lab

MONDAY, DECEMBER 11 1:00-2:30 PM

## TUT9: Cell & Pack Design

**Instructor:**

Kevin Konecky, Battery and Energy Storage Systems Consultant, Total Battery Consulting

## TUT10: Sodium-ion Batteries (instructor will be presenting virtually)

**Instructor:**

Philipp Adelhelm, PhD, Professor, Institute of Chemistry, Humboldt-University Berlin

## TUT11: Battery Intelligence – Part 1

**Instructor:**

Kevin Wood, PhD, Senior Solutions Engineer, Voltaiq, Inc.

## TUT12: Managing & Understanding the Risks of Li-ion Battery Safety

**Instructor:**

Shmuel De-Leon, CEO, Shmuel De-Leon Energy Ltd.

MONDAY, DECEMBER 11 3:00-4:30 PM

## TUT13: Silicon-Based Anodes

**Instructor:**

Dee Strand, PhD, CSO, R&D, Wildcat Discovery Technologies, Inc.

## TUT14: BMS & Charging

**Instructors:**

Scott Trimboli, PhD, Associate Professor, Electrical & Computer Engineering, University of Colorado, Colorado Springs

Gregory L. Plett, PhD, Professor, Electrical & Computer Engineering, University of Colorado, Colorado Springs

## TUT15: Battery Intelligence – Part 2

**Instructor:**

Kevin Wood, PhD, Senior Solutions Engineer, Voltaiq, Inc.

## TUT16: The Rechargeable Battery Market: Value Chain and Main Trends

**Instructors:**

Christophe Pillot, PhD, Director, Avicenne Energy

Michael Sanders, Senior Advisor, Energy, Avicenne Energy

\* All Access or separate registration required for Tutorials

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AABC offers comprehensive packages that can be customized to your budget and objectives. Sponsorship allows you to achieve your goals before, during, and long after the event. Packages may include 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.

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Showcase your solutions to a guaranteed, targeted audience through a 20-minute presentation during a specific program, breakfast, lunch, or a pre-conference workshop. Package includes exhibit space, on-site branding, and access to cooperative marketing efforts by AABC. Lunches are delivered to attendees who are already seated in the main session room. Presentations will sell out quickly! Sign on early to secure your talk.

## One-to-One Meetings

Select your top prospects from the pre-conference registration list. AABC 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.

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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 the invitations, to venue suggestions, AABC will deliver your prospects and help you make the most of this invaluable opportunity.

## 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 yours today!

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- Literature Distribution (Tote Bag Insert or Chair Drop)
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- Padfolios and More...

For more information, please contact:



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# Battery Chemistries for Automotive Applications

## Recent Advancements in Battery Chemistries

**MONDAY, DECEMBER 11****7:00 am Registration Open until 4:30 PM**

Peak Registration Hours are Monday 7:00 - 8:30 am & Tuesday 7:30 - 8:30 am.  
Avoid lines come pick up your badge on Sunday or Monday after 9:00 am.

**TUESDAY, DECEMBER 12****7:30 am Registration and Morning Coffee****8:30 Organizer's Welcome Remarks**

Victoria Mosolgo, Conference Producer, Cambridge EnerTech

### LITHIUM-METAL

**8:35 Chairperson's Remarks**

Martin Winter, PhD, Director & Professor, Electrochemical Energy Technology, University of Muenster

**8:40 Electrode/Electrolyte Interfaces and Interphases**

Venkat Srinivasan, PhD, Director, Center for Collaborative Energy Storage Science, Argonne National Laboratory

Martin Winter, PhD, Director & Professor, Electrochemical Energy Technology, University of Muenster

Li-metal-based batteries, crucial for transportation decarbonization, are limited by processes at the electrode-electrolyte interface. Based on extensive discussions among leading battery researchers from the US and Germany, a collaborative research program was established that brought together experts from the two countries to understand these challenges. In this presentation, we will describe the progress of this collaboration and the insights gained that can help accelerate the commercialization of Li-metal-based batteries.

**9:00 Overcoming Charge Anxiety and Meeting Customer Expectations with Energy Dense Lithium-Metal Batteries**

Brian Sisk, PhD, CTO, Sepion Technologies

Sepion brings a differentiated approach to replacing graphite anodes with lithium metal by combining the latest in nanoscience, polymer chemistry, and cell engineering to safely unlock a 40% increase in electric vehicle range with a gigafactory-compatible solution.

**9:20 Designing Sulfurized Polymers as Stable Cathode Materials for Lithium Batteries**

Ping Liu, PhD, Professor and Director, Sustainable Power and Energy Center, University of California, San Diego

The community has focused on building nanocomposites of sulfur to provide electronic conductivity, confinement of soluble polysulfides, and faster kinetics with various catalytic agents. Yet these approaches face increasing challenges in the case of lean electrolytes due to the need to facilitate the reaction through the dissolution mechanism.

**9:40 MODERATED Q&A: Session Wrap-Up**

Moderator: Martin Winter, PhD, Director & Professor, Electrochemical Energy Technology, University of Muenster

Panelists:

Venkat Srinivasan, PhD, Director, Center for Collaborative Energy Storage Science, Argonne National Laboratory

Brian Sisk, PhD, CTO, Sepion Technologies

Ping Liu, PhD, Professor and Director, Sustainable Power and Energy Center, University of California, San Diego

**10:00 Grand Opening Coffee Break in the Exhibit Hall with Poster Viewing**

### LITHIUM-METAL (CONT.)

**10:40 Lithium-Metal Batteries: Electrolytes and Tools**

Sang Cheol Kim, PhD, Postdoctoral Fellow, Stanford

This presentation discusses the development of new electrolyte chemistries for

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enhanced electrochemical performance, and new tools for studying solvation structures.

**11:00 Scaling High Performance Lithium Metal Batteries with Dry Process 3D Printing**

Arwed Niestroj, Senior Vice President, E Mobility & Product, C Level, Sakuu Corp.

Sakuu has completed the development of its Cypress lithium-metal battery showing high-energy density, high power, highest safety, best cycle life, and availability for licensing to manufacturers. Sakuu's industrial speed dry process 3D printing enables significant cost savings and the world's first 3D-printed patterned Li-metal batteries, allowing increased battery pack energy densities from consumer industry products to automotive EV.

**11:20 Performance of Lyten's Cylindrical and Pouch Li-S Cells**

Kumar Bugga, Senior Fellow, Lyten

Combining its unique 3D graphene sulfur host with several advanced cell components, Lyten is developing next-generation Li-S cells with higher specific energy than Li-ion batteries. Lyten has begun manufacturing commercial cylindrical and pouch cells on semi-automatic assembly lines. We will present the performance of these cells and outline our roadmap for advancing Lyten's low-cost, high-energy, and green Li-S technology for EVs.

**11:40 MODERATED Q&A: Session Wrap-Up**

Moderator: Martin Winter, PhD, Director & Professor, Electrochemical Energy Technology, University of Muenster

Panelists:

Sang Cheol Kim, PhD, Postdoctoral Fellow, Stanford

Arwed Niestroj, Senior Vice President, E Mobility & Product, C Level, Sakuu Corp.

Kumar Bugga, Senior Fellow, Lyten

**12:00 pm Networking Lunch**

### SILICON ANODE

**1:00 Chairperson's Remarks**

Martin Winter, PhD, Director & Professor, Electrochemical Energy Technology, University of Muenster

**1:05 Replacing Graphite with Sila's Silicon: Shipping and Validating Today**

Kurt Kelty, Vice President, Automotive, Sila Nanotechnologies, Inc.

Kurt Kelty will discuss how innovative drop-in-replacement nanocomposite, silicon-based anode powder enables up to 20% more energy density today over state-of-the-art lithium-ion cells with graphite, without performance compromise. This material is shipping today and is ready to scale to meet larger demand and power EVs by the middle of this decade.

**1:25 Enovix BrakeFlow Technology: A Breakthrough in Next-Gen Battery Safety**

Robert Rosen, PhD, Senior Director, Strategic Materials, Global Procurement, ENOVIX Corp

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.

**1:45 Binders vs. Structural Additives—The Key to Maximum Silicon Anode Performance**

Manuel Wieser, CTO, AnteoTech Ltd.

Binders and structural additives constitute the smallest fraction of anode compositions, yet they are critically important to achieve long cycle life. This is particularly relevant for silicon containing anodes. While binder chemistries have been evolving over the past years, structural additives such as AnteoTech's binder additive, Anteo X, or carbon additives present new strategies that aim to minimize inactive materials, yet propelling silicon anodes forward by 100s of cycles.

**2:05 MODERATED Q&A: Session Wrap-Up**

Moderator: Martin Winter, PhD, Director & Professor, Electrochemical Energy



# Battery Chemistries for Automotive Applications

## Recent Advancements in Battery Chemistries

Technology, University of Muenster

### Panelists:

*Kurt Kelty, Vice President, Automotive, Sila Nanotechnologies, Inc.*  
*Robert Rosen, PhD, Senior Director, Strategic Materials, Global Procurement, ENOVIX Corp*  
*Manuel Wieser, CTO, AnteoTech Ltd.*

### 2:20 Refreshment Break in the Exhibit Hall with Poster Viewing

(Sponsorship Opportunity Available)

## CATHODES

### 3:15 Chairperson's Remarks

*Martin Winter, PhD, Director & Professor, Electrochemical Energy Technology, University of Muenster*

### 3:20 Next-Generation Cobalt-Free Manganese-Rich Cathodes for Long-Range EVs

*Jay F. Whitacre, PhD, CEO & CTO, Materials Science & Engineering, Stratus Materials*

This talk will introduce a new class of cathode materials to the battery community; the Stratus Materials "LXMO" product line will be explained, and results from large-format (>5Ah) full cells demonstrating a full suite of materials capabilities will be shared. The data show that this chemistry can outperform nickel-rich cathodes while costing significantly less and having superior safety characteristics.

### 3:40 Talk Title to be Announced

*Kenan Sahin, PhD, President & Founder, CAMX Power*



### 4:00 MODERATED Q&A: Session Wrap-Up

*Moderator: Martin Winter, PhD, Director & Professor, Electrochemical Energy Technology, University of Muenster*

### Panelists:

*Jay F. Whitacre, PhD, CEO & CTO, Materials Science & Engineering, Stratus Materials*  
*Kenan Sahin, PhD, President & Founder, CAMX Power*

## SOLID-STATE

### 4:15 Chairperson's Remarks

*Martin Winter, PhD, Director & Professor, Electrochemical Energy Technology, University of Muenster*

### 4:20 Scaling-Up High Energy Density Solid-State Batteries

*Shirley Meng, PhD, Professor, University of Chicago; Chief Scientist, Argonne Collaborative Center for Energy Storage Science, Argonne National Laboratory*

Recent years have seen monumental and exciting developments in the field of all-solid-state batteries (ASSBs). Despite its promises, they still face a multitude of technical hurdles before commercialization can be achieved. In this talk, I will provide a perspective on a wide range of scalability challenges and considerations for ASSBs, including solid electrolyte synthesis, dry electrode and separator processing, cell assembly, and stack pressure considerations at the module level.

### 4:40 Hydro-Quebec's Solutions for Practical Solid-State Batteries Using New-Generation Lithium-Metal Anode

*Chisu Kim, PhD, Director Research, CEETSE, Hydro Quebec Research Institute IREQ*

Hydro-Quebec is developing a new-generation lithium metal anode technology, which is designed to provide a higher volumetric energy density at a reduced cost, offering flexible adaptability to control thickness and width without compromising productivity. This presentation will demonstrate the key features of the new lithium metal anode and introduce polymer and sulfide-based solid-state batteries under development by Hydro-Quebec by leveraging the advanced lithium metal anode and new solid-electrolyte families.

### 5:00 Solid-State Batteries

*Juergen Janek, PhD, Professor, Solid-State Ionics & Electrochemistry, Justus Liebig University, Giessen*

In this presentation, the current status of sulfide-based SSBs and the recent development of halide solid electrolytes will be briefly discussed, as well as the potential need for targeted design of cathode active materials for SSBs

### 5:20 LMFP: Cell Performance and Manufacturing Technology



*Vincent Huang, PhD, Senior Manager, Research & Development, HCM CO., LTD.*

LMFP has attracted more attentions because of the advantages such as high safety, longer cycle life and high voltage. We believe that LMFP will become one of the key materials in Lithium-ion battery industry. In this talk, I will introduce who we are, and the insight into collaboration strategies and manufacturing technology. From the aspect of LMFP, I will talk about LMFP/NMC composite batteries, and our synthesized LMFP which has a discharge capacity of 150 mAh/g with excellent rate capability (>15C) and lifetime >5000 cycles.

### 5:40 MODERATED Q&A: Session Wrap-Up

*Moderator: Martin Winter, PhD, Director & Professor, Electrochemical Energy Technology, University of Muenster*

### Panelists:

*Shirley Meng, PhD, Professor, University of Chicago; Chief Scientist, Argonne Collaborative Center for Energy Storage Science, Argonne National Laboratory*  
*Chisu Kim, PhD, Director Research, CEETSE, Hydro Quebec Research Institute IREQ*  
*Juergen Janek, PhD, Professor, Solid-State Ionics & Electrochemistry, Justus Liebig University, Giessen*  
*Vincent Huang, PhD, Senior Manager, Research & Development, HCM CO., LTD.*  
*Shih-Chieh Liao, PhD, Chief Technical Advisor, Research & Development, HCM CO., LTD.*

### 6:00 Networking Reception in the Exhibit Hall with Poster Viewing



### 7:00 Close of Day

## WEDNESDAY, DECEMBER 13

### 7:40 am Registration and Morning Coffee

### 7:45 Interactive Breakout Discussions

Roundtable discussions are informal, moderated discussions with brainstorming and interactive problem-solving, allowing participants from diverse backgrounds to exchange ideas and experiences and develop future collaborations around a focused topic.

#### TABLE 1: Innovations in Recycling Battery Materials

*Moderator: Steven E. Sloop, President, OnTo Technology LLC*

#### TABLE 2: Battery Pack System Cost and Safety – Will Future xEV Battery Packs Increase in Complexity or Simplify and How Will Cost and Safety Be Impacted?

*Moderator: Kevin Konecky, Battery and Energy Storage Systems Consultant, Total Battery Consulting*

#### TABLE 3: Production Supply and Sustainability of a North American Supply Chain

*Moderator: Rob Privette, Business Development Manager, North America, Umicore*

#### TABLE 4: Li-ion NMC Fast Charging New Cells for E-Mobility

*Moderator: Shmuel De-Leon, CEO, Shmuel De-Leon Energy, Ltd.*

#### TABLE 5: Inactive Materials: Developments in Current Collectors, Separators and Electrolytes

*Moderator: Sam Jaffe, Business Development, Addionics*

#### TABLE 6: Building the Domestic Battery Raw Material Supply Chain

*Moderator: Carl Thoemmes, Business Development, Battery Materials, Koura*

#### TABLE 7: Battery Cost vs. Passport, CO2 Footprint & Lifetime Warranty – What Does the Battery Regulation Legislation Bring?

*Moderator: Wenzel Prochazka, Senior Product Manager Electrification Systems, NXP Semiconductors Austria*

#### TABLE 8: High Percentage Silicon-Content Anodes and Cells

*Moderator: Benjamin Park, PhD, Founder & CTO, Enevate*

#### TABLE 9: Battery Management Systems

*Moderator: Sheldon Williamson, PhD, Professor & Canada Research Chair, Electrical & Computer & Software Engineering, University of Ontario Institute of Technology*

#### TABLE 10: Battery Intelligence

*Moderator: Eli Leland, PhD, CTO and Co-Founder, Voltaiq, Inc.*

#### TABLE 11: Lithium Metal Batteries

*Moderator: Brian Sisk, PhD, CTO, Sepion Technologies*

#### TABLE 12: Battery Safety & Thermal Runaway

*Moderator: Judith Jeevarajan, PhD, Vice President and Executive Director, Electrochemical Safety Research Institute, UL Research Institutes*

#### TABLE 13: Silicon Anodes

*Moderator: Manuel Wieser, Head of Energy Business, AnteoTech*



# Battery Chemistries for Automotive Applications

## Recent Advancements in Battery Chemistries

### SOLID-STATE (CONT.)

#### 8:25 Chairperson's Remarks

**Martin Winter, PhD, Director & Professor, Electrochemical Energy Technology, University of Muenster**

#### 8:30 Enabling Lithium Metal: From Mine to Materials, Batteries, Vehicles and Data

**Kang Xu, PhD, Chief Scientist, SES AI**

Since its founding in 2012, SES AI has been persistently pursuing the crown jewel of all battery chemistries, rechargeable Li-Metal battery (LMB). Leveraging the knowledge derived from decades of unsuccessful efforts, SES has developed unique electrolyte systems and interphasial chemistries that have harnessed the lithium metal for excellent cycle-life, rate capability, energy density and safe operation. Turning these technological fruitions into commercial products (100 Ah large format LMBs) for EV and eVTOL applications, SES now looks on the new horizon, engaging the frontiers of AI/ML-assisted data mining and management. The efforts span from materials discovery and tool development, rationale design of electrochemistry and cell engineering, integration of batteries into smart vehicles, recycling and recovery of key materials, and establishment and management of databases.



#### 8:50 Quasi-Solid-State Batteries: The Best of Both Worlds

**Raimund Koerver, PhD, Director of Innovation, Factorial**

Solid or quasi-solid electrolytes in batteries have potential to fulfill the growing demand for more powerful and higher energy density storage solutions. Factorial's batteries, equipped with a lithium metal anode, have demonstrated high performance at ambient temperatures and aim to address safety concerns. The company's proprietary electrolyte innovation realizes benefits of liquid and solid batteries, without sacrificing performance or safety. This talk covers the challenges, progress, and benefits of quasi-solid-state batteries.



**Factorial**

#### 9:10 Powering High Energy and Fast-Charging Batteries with Nano-Porous Silicon

**Casper Peeters, CEO, E-magy B.V.**

A major improvement for the next generation of Li-ion batteries is the introduction of silicon as material for the anode, bringing capacity and fast charging to the next level. The biggest challenge of applying silicon-dominant anodes in Li-ion batteries, is silicon's tendency to expand during cycling. E-magy has invented and manufactures micron-sized silicon particles with nanopores that overcome this challenge by containing that expansion within the nanopores themselves.



#### 9:30 Recent Discoveries Made in the Tesla-Dalhousie Research Partnership on Advanced Batteries

**Michael Metzger, PhD, Assistant Professor, Physics & Atmospheric Science, Dalhousie University**

The Tesla-Dalhousie research partnership on long-lived, high-energy density and low-cost batteries for electric vehicles and stationary energy storage is the only academic research partnership of Tesla worldwide. In this contribution we will present impactful research results from this partnership that recently attracted widespread attention: the elimination of reversible self-discharge in lithium-ion cells and sodium-ion cells with lifetimes that rival modern lithium iron phosphate cells.

#### 9:50 Unlocking the Potential of Dry Cathodes with Solgain™

**Andrew Sics, Executive Key Account Manager, Battery Materials Growth Platform, Solvay**

With dry electrode manufacturing being a large area of development, Solvay is pushing polymer performance to the edge to meet the next-generation performance needs today. Solgain™ is the technology for "dry cathode manufacturing" that is enabled by the latest Solvay PVDF polymer. Solgain™ is an Eco friendly technology that produces a thick, highly loaded homogenous electrode. This technology supports some of the known "dry" process advantages like lowering energy consumption and reducing footprint and costs. Solgain™ also improves upon the ease and scalability for manufacturing and improves electrode performance using traditional cathode active materials.



#### 10:10 MODERATED Q&A: Session Wrap-Up

**Moderator: Martin Winter, PhD, Director & Professor, Electrochemical Energy Technology, University of Muenster**

#### Panelists:

**Michael Metzger, PhD, Assistant Professor, Physics & Atmospheric Science, Dalhousie University**

**Andrew Sics, Executive Key Account Manager, Battery Materials Growth Platform, Solvay**

**Raimund Koerver, PhD, Director of Innovation, Factorial**

**Casper Peeters, CEO, E-magy B.V.**

**10:25 Coffee Break in the Exhibit Hall with Poster Viewing (Sponsorship Opportunity Available)**

### PLENARY KEYNOTE

#### 10:55 Chairperson's Remarks

**Craig Wohlers, Executive Director, Conferences, Cambridge EnerTech**



#### 11:00 LG Leading the Battery Expansion in North America

**Robert Lee, President, North American & Chief Strategy Officer, LG Energy Solution**

LG Energy Solution is the leading lithium-ion battery manufacturer, working with the top OEMs globally in transforming the automobile industry. The market for EVs is expanding rapidly, driven by both consumer demand and regulatory incentives. In North America, there are unprecedented levels of investment to support EVs, by both OEMs and battery manufacturers. This presentation will discuss market growth projections, announced expansion plans, and the challenges ahead.



#### 11:20 A Sustainability Perspective on Near-Future Energy Storage Technologies

**Ulderico Ulissi, PhD, Manager, 21C Lab, Contemporary Amperex Technology Limited (CATL)**

In this presentation we will discuss sustainability and how it is linked to product development, to critically discuss the realistic opportunities to make batteries more sustainable in the near future. This will provide the audience more insights into the CATL carbon neutrality plan, and into its pledge to achieve carbon neutrality in its core operations by 2025 and across the battery value chain by 2035.



#### 11:40 USABC Battery Development Program Overview

**Matt Denlinger, Battery Research Engineer, Energy Storage Research, Ford Motor Company**

The United States Advanced Battery Consortium (USABC) is a subsidiary of USCAR. The organization supports advanced battery technology development and commercialization for electric vehicles via funding through a cooperative agreement with the Department of Energy. This talk will give an overview of current and past USABC programs, as well as future funding opportunities for US battery developers.

#### 12:00 pm MODERATED Q&A: Session Wrap-Up



**Moderator: Craig Wohlers, Executive Director, Conferences, Cambridge EnerTech**

**Panelists: Robert Lee, President, North American & Chief Strategy Officer, LG Energy Solution**

**Ulderico Ulissi, PhD, Manager, 21C Lab, Contemporary Amperex Technology Limited (CATL)**

**John Kwon, General Counsel of Global Legal & Strategy, Contemporary Amperex Technology Limited (CATL)**

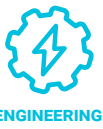
**Matt Denlinger, Battery Research Engineer, Energy Storage Research, Ford Motor Company**

**12:15 Networking Lunch (Sponsorship Opportunity Available)**

**1:15 Dessert Break in the Exhibit Hall with Poster Viewing (Sponsorship Opportunity Available)**

**2:00 Close of Symposium**





# Battery Engineering for Automotive Applications

Building Better Batteries through Improvements in Battery Safety, Cell Engineering, and Battery Management Systems

## MONDAY, DECEMBER 11

### 7:00 am Registration Open until 4:30 PM

Peak Registration Hours are Monday 7:00 - 8:30 am & Tuesday 7:30 - 8:30 am. Avoid lines come pick up your badge on Sunday or Monday after 9:00 am.

## TUESDAY, DECEMBER 12

### 7:30 am Registration and Morning Coffee

### 8:30 Organizer's Welcome Remarks

Victoria Mosolgo, Conference Producer, Cambridge EnerTech

## SENSING & DIAGNOSTICS

### 8:35 Chairperson's Remarks

Gabrielle Vuylsteke, Research Engineer, Research & Advanced Engineering, Ford Motor Co.

### 8:40 Battery Diagnostics and Reuse Sensing Technology

Keisuke Ishikawa, Researcher, Toyota Central R&D Labs, Inc.

This presentation introduces a novel Electrochemical Impedance Spectroscopy (EIS) method for detecting the growth of lithium metal plating within lithium-ion batteries. This method can be assembled either as a sensor or as an instrumental system to diagnose the safety degradation associated with battery reusing.

### 9:00 Assessing Robustness of a Model-Based Lithium-ion Battery Pack State Estimation over Life: A Case Study Using Battery Life Test Data

Gabrielle Vuylsteke, Research Engineer, Research & Advanced Engineering, Ford Motor Co.

This work presents a case study evaluating the reliability of a model-based battery state estimation framework, where we tested the algorithm on pack-level data from beginning, middle, and end of battery life.

### 9:20 Defining Diagnostic Parameters for Early Detection of Thermal Runaway

Loraine Torres-Castro, PhD, Battery Safety Lead, Sandia National Laboratories

### 9:40 MODERATED Q&A: Session Wrap-Up

Moderator: Gabrielle Vuylsteke, Research Engineer, Research & Advanced Engineering, Ford Motor Co.

#### Panelists:

Keisuke Ishikawa, Researcher, Toyota Central R&D Labs, Inc.

Loraine Torres-Castro, PhD, Battery Safety Lead, Sandia National Laboratories

### 10:00 Grand Opening Coffee Break in the Exhibit Hall with Poster Viewing



## BATTERY MANAGEMENT FOR LITHIUM-METAL

### 10:40 Closed-Form Equations to Compute Impedance for Rechargeable Lithium-Metal Batteries with Application to Advanced Battery Management

Gregory L. Plett, PhD, Professor, Electrical & Computer Engineering, University of Colorado, Colorado Springs

Recent advances have made lithium-metal viable for commercial production, though mathematical models of this chemistry have been slow to appear. This work introduces a closed-form impedance model for lithium-metal chemistry and points the way toward reduced complexity model forms amenable to battery management system (BMS) applications.

### 11:00 A Control-Oriented Reduced-Complexity Model for Lithium-Metal Batteries with Application to Advanced Battery Management

Scott Trimboli, PhD, Associate Professor, Electrical & Computer Engineering, University of Colorado, Colorado Springs

Advances in design have overcome many of the detractors (poor cycle-life and safety concerns) and LMB now show promise for commercial development. Like lithium-ion batteries (LIB), LMB require careful management to ensure good performance and safe operation. In this presentation, we will formulate a reduced-complexity single particle model (SPM) of LMB amenable to real-time battery management and advanced control.

### 11:20 SafeCore - An Internal Fuse to Help Prevent Thermal Runaway



Dan Squiller, CEO, Amionx

SafeCore is a material that is coated on the current collector that acts like a fuse to help prevent thermal runaway. It protects against overcharge and internal short, and can enable next-generation chemistries like lithium metal and nanosilicon.

### 11:40 MODERATED Q&A: Session Wrap-Up

Moderator: Gabrielle Vuylsteke, Research Engineer, Research & Advanced Engineering, Ford Motor Co.

#### Panelists:

Gregory L. Plett, PhD, Professor, Electrical & Computer Engineering, University of Colorado, Colorado Springs

Scott Trimboli, PhD, Associate Professor, Electrical & Computer Engineering, University of Colorado, Colorado Springs

Dan Squiller, CEO, Amionx

### 12:00 pm Networking Lunch



## FIRE SUPPRESSION & PREVENTING THERMAL RUNAWAY

### 1:00 Chairperson's Remarks

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

### 1:05 Fire Suppression Studies for Lithium-ion Battery Fires

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

In the past few years, the Electrochemical Safety Research Institute (ESRI) team has been working on characterizing the efficacy of fire suppressants on various sizes and chemistries of lithium-ion modules. The fire suppressants that have been used repeatedly for the studies are nitrogen gas, water, and a commercial aerosol-based fire suppressant. The time, duration, and direction of release of the suppressants, as well as reignition after suppressant use, have been studied.

### 1:25 Benchmarking and Predicting the Risks of Li-ion Cells Undergoing Thermal Runaway.

Donal P. Finegan, PhD, Staff Scientist Batteries, Electrified Transport, National Renewable Energy Laboratory

With new designs and chemistries, the performance of Li-ion batteries increases year after year. The risks associated with thermal runaway of cells change too and a challenge persists in determining whether increased performance comes at the expense of reduced safety. This work focuses on understanding correlations between heat generation and mass ejection during thermal runaway, the causes of outlier behaviors, and the predictability of risks using zero- or one-shot learning.

### 1:45 New Requirements and New Solutions for Multi-Functional Venting Units

Michael Harenbrock, PhD, Principal Expert, Engineering Electric Mobility, MANN+HUMMEL GmbH

Multi-functional venting units are essential components in holistic battery safety concepts, enabling pressure equalization between pack interior and environment in regular operation, as well as effective overpressure release during thermal runaway, even reducing the risk of battery fires. With an increasing variety in battery pack designs and cell chemistries, the functionality of venting units must be adapted accordingly. This presentation will show current trends and solutions in venting unit engineering.

### 2:05 MODERATED Q&A: Session Wrap-Up

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

#### Panelists:

Donal P. Finegan, PhD, Staff Scientist Batteries, Electrified Transport, National Renewable Energy Laboratory

Michael Harenbrock, PhD, Principal Expert, Engineering Electric Mobility, MANN+HUMMEL GmbH

### 2:20 Refreshment Break in the Exhibit Hall with Poster Viewing



# Battery Engineering for Automotive Applications

Building Better Batteries through Improvements in Battery Safety, Cell Engineering, and Battery Management Systems

(Sponsorship Opportunity Available)

## FAST-CHARGING

### 2:55 Chairperson's Remarks

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

### 3:00 Cell Structure Engineering for Extreme Fast-Charging of LFP-Based Lithium-ion Batteries

*Ryan Longchamps, PhD, Head Product Development, Engineering, EC Power LLC*

Lithium iron phosphate (LFP)-based lithium-ion batteries enable moderate range electric vehicles with safe batteries that approach mass-market acceptable price points. However, the challenge of reaching "refill" times comparable to user expectations (e.g., <10 min.) persists. This talk presents EC Power's thermally modulated cell structure, which permits extreme fast-charging of ~170 Wh/kg LFP-based lithium-ion cells with long cycle life at both room temperature and -50 degrees Celsius.

### 3:20 Regarding the Tandem Needs of Fast Charging and Extended Battery Life Predictions

*Kevin L. Gering, Distinguished Staff Scientist, Energy Storage Technologies, Idaho National Laboratory*

Fast-charging can readily lead to early cell failure and reduced performance. The ability to use cell parameters for the development of advanced charge protocols provides an opportunity to tailor both the time and energy accepted to specific needs while minimizing degradation. During this talk, advanced protocols and analysis, including the use of machine learning to identify failure modes and predict performance, will be discussed.

### 3:40 MODERATED Q&A: Session Wrap-Up

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

*Panelists:*

*Ryan Longchamps, PhD, Head Product Development, Engineering, EC Power LLC*  
*Kevin L. Gering, Distinguished Staff Scientist, Energy Storage Technologies, Idaho National Laboratory*

## SCALE-UP

### 4:15 Chairperson's Remarks

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

### 4:20 Challenges with Scaling-Up PPR Battery Designs from 18650 to 21700 Cells

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

NASA has 3 design approaches for achieving passively propagation-resistant battery designs with 18650 cells. The interstitial heat sink approach is most volumetrically efficient and achieves 459 Wh/L using 18650 cells 725 Wh/L. Scaling-up this design to 21700 designs that are >725 Wh/L presents challenges to demonstrate similar adjacent cell protection from conducted heat through the heat sink and from ejected heat diverted by blast plate barriers and channels.

### 4:40 Scaling-Up Laser-Ablation for Roll-to-Roll Structuring of Fast-Charging and Long-Life Electrodes

*Donal P. Finegan, PhD, Staff Scientist Batteries, Electrified Transport, National Renewable Energy Laboratory*

Controlling the microstructure of porous Li-ion electrodes can considerably improve their energy- and power-density. However, scale-up of cost-effective structuring techniques to high-throughput roll-to-roll production is challenging. In this work, we focus on the use of laser-ablation for high-throughput roll-to-roll production of structured electrodes, with enhanced fast-charging and long-life capability. This talk will cover the challenges, performance benefits, and economics associated with scaling to roll-to-roll production of laser-ablated structured electrodes.

## LIFETIME & SAFETY

### 5:00 How Temperature Affects Lifetime and Safety of Li-ion Batteries

*Max Feinauer, Research Associate, Center for Solar Energy and Research, ZSW*

Understanding the aging behavior of Li-ion batteries is critical to improving their lifetime, performance, safety, and sustainability. In particular, temperature is one of the most impacting factors influencing the cyclic aging behavior of Li-ion batteries. Furthermore, the subsequent aging and safety behavior can change drastically depending on the previous aging conditions. While safety-critical Li plating dominates cyclic aging at low temperatures, solid-electrolyte-interphase growth dominates the aging at high temperatures.

### 5:20 Towards the Industrialization of Next-Generation Batteries



*Yong Che, PhD, Co-founder and CTO, Top Management, Enpower Greentech Inc.*

Navigating the shift from lab tech to industrial production, known as the challenging "valley of death," demands precision and collaboration. Enpower Greentech Inc. (EGI) is a startup, leveraging regional strengths from the US, Japan, and China. EGI employs open innovation in R&D, bridging the gap between lab innovations and industrialization. The presentation focuses on lithium metal-based battery product industrialization and cell performances.

### 5:40 MODERATED Q&A: Session Wrap-Up

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

*Panelists:*

*Donal P. Finegan, PhD, Staff Scientist Batteries, Electrified Transport, National Renewable Energy Laboratory*

*Max Feinauer, Research Associate, Center for Solar Energy and Research, ZSW*

### 6:00 Networking Reception in the Exhibit Hall with Poster Viewing



### 7:00 Close of Day

## WEDNESDAY, DECEMBER 13

### 7:40 am Registration and Morning Coffee

### 7:45 Interactive Breakout Discussions

Roundtable discussions are informal, moderated discussions with brainstorming and interactive problem-solving, allowing participants from diverse backgrounds to exchange ideas and experiences and develop future collaborations around a focused topic.

#### TABLE 1: Innovations in Recycling Battery Materials

*Moderator: Steven E. Sloop, President, OnTo Technology LLC*

#### TABLE 2: Battery Pack System Cost and Safety – Will Future xEV Battery Packs Increase in Complexity or Simplify and How Will Cost and Safety Be Impacted?

*Moderator: Kevin Konecky, Battery and Energy Storage Systems Consultant, Total Battery Consulting*

#### TABLE 3: Production Supply and Sustainability of a North American Supply Chain

*Moderator: Rob Privette, Business Development Manager, North America, Umicore*

#### TABLE 4: Li-ion NMC Fast Charging New Cells for E-Mobility

*Moderator: Shmuel De-Leon, CEO, Shmuel De-Leon Energy, Ltd.*

#### TABLE 5: Inactive Materials: Developments in Current Collectors, Separators and Electrolytes

*Moderator: Sam Jaffe, Business Development, Addionics*

#### TABLE 6: Building the Domestic Battery Raw Material Supply Chain

*Moderator: Carl Thoenmes, Business Development, Battery Materials, Koura*

#### TABLE 7: Battery Cost vs. Passport, CO2 Footprint & Lifetime Warranty – What Does the Battery Regulation Legislation Bring?

*Moderator: Wenzel Prochazka, Senior Product Manager Electrification Systems, NXP Semiconductors Austria*

#### TABLE 8: High Percentage Silicon-Content Anodes and Cells

*Moderator: Benjamin Park, PhD, Founder & CTO, Enevat*

#### TABLE 9: Battery Management Systems

*Moderator: Sheldon Williamson, PhD, Professor & Canada Research Chair, Electrical & Computer & Software Engineering, University of Ontario Institute of Technology*

#### TABLE 10: Battery Intelligence





# Battery Engineering for Automotive Applications

Building Better Batteries through Improvements in Battery Safety, Cell Engineering, and Battery Management Systems

Moderator: *Eli Leland, PhD, CTO and Co-Founder, Voltaiq, Inc.*

## TABLE 11: Lithium Metal Batteries

Moderator: *Brian Sisk, PhD, CTO, Sepion Technologies*

## TABLE 12: Battery Safety & Thermal Runaway

Moderator: *Judith Jeevarajan, PhD, Vice President and Executive Director, Electrochemical Safety Research Institute, UL Research Institutes*

## TABLE 13: Silicon Anodes

Moderator: *Manuel Wieser, Head of Energy Business, AnteoTech*

## INCREASING BATTERY PERFORMANCE

### 8:25 Chairperson's Remarks

*Kevin Konecky, Battery and Energy Storage Systems Consultant, Total Battery Consulting*

### 8:30 How to Address Cost Pressures & Sustainability with ENNOVI™ Customized Battery Interconnect Solutions

*Gustavo Cibrian, Product Manager, Energy Interconnect Systems NA Region*

This presentation is about uncovering the key challenges faced by battery makers and EV makers, gaining an understanding of the latest trends and advancements in battery interconnect technology. Understanding the different cost-effective and eco-conscious solutions and how they are implemented in current and next-generation EV. Discovering the technologies behind these solutions and how they can be customized to your end application.

### 8:50 Battery Trends – What Does that Mean for Sustainable BMS Building Blocks?

*Wenzel Prochazka, Dr., Senior Product Manager Electrification Systems, Advanced Analog, NXP Semiconductors Austria GmbH*

The trend towards energy efficient and sustainable batteries continues, as electric vehicles are becoming a core product for global OEMs. Especially in the EU the battery directive a roadmap to becoming sustainable that not only drives technical innovation in battery design, but also sets a strong focus on sustainability data and secure product information handling for generating a stable value to the battery even on the used or secondary market.



### 9:10 Research Strategy for Batteries for the Department of Defense

*Joshua Lamb, PhD, Special Scientific Advisor, OUSD R&E/Emerging Technologies, Office of the Undersecretary of Defense*

The Department of Defense fields a wide variety of batteries with unique requirements and operating environments. While many of these can be met with commercially available battery technology, existing and emerging requirements call for new developments in science and technology (S&T). This talk will give an overview of the DoD Battery S&T Strategy and high-level needs across all domains.

### 9:30 Increasing Battery System Performance

*Kevin Konecky, Battery and Energy Storage Systems Consultant, Total Battery Consulting*

Battery systems are complex systems with the battery cell as the core technology of the system but then integrated with multiple subsystems, including mechanical, thermal, and battery management systems (BMS). This presentation will look into the different subsystems that contribute to the overall battery system performance and opportunities for improvement in next-generation battery systems. Battery system trends in the industry will be evaluated and discussed.

### 9:50 Utilizing Chip-on-Cell Sensing for Better Battery Management

*Carlton Brown, Vice President Global Customer Programs, Dukosi*

By applying chip-on-cell battery monitoring solution with near field communication, enable cell-to-pack architectures without increasing pack size for line-of-sight communication, and without sense lead wire harnesses and connectors. Measure with the highest accuracy and data granularity, do so while inherently electrically isolated, synchronize measurements of all cells, and utilize on-cell provenance and usage history data storage to aid in compliance with emerging tracking and tracing regulation. Improve warranty analysis and re-use.



### 10:10 MODERATED Q&A: Session Wrap-Up

Moderator: *Kevin Konecky, Battery and Energy Storage Systems Consultant, Total Battery Consulting*

Panelists:

*Carlton Brown, Vice President Global Customer Programs, Dukosi*  
*Joshua Lamb, PhD, Special Scientific Advisor, OUSD R&E/Emerging Technologies, Office of the Undersecretary of Defense*  
*Wenzel Prochazka, Dr., Senior Product Manager Electrification Systems, Advanced Analog, NXP Semiconductors Austria GmbH*

**10:25 Coffee Break in the Exhibit Hall with Poster Viewing** (Sponsorship Opportunity Available)

## PLENARY KEYNOTE

### 10:55 Chairperson's Remarks

*Craig Wohlers, Executive Director, Conferences, Cambridge EnerTech*



### 11:00 LG Leading the Battery Expansion in North America

*Robert Lee, President, North American & Chief Strategy Officer, LG Energy Solution*

LG Energy Solution is the leading lithium-ion battery manufacturer, working with the top OEMs globally in transforming the automobile industry. The market for EVs is expanding rapidly, driven by both consumer demand and regulatory incentives. In North America, there are unprecedented levels of investment to support EVs, by both OEMs and battery manufacturers. This presentation will discuss market growth projections, announced expansion plans, and the challenges ahead.



### 11:20 A Sustainability Perspective on Near-Future Energy Storage Technologies

*Ulderico Ulissi, PhD, Manager, 21C Lab, Contemporary Amperex Technology Limited (CATL)*

In this presentation we will discuss sustainability and how it is linked to product development, to critically discuss the realistic opportunities to make batteries more sustainable in the near future. This will provide the audience more insights into the CATL carbon neutrality plan, and into its pledge to achieve carbon neutrality in its core operations by 2025 and across the battery value chain by 2035.



### 11:40 USABC Battery Development Program Overview

*Matt Denlinger, Battery Research Engineer, Energy Storage Research, Ford Motor Company*

The United States Advanced Battery Consortium (USABC) is a subsidiary of USCAR. The organization supports advanced battery technology development and commercialization for electric vehicles via funding through a cooperative agreement with the Department of Energy. This talk will give an overview of current and past USABC programs, as well as future funding opportunities for US battery developers.

### 12:00 pm MODERATED Q&A: Session Wrap-Up



Moderator: *Craig Wohlers, Executive Director, Conferences, Cambridge EnerTech*

Panelists:

*Robert Lee, President, North American & Chief Strategy Officer, LG Energy Solution*

*Ulderico Ulissi, PhD, Manager, 21C Lab, Contemporary Amperex Technology Limited (CATL)*

*John Kwon, General Counsel of Global Legal & Strategy, Contemporary Amperex Technology Limited (CATL)*

*Matt Denlinger, Battery Research Engineer, Energy Storage Research, Ford Motor Company*

**12:15 Networking Lunch** (Sponsorship Opportunity Available)



**1:15 Dessert Break in the Exhibit Hall with Poster Viewing** (Sponsorship Opportunity Available)

**2:00 Close of Symposium**



# EV Technology for Heavy-Duty Applications

## Commercializing Advanced High-Energy Batteries and Infrastructure for HEVs

### MONDAY, DECEMBER 11

#### 7:00 am Registration Open until 4:30 PM

Peak Registration Hours are Monday 7:00 - 8:30 am & Tuesday 7:30 - 8:30 am.  
Avoid lines come pick up your badge on Sunday or Monday after 9:00 am.

### TUESDAY, DECEMBER 12

#### 7:30 am Registration and Morning Coffee

#### 8:30 Organizer's Welcome Remarks

*Craig Wohlers, Executive Director, Conferences, Cambridge EnerTech*

### HEAVY-DUTY MARKET EXPANSION

#### 8:35 Chairperson's Remarks

*Joshua Goldman, Vice President of Mobility, Xendee*

#### 8:40 Leading California Initiatives for the Heavy-Duty Vehicle Transition to Zero-Emissions

*Leslie Goodbody, Engineer, California Air Resources Board*

California now has regulations in place to transition transit and shuttle buses and on-road trucks to zero-emission. What's next? What are we learning and what more can we learn as these policies are implemented in real-time? This talk will include policy and regulatory drivers, incentive programs available to support the zero-emission transition, and the important role of government agencies, utilities, and private stakeholders in ensuring successful vehicle deployments.

#### 9:00 Market Trends across the Heavy-Duty E-Mobility Segment in 2023

*Kevin Beaty, President, YUNEV LLC*

*Shruti Sahu, Project Manager, YUNEV*

MHD commercial vehicle e-mobility fleet demand will be reviewed for 2023 – including vehicle deployments and multi-year orders. ZEV technology trends will be discussed (BEV, H2 FCEV, LCF RE EVs, etc.). Trendsetting OEM strategies and partnerships will be highlighted, along with key developments in MHD EV charging and H2 refueling infrastructure. Commercial vehicle OEM battery supply chain trends, challenges, and opportunities will also be discussed along with key policy developments.

### HEAVY-DUTY FLEET CHARGING

#### 9:20 Navigating the EV Commercial Fleet Transition: Powering Infrastructure Where It's Needed

*Julie Johnson, Vice President, Zeem Solutions*

Embark on a dynamic exploration of the emerging EV transition sector, revealing its precision in delivering power where infrastructure is demanded. Delve into the complexities of where, what, and when, discovering the daily unfolding 'hows' that form the building blocks of a scalable future. Uptime, security, and health take center stage in this transformative journey, shaping the path toward a sustainable and resilient commercial fleet transition.

#### 9:40 MODERATED Q&A: Session Wrap-Up

*Moderator: Joshua Goldman, Vice President of Mobility, Xendee*

*Panelists:*

*Leslie Goodbody, Engineer, California Air Resources Board*

*Kevin Beaty, President, YUNEV LLC*

*Julie Johnson, Vice President, Zeem Solutions*

#### 10:00 Grand Opening Coffee Break in the Exhibit Hall with Poster Viewing



#### 10:40 Charging for Heavy-Duty Vehicles and Fleets

*Shazan Siddiqi, Senior Technology Analyst, IDTechEx*

Early electric trucks have relied on charging infrastructure designed for light-duty vehicles, but more powerful standards like MCS are ready for commercialisation offering DC fast-charging up to 3.75 megawatts. Wired stationary charging is the dominant technology, but alternatives like wireless charging and battery swapping can further reduce downtimes. This presentation will cover the current and future market landscape for electric fleet charging technology.

#### 11:00 Future-Proofing Your EV Charging Station Infrastructure

*Anthony De Vito, Director, Zero-Emission Vehicles, Core States Energy*

Core States Energy will overview our field-proven design-build checklist of best practices to help navigate the way toward cleaner solutions. We will explore the implications of converting fleets and outline critical real estate impacts, cost considerations, and map out best practices to steer a clear path toward a successful fleet transition.

#### 11:20 Advancing Lithium-ion Batteries for Sustainable Heavy-Duty Applications



*Maher El-Kady, Dr., Chief Technology Officer and Co-Founder, Executive, Nanotech Energy*

The electrification of heavy-duty vehicles is driving the need for advanced battery technologies that can meet the demands of high-power output, extended range, and durability. In this technical talk, we present our revolutionary battery technology that redefines the fundamental elements of lithium-ion batteries, including electrodes, electrolyte, and separators. Join us as we unveil the future of battery technology for heavy-duty applications and pave the way for a greener transportation landscape.

#### 11:40 MODERATED Q&A: Session Wrap-Up

*Moderator: Joshua Goldman, Vice President of Mobility, Xendee*

*Panelists:*

*Shazan Siddiqi, Senior Technology Analyst, IDTechEx*

*Anthony De Vito, Director, Zero-Emission Vehicles, Core States Energy*

*Maher El-Kady, Dr., Chief Technology Officer and Co-Founder, Executive, Nanotech Energy*

#### 12:00 pm Networking Lunch



### INNOVATIONS IN HEAVY-DUTY APPLICATIONS

#### 1:00 Chairperson's Remarks

*Kevin Beaty, President, YUNEV LLC*

#### 1:05 Daimler Truck Battery Cell Technology

*Rianne Schoeffler, Electrochemist & Battery Product Developer, Daimler Truck North America*

Battery Electric Trucks are an important part of Daimler Trucks strategy to reduce GHG emissions. Daimler Truck 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 unique challenges for the electrification of heavy duty vehicles with a special focus on the need for a truckified cell.

#### 1:25 Battery Technologies for Heavy-Duty Trucks Using Electrified Roadways

*Roger Gerson, Director, Engineering & Battery Line Architect, Battery Systems, Accelera by Cummins*

Battery performance requirements for heavy-duty trucks are primarily derived from the category of use of the truck, and the work demand of the daily mission in the context of the charging environment. Here, we provide a hypothesis on battery technologies for heavy-duty trucks operating in an environment of ubiquitous megawatt charging in USA.

#### 1:45 Extreme Fast-Charge Batteries for Heavy Duty Applications

*Brian Barnett, PhD, CTO, Nyobolt*

For many heavy-duty applications, batteries must deliver very high-power discharge capability and a very large number of charge-discharge cycles. The IDEAL battery would provide these attributes and would also be capable of incredibly fast charge with minimal heat release, allowing almost constant up-time. Nyobolt is commercializing battery technology with the capability of fully charging in 5-10 minutes or less, with outstanding cycle life, for mining and material handling/robotic applications.

#### 2:05 MODERATED Q&A: Session Wrap-Up

*Moderator: Kevin Beaty, President, YUNEV LLC*

*Panelists:*

*Rianne Schoeffler, Electrochemist & Battery Product Developer, Daimler Truck North America*

*Roger Gerson, Director, Engineering & Battery Line Architect, Battery Systems, Accelera by Cummins*

*Brian Barnett, PhD, CTO, Nyobolt*

#### 2:20 Refreshment Break in the Exhibit Hall with Poster Viewing

*(Sponsorship Opportunity Available)*



# EV Technology for Heavy-Duty Applications

## Commercializing Advanced High-Energy Batteries and Infrastructure for HEVs

### 3:00 60 Seconds Fast-Charging in High-Utilization Applications: Skeleton Superbattery

*Sebastian Pohlmann, PhD, Vice President, Automotive, Skeleton Technologies GmbH*

Applications such as intralogistics, mining, or forestry vehicles are difficult to electrify due to their long operation time of up to 7000h/year. These applications require fast-charging batteries with long-cycle lifetime. Skeleton Technologies' Superbattery technology can be charged in 60 seconds, and presents a lifetime of 50,000 cycles. This presentation presents the Superbattery technology and covers real-life use cases in which fast charging is required.

### 3:20 Designing for Equity and Reliability

*Steven Marsh, Senior Engineering and Technology Director, Forum Mobility*

While we recognize that electric vehicle charging for heavy-duty fleets is not as easy as filling a tank, Forum Mobility has designed its charging depots to provide access and reliability, guided by the needs of its users: fleet operators and heavy-duty truck drivers. Here, we present the engineering and technology choices that support this.

### 3:40 Essential Low-Voltage Battery Systems As Key Enablers in Electrifying Commercial Vehicles

*Wei Song, Senior Director - Global Core Products Strategy, Clarios*

The future of commercial vehicles is being shaped by electrification and digitalization, bringing in a new set of requirements and applications in battery technology. This shift necessitates a seamless integration of both high and low-voltage energy storage systems to meet the evolving demands of commercial vehicles. Explore the vital role of essential low-voltage battery systems as key enablers in electrifying commercial vehicles.

### 4:00 MODERATED Q&A: Session Wrap-Up

*Moderator: Kevin Beaty, President, YUNEV LLC*

*Panelists:*

*Sebastian Pohlmann, PhD, Vice President, Automotive, Skeleton Technologies GmbH*

*Steven Marsh, Senior Engineering and Technology Director, Forum Mobility*

*Wei Song, Senior Director - Global Core Products Strategy, Clarios*

### 4:20 Low-Voltage Batteries and Safety Power Net for Electric Trucks

*Nicolas Jaeckel, PhD, Senior Battery Expert, eCubator, Knorr Bremse/Bendix*

Heavy-duty applications are highly utilized, resulting in advanced requirements in lifetime and power for the low-voltage energy storage and the power distribution. This talk displays the challenges and proposed solutions for future low-voltage systems. The focus is on safety-critical subsystems, which need a redundant power supply.

### 4:40 Expanding the Capabilities of Electric Powertrains through Advanced Power Electronics

*Mo Farrokhi, PhD, Vice President of Marketing, Exro*

Introducing a revolutionary advancement in power electronics—the Exro Coil Driver. This innovative solution combines the functionalities of a traction inverter and an onboard charger, simplifying powertrain design while reducing overall costs. It enables integrated AC fast-charging capabilities, significantly reducing CAPEX and OPEX requirements for building and operating fleet charging depots. It also improves the performance and efficiency of the drive unit, all through innovations in power electronics.

### 5:00 Designing Solar and Battery DERs to Future-Proof Your EV Charging Stations

*Joshua Goldman, Vice President of Mobility, Xendee*

Microgrids and Distributed Energy Resources (DERs) such as solar and grid batteries have become a valuable element in the future of high-power EV charging. By using Xendee's techno-economic analysis software, Mr. Goldman will show how fleets can use DERs to ensure their plans will meet their future needs to reduce their carbon footprint, increase uptime, and accelerate permitting and grid interconnection, while reducing operating costs and increasing resiliency.

### 5:20 MODERATED Q&A: Session Wrap-Up

*Moderator: Kevin Beaty, President, YUNEV LLC*

*Panelists:*

*Nicolas Jaeckel, PhD, Senior Battery Expert, eCubator, Knorr Bremse/Bendix*

*Mo Farrokhi, PhD, Vice President of Marketing, Exro*

*Joshua Goldman, Vice President of Mobility, Xendee*

### 6:00 Networking Reception in the Exhibit Hall with Poster Viewing

### 7:00 Close of Day

## WEDNESDAY, DECEMBER 13

### 7:40 am Registration and Morning Coffee

### 7:45 Interactive Breakout Discussions

Roundtable discussions are informal, moderated discussions with brainstorming and interactive problem-solving, allowing participants from diverse backgrounds to exchange ideas and experiences and develop future collaborations around a focused topic.

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*Moderator: Steven E. Sloop, President, OnTo Technology LLC*

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#### TABLE 3: Production Supply and Sustainability of a North American Supply Chain

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#### TABLE 4: Li-ion NMC Fast Charging New Cells for E-Mobility

*Moderator: Shmuel De-Leon, CEO, Shmuel De-Leon Energy, Ltd.*

#### TABLE 5: Inactive Materials: Developments in Current Collectors, Separators and Electrolytes

*Moderator: Sam Jaffe, Business Development, Addionics*

#### TABLE 6: Building the Domestic Battery Raw Material Supply Chain

*Moderator: Carl Thoemmes, Business Development, Battery Materials, Koura*

#### TABLE 7: Battery Cost vs. Passport, CO2 Footprint & Lifetime Warranty – What Does the Battery Regulation Legislation Bring?

*Moderator: Wenzel Prochazka, Senior Product Manager Electrification Systems, NXP Semiconductors Austria*

#### TABLE 8: High Percentage Silicon-Content Anodes and Cells

*Moderator: Benjamin Park, PhD, Founder & CTO, Enevate*

#### TABLE 9: Battery Management Systems

*Moderator: Sheldon Williamson, PhD, Professor & Canada Research Chair, Electrical & Computer & Software Engineering, University of Ontario Institute of Technology*

#### TABLE 10: Battery Intelligence

*Moderator: Eli Leland, PhD, CTO and Co-Founder, Voltaiq, Inc.*

#### TABLE 11: Lithium Metal Batteries

*Moderator: Brian Sisk, PhD, CTO, Sepion Technologies*

#### TABLE 12: Battery Safety & Thermal Runaway

*Moderator: Judith Jeevarajan, PhD, Vice President and Executive Director, Electrochemical Safety Research Institute, UL Research Institutes*

#### TABLE 13: Silicon Anodes

*Moderator: Manuel Wieser, Head of Energy Business, AnteoTech*

## INNOVATIONS IN HEAVY-DUTY APPLICATIONS

### 8:45 Chairperson's Remarks

*Steven Marsh, Senior Engineering and Technology Director, Forum Mobility*

### 8:50 Next Generation Solid-state Battery: Superior Performance, Cost and Resources

*Dmitry Belov, PhD, Chief Scientist, ProLogium Technology*



### 9:10 Open Access Performance Evaluation and Health Monitoring of Second-Life Hybrid-Bus Batteries before Recycling

*Chintan Pathak, PhD, Co-Founder & CPO, BattGenie*

Understanding the state-of-health (SOH) of the batteries is critical to enable second-life use. We have built a BESS consisting of second-life batteries from used LFP batteries that is currently deployed at the charging station at the Everett Transit Center. Learnings from the data collected from a real-world deployment of a BESS consisting of second-life batteries will be presented.

## TECHNICAL TALENT ACQUISITION

### 9:30 Navigating the Battery Talent Market

*Matt Anders, Divisional Manager, Energy & Battery Storage, Piper Maddox*

*Conor McStay, Division Manager, E-Mobility, Piper Maddox*

The electric vehicle and battery industry continues to grow at a blistering pace as the world pushes closer to an electrified world. However, with all that growth comes challenges—a major one being the supply of talent with the skillset needed





# EV Technology for Heavy-Duty Applications

## Commercializing Advanced High-Energy Batteries and Infrastructure for HEVs

to get the job done. Understanding the market landscape, the trends, and what people are looking for is crucial to staying ahead of the curve.

### 9:50 Talk Title to be Announced

*Kenan Sahin, PhD, President & Founder, CAMX Power*



### 10:10 MODERATED Q&A: Session Wrap-Up

*Moderator: Steven Marsh, Senior Engineering and Technology Director, Forum Mobility*

*Panelists:*

*Chintan Pathak, PhD, Co-Founder & CPO, BattGenie*

*Matt Anders, Divisional Manager, Energy & Battery Storage, Piper Maddox*

*Conor McStay, Division Manager, E-Mobility, Piper Maddox*

*Kenan Sahin, PhD, President & Founder, CAMX Power*

**10:25 Coffee Break in the Exhibit Hall with Poster Viewing** *(Sponsorship Opportunity Available)*

## PLENARY KEYNOTE

### 10:55 Chairperson's Remarks

*Craig Wohlers, Executive Director, Conferences, Cambridge EnerTech*



### 11:00 LG Leading the Battery Expansion in North America

*Robert Lee, President, North American & Chief Strategy Officer, LG Energy Solution*

LG Energy Solution is the leading lithium-ion battery manufacturer, working with the top OEMs globally in transforming the automobile industry. The market for EVs is expanding rapidly, driven by both consumer demand and regulatory incentives. In North America, there are unprecedented levels of investment to support EVs, by both OEMs and battery manufacturers. This presentation will discuss market growth projections, announced expansion plans, and the challenges ahead.



### 11:20 A Sustainability Perspective on Near-Future Energy Storage Technologies

*Ulderico Ulissi, PhD, Manager, 21C Lab, Contemporary Amperex Technology Limited (CATL)*

In this presentation we will discuss sustainability and how it is linked to product development, to critically discuss the realistic opportunities to make batteries more sustainable in the near future.

This will provide the audience more insights into the CATL carbon neutrality plan, and into its pledge to achieve carbon neutrality in its core operations by 2025 and across the battery value chain by 2035.



### 11:40 USABC Battery Development Program Overview *Matt Denlinger, Battery Research Engineer, Energy Storage Research, Ford Motor Company*

The United States Advanced Battery Consortium (USABC) is a subsidiary of USCAR. The organization supports advanced battery technology development and commercialization for electric vehicles via funding through a cooperative agreement with the Department of Energy. This talk will give an overview of current and past USABC programs, as well as future funding opportunities for US battery developers.

### 12:00 pm MODERATED Q&A: Session Wrap-Up



*Moderator: Craig Wohlers, Executive Director, Conferences, Cambridge EnerTech*

*Panelists:*

*Robert Lee, President, North American & Chief Strategy Officer, LG Energy Solution*

*Ulderico Ulissi, PhD, Manager, 21C Lab, Contemporary Amperex Technology Limited (CATL)*

*John Kwon, General Counsel of Global Legal & Strategy, Contemporary Amperex Technology Limited (CATL)*

*Matt Denlinger, Battery Research Engineer, Energy Storage Research, Ford Motor Company*

**12:15 Networking Lunch** *(Sponsorship Opportunity Available)*



**1:15 Dessert Break in the Exhibit Hall with Poster Viewing** *(Sponsorship Opportunity Available)*

**2:00 Close of Symposium**

## Present a Poster SAVE \$50!

AABC encourages attendees to gain further exposure by presenting their work in the poster sessions. To secure an onsite poster board, your full submission must be received, and your registration paid in full by November 10, 2023.

Register and indicate that you would like to present a poster. Once your registration has been fully processed, we will send an email with a unique link and instructions for submitting your abstract and other materials. Please see [website](#) for more information.

### Reasons you should present your research poster at this conference:

- Your research will be seen by leaders from top commercial, academic and government institutes
- Discuss your research and collaborate with interested attendees and speakers
- Your poster presentation will be published in our conference materials
- Receive a \$50 discount off your Commercial or Academic/Government registration



# High-Performance Battery Manufacturing

## Global Production of Safe, Efficient, Higher Energy Density Batteries

### MONDAY, DECEMBER 11

#### 7:00 am Registration Open until 4:30 PM

Peak Registration Hours are Monday 7:00 - 8:30 am & Tuesday 7:30 - 8:30 am.  
Avoid lines come pick up your badge on Sunday or Monday after 9:00 am.

### TUESDAY, DECEMBER 12

#### 7:30 am Registration and Morning Coffee

#### 8:30 Organizer's Welcome Remarks

Craig Wohlers, Executive Director, Conferences, Cambridge EnerTech

## GLOBAL MARKET OPPORTUNITIES IN BATTERY MANUFACTURING

#### 8:35 Chairperson's Remarks

James Wilcox, PhD, Vice President, Enovix Mobility

#### 8:40 Fireside Chat: Developments in the Lithium-ion Battery Industry from the Lithium Chemicals' Perspective

Brian Barnett, PhD, President, Battery Perspectives

Ashish Patki, Director, Business Development and Market Intelligence, Livent

Since the onset of the pandemic, various demand-drivers for lithium-ion batteries have shown peculiar trends. To look forward, the lithium-ion battery supply chain should look back at these trends, particularly the breadth of applications on the one hand, and the variables impacting supply of lithium chemicals on the other hand.

#### 9:20 Sodium-ion Batteries—Market Liftoff Potentials and Manufacturing Integration

Ilias Belharouak, PhD, Section Head, Electrification and Energy Infrastructure Division, Oak Ridge National Laboratory

SolidPAC toolkit is flexible, enabling the battery community to quantify the effects of materials' chemistry and fractions, electrode thicknesses and loadings, and electron flows on cell energy density and costs; and to use reverse-engineering concepts to correlate the cell energy density output of solid-state batteries to materials and cell design inputs.

#### 9:40 MODERATED Q&A: Session Wrap-Up

Moderator: James Wilcox, PhD, Vice President, Enovix Mobility

Panelists:

Ilias Belharouak, PhD, Section Head, Electrification and Energy Infrastructure Division, Oak Ridge National Laboratory

#### 10:00 Grand Opening Coffee Break in the Exhibit Hall with Poster Viewing



## SUPPLY CHAIN SUSTAINABILITY

#### 10:40 Earth-Abundant Cathode Active Materials: Research and Development Efforts at Argonne National Laboratory

Jason Croy, PhD, Group Leader, Materials Research Group, Electrochemical Energy Storage, Argonne National Lab

This presentation will explore research and development efforts at Argonne National Laboratory focused on enabling new designs in high-Mn, low-Ni, Co-free cathodes towards diversifying the portfolio of viable materials for commercial applications.

#### 11:00 Sustainable Cathode Production for Our Terawatt-Hour Future

Yuan Gao, Independent Board Director, Nano One

The industry has come to the point that certain processing technologies that were developed when Li-ion batteries were mainly used for small portable electronics must be updated/replaced. At this conference, I will illustrate that 1) more efficient technologies are imperative as the industry moves forward; 2) solutions to this problem have been developed; and 3) adapting these more efficient technologies will result in both improved sustainability and cost savings.

#### 11:20 Light Weighting and Thermal Management Solutions Well Suited for Electric Vehicle Battery Pack

Soma Bobba, Global Technical Manager, Automotive, Mobility, SABIC Specialties

Light-weighting efforts are critical in extending the drive range of electric vehicles (EVs). Thermoplastic materials can offer light weighting, part integration and design freedom to help to meet critical material requirements. An exercise is carried out to study the feasibility of thermoplastic materials for different components within the battery pack.

#### 11:40 MODERATED Q&A: Session Wrap-Up

Moderator: James Wilcox, PhD, Vice President, Enovix Mobility

Panelists:

Jason Croy, PhD, Group Leader, Materials Research Group, Electrochemical Energy Storage, Argonne National Lab

Yuan Gao, Independent Board Director, Nano One

Soma Bobba, Global Technical Manager, Automotive, Mobility, SABIC Specialties

#### 12:00 pm Networking Lunch



## ADVANCES IN CELL MANUFACTURING

#### 1:00 Chairperson's Remarks

Jason Croy, PhD, Group Leader, Materials Research Group, Electrochemical Energy Storage, Argonne National Lab

#### 1:05 Early Battery Cell-Quality Determination during the Formation Process Using EIS-Measurement Technology

Tobias Robben, Research Associate, Chair of Production Engineering of E-Mobility Components (PEM), RWTH Aachen University

The battery cell finishing process chain is a highly time- and cost-intensive process in battery manufacturing. With the integration of battery-quality determination into the formation process, the process chain is streamlined. This presentation will show the potential of online EIS (Electrochemical Impedance Spectroscopy) in the formation process and how the quality of the battery cell can be monitored during formation.

#### 1:25 Future Manufacturing Approaches Including Advances in Pre-Lithiation

Kyle Gordon, Senior Project Manager, Advanced Technology Center, Automotive & Industrials, Roland Berger

Outlook on achieving manufacturing targets with on-demand supply balance for Li, Ni, Co, Mn, and graphite; alternative feedstock and processing routes; comparing costs and CO2 emission; strategies to secure critical raw materials adopted by major players; framework for holistic evaluation of manufacturing strategies.

#### 1:45 Speeding Up Battery Research and Quality Assurance

Hermisno Villarraga-Gomez, PhD, X-ray Quality Solutions Manager, Industrial Quality Solutions, ZEISS Industrial Metrology

This presentation introduces multi-scale correlative inspection workflows for developing a better understanding of battery systems, increasing R&D cost-effectiveness, speeding up product development times, and simplifying quality control.

#### 2:05 MODERATED Q&A: Session Wrap-Up

Moderator: Jason Croy, PhD, Group Leader, Materials Research Group, Electrochemical Energy Storage, Argonne National Lab

Panelists:

Tobias Robben, Research Associate, Chair of Production Engineering of E-Mobility Components (PEM), RWTH Aachen University

Kyle Gordon, Senior Project Manager, Advanced Technology Center, Automotive & Industrials, Roland Berger

Hermisno Villarraga-Gomez, PhD, X-ray Quality Solutions Manager, Industrial Quality Solutions, ZEISS Industrial Metrology

#### 2:20 Refreshment Break in the Exhibit Hall with Poster Viewing

(Sponsorship Opportunity Available)



# High-Performance Battery Manufacturing

## Global Production of Safe, Efficient, Higher Energy Density Batteries

### 3:00 Scaling-Up Smart: What the Battery Industry Can Learn from the Semiconductor Story

*Tal Sholkapper, PhD, CEO & Co-Founder, Executive, Voltaiq, Inc.*

With rising consumer demand and massive regulatory tailwinds, the battery industry must increase production several-fold before the end of the decade. The factories have been announced, many have broken ground, and some are even approaching early production, but industry incumbents and new entrants alike are finding that scaling-up quickly is much harder than they expected. With rapidly evolving supply chains, a relatively immature ecosystem of equipment providers, and literally thousands of recipe and production parameters to optimize, it's no wonder that the average gigafactory takes 4-5 years to reach profitable levels of yield and throughput. The semiconductor industry navigated a similar exponential growth in scale a few decades ago, and they did it through intelligent, focused investments in production metrology and analytics. In this talk, we'll review relevant parallels between semiconductor and battery production, and how smart battery companies can beat their competitors to massive scale.

### 3:20 Enovix Cell Architecture Enables Multiple Advantages for EV OEMs

*James Wilcox, Vice President, Enovix Mobility*

Our goal is to create a Li-ion battery that can exceed the performance demands of the technologies of the future, from consumer electronics to EVs. Founded in 2007 with locations in Fremont, California; Penang, Malaysia; and Hyderabad, India, we've taken a different approach to building a next generation cell and completely redesigned the mechanical structure of the battery, unlocking multiple advantages. Instead of stacking large sheets of electrodes like traditional batteries, we stack smaller electrodes orthogonally aligned to the small face of the battery cell. This electrode arrangement enables the use of an internal cell constraint system to manage the unique mechanical challenges posed by materials such as silicon that undergo large volume changes during operation. The unique cell design also enables fast charge, high cycle life, long calendar life and reduced internal temperature gradients improving performance at both the cell and system level. We're currently scaling commercial production for the consumer electronics industry and are actively working with industry-leading EV OEMs. Dr. Wilcox will detail Enovix cell advantages and provide an update on the company's progress.

### 3:40 Using a Polymer Matrix To Unlock the Full Potential of Silicon in Li-Ion and Solid Electrolyte Batteries

*Paul Jones, VP Corporate Strategy, Paraclete Energy, Inc.*

Paul Jones, VP Corporate Strategy for Paraclete Energy, Inc, will demonstrate how a polymer matrix can cost-effectively leverage the high capacity of silicon to build cycle-stable Li-ion and solid-electrolyte batteries while providing a revolutionary range for electric vehicles.

### 4:00 MODERATED Q&A: Session Wrap-Up

*Moderator: Jason Croy, PhD, Group Leader, Materials Research Group, Electrochemical Energy Storage, Argonne National Lab*

*Panelists:*

*Tal Sholkapper, PhD, CEO & Co-Founder, Executive, Voltaiq, Inc.*

*James Wilcox, Vice President, Enovix Mobility*

*Paul Jones, VP Corporate Strategy, Paraclete Energy, Inc.*

### 4:20 Battery Lifecycle Management and AI for Decision Support

*Ashu Suvarna, New Business Incubation & Innovation Lead, Solutions Innovation, Hitachi Metals America LLC*

### 4:40 Novel, Dry Manufacturing Process for Low-Cost, Low-Carbon, High Energy Density, Mixed-Metal Oxide Cathode Active Materials

*Virginia Irwin Klausmeier, President & CEO, Sylvatex*

The cathode is the battery's most costly and carbon-intensive part; thus, it creates a critical supply-chain bottleneck in realizing the decarbonization impact we desire. A lower-cost, more sustainably manufactured EV is achievable in the near term by employing a future-proofed next-generation cathode manufacturing process.

### VOLTAIQ

### 5:00 Achieving Industrial Manufacturing of 100% Silicon Anodes, and Integration into Ultra-Fast Charging Multi-Ah Cells

*Robert Anstey, CEO and Founder, GDI*

GDI, in partnership with AGC, has demonstrated industrial manufacturing of advanced 100% silicon anodes. These 100% silicon anodes can be directly integrated into multiple existing cell designs without the need for prelithiation or compression. This enables existing cell companies to produce Li-ion cells with 100% silicon that will increase energy density by over 30%, enable hundreds of cycles of 15-min charging, and accelerate mass adoption of E-mobility.

### 5:20 Preventing Quality Escapes In-line during Battery Manufacturing with ML and Ultrasound

*Austin Dulaney, Head of Machine Learning and Data Science, Engineering, Liminal Insights Inc.*

In this talk, we highlight the need for inspection methods in battery cell manufacturing that deliver comprehensive information for 100% of cells produced to assess the true distribution of batch quality and to prevent quality escapes. We share how cell manufacturers and EV OEMs can implement Liminal's high-throughput primary inspection systems in-line to distinguish between good and bad cells, and high-resolution secondary inspection systems to diagnose defects in bad cells.

liminal

### 5:40 MODERATED Q&A: Session Wrap-Up

*Moderator: Jason Croy, PhD, Group Leader, Materials Research Group, Electrochemical Energy Storage, Argonne National Lab*

*Panelists:*

*Ashu Suvarna, New Business Incubation & Innovation Lead, Solutions Innovation, Hitachi Metals America LLC*

*Virginia Irwin Klausmeier, President & CEO, Sylvatex*

*Robert Anstey, CEO and Founder, GDI*

*Austin Dulaney, Head of Machine Learning and Data Science, Engineering, Liminal Insights Inc.*

### 6:00 Networking Reception in the Exhibit Hall with Poster Viewing

### 7:00 Close of Day

WEDNESDAY, DECEMBER 13

### 7:40 am Registration and Morning Coffee

### 7:45 Interactive Breakout Discussions

Roundtable discussions are informal, moderated discussions with brainstorming and interactive problem-solving, allowing participants from diverse backgrounds to exchange ideas and experiences and develop future collaborations around a focused topic.

#### TABLE 1: Innovations in Recycling Battery Materials

*Moderator: Steven E. Sloop, President, OnTo Technology LLC*

#### TABLE 2: Battery Pack System Cost and Safety – Will Future xEV Battery Packs Increase in Complexity or Simplify and How Will Cost and Safety Be Impacted?

*Moderator: Kevin Konecky, Battery and Energy Storage Systems Consultant, Total Battery Consulting*

#### TABLE 3: Production Supply and Sustainability of a North American Supply Chain

*Moderator: Rob Privette, Business Development Manager, North America, Umicore*

#### TABLE 4: Li-ion NMC Fast Charging New Cells for E-Mobility

*Moderator: Shmuel De-Leon, CEO, Shmuel De-Leon Energy, Ltd.*

#### TABLE 5: Inactive Materials: Developments in Current Collectors, Separators and Electrolytes

*Moderator: Sam Jaffe, Business Development, Addionics*

#### TABLE 6: Building the Domestic Battery Raw Material Supply Chain

*Moderator: Carl Thoemmes, Business Development, Battery Materials, Koura*

#### TABLE 7: Battery Cost vs. Passport, CO2 Footprint & Lifetime Warranty – What Does the Battery Regulation Legislation Bring?

*Moderator: Wenzel Prochazka, Senior Product Manager Electrification Systems, NXP Semiconductors Austria*



# High-Performance Battery Manufacturing

Global Production of Safe, Efficient, Higher Energy Density Batteries

## TABLE 8: High Percentage Silicon-Content Anodes and Cells

Moderator: Benjamin Park, PhD, Founder & CTO, Enevate

## TABLE 9: Battery Management Systems

Moderator: Sheldon Williamson, PhD, Professor & Canada Research Chair, Electrical & Computer & Software Engineering, University of Ontario Institute of Technology

## TABLE 10: Battery Intelligence

Moderator: Eli Leland, PhD, CTO and Co-Founder, Voltaiq, Inc.

## TABLE 11: Lithium Metal Batteries

Moderator: Brian Sisk, PhD, CTO, Sepion Technologies

## TABLE 12: Battery Safety & Thermal Runaway

Moderator: Judith Jeevarajan, PhD, Vice President and Executive Director, Electrochemical Safety Research Institute, UL Research Institutes

## TABLE 13: Silicon Anodes

Moderator: Manuel Wieser, Head of Energy Business, AnteoTech

## ADVANCES IN CELL MANUFACTURING

### 9:05 Chairperson's Remarks

Yuan Gao, Independent Board Director, Nano One

### 9:10 Choosing a Battery Manufacturing Partner: A Look at Battery Manufacturing Best Practices and Pitfalls

Troy Hayes, PhD, PE, Practice Director, Director of Asia Offices and Principal Engineer, Materials and Corrosion Engineering, Exponent



Li-ion battery quality can vary greatly among manufacturers and sites. US manufacturers are experiencing many challenges that manufacturers in Asia previously faced, despite efforts to borrow technologies from these early pioneers. Detailed evaluations of battery manufacturing processes can identify and resolve potential problems before batteries enter the marketplace. This talk will share insights from conducting hundreds of factory audits worldwide, including common pitfalls and best practices.

### 9:30 Third-Party EV Cell Testing and Its Importance

Chara Eirene Abiera Diaz, Program Manager, EV Technology, Element Materials Technology

As the demand grows for electric vehicles and energy storage, there has been emphasis on the safety and performance in the batteries they use. Third-party cell testing allows for companies to access testing infrastructure without cost to themselves, and they are then able to utilize the vast knowledge of highly experienced teams that can conduct tests safely with no bias.

### 9:50 Infrared - complementary technology for electrode manufacturing

Larisa von Riewel, Ph.D, Ph.D, Senior Scientist, Innovation & Research, Heraeus Noblelight America



The drying of electrodes is an essential and limiting process step in manufacturing lithium-ion batteries. Electrode properties and process speed are significantly restricted by heat and mass transfer mechanisms in conventional convective drying. Specifically, we investigated the effects on binder migration, adhesion of active layer onto the substrate, lifetime, and the role of binders as a function of distinct slurry drying rates (low or high) for both anode and cathode.

### 10:10 MODERATED Q&A: Session Wrap-Up

Moderator: Yuan Gao, Independent Board Director, Nano One

Panelists:

Troy Hayes, PhD, PE, Practice Director, Director of Asia Offices and Principal Engineer, Materials and Corrosion Engineering, Exponent

Chara Eirene Abiera Diaz, Program Manager, EV Technology, Element Materials Technology

Larisa von Riewel, Ph.D, Ph.D, Senior Scientist, Innovation & Research, Heraeus Noblelight America

10:25 Coffee Break in the Exhibit Hall with Poster Viewing (Sponsorship Opportunity Available)

## PLENARY KEYNOTE

### 10:55 Chairperson's Remarks

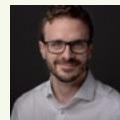
Craig Wohlers, Executive Director, Conferences, Cambridge EnerTech



### 11:00 LG Leading the Battery Expansion in North America

Robert Lee, President, North American & Chief Strategy Officer, LG Energy Solution

LG Energy Solution is the leading lithium-ion battery manufacturer, working with the top OEMs globally in transforming the automobile industry. The market for EVs is expanding rapidly, driven by both consumer demand and regulatory incentives. In North America, there are unprecedented levels of investment to support EVs, by both OEMs and battery manufacturers. This presentation will discuss market growth projections, announced expansion plans, and the challenges ahead.



### 11:20 A Sustainability Perspective on Near-Future Energy Storage Technologies

Ulderico Ulissi, PhD, Manager, 21C Lab, Contemporary Amperex Technology Limited (CATL)

In this presentation we will discuss sustainability and how it is linked to product development, to critically discuss the realistic opportunities to make batteries more sustainable in the near future. This will provide the audience more insights into the CATL carbon neutrality plan, and into its pledge to achieve carbon neutrality in its core operations by 2025 and across the battery value chain by 2035.



### 11:40 USABC Battery Development Program Overview

Matt Denlinger, Battery Research Engineer, Energy Storage Research, Ford Motor Company

The United States Advanced Battery Consortium (USABC) is a subsidiary of USCAR. The organization supports advanced battery technology development and commercialization for electric vehicles via funding through a cooperative agreement with the Department of Energy. This talk will give an overview of current and past USABC programs, as well as future funding opportunities for US battery developers.

### 12:00 pm MODERATED Q&A: Session Wrap-Up



Moderator: Craig Wohlers, Executive Director, Conferences, Cambridge EnerTech

Panelists:

Robert Lee, President, North American & Chief Strategy Officer, LG Energy Solution

Ulderico Ulissi, PhD, Manager, 21C Lab, Contemporary Amperex Technology Limited (CATL)

John Kwon, General Counsel of Global Legal & Strategy, Contemporary Amperex Technology Limited (CATL)

Matt Denlinger, Battery Research Engineer, Energy Storage Research, Ford Motor Company

12:15 Networking Lunch (Sponsorship Opportunity Available)



1:15 Dessert Break in the Exhibit Hall with Poster Viewing (Sponsorship Opportunity Available)

2:00 Close of Symposium



# Battery Recycling

## Advanced Recycling Methods for Sustainable Battery Materials Supply

### MONDAY, DECEMBER 11

#### 7:00 am Registration Open until 4:30 PM

Peak Registration Hours are Monday 7:00 - 8:30 am & Tuesday 7:30 - 8:30 am. Avoid lines come pick up your badge on Sunday or Monday after 9:00 am.

### TUESDAY, DECEMBER 12

#### 7:30 am Registration and Morning Coffee

#### 8:30 Organizer's Welcome Remarks

*Craig Wohlers, Executive Director, Conferences, Cambridge EnerTech*

## RECYCLING MARKET DEMAND

#### 8:35 Chairperson's Remarks

*Steve Sloop, PhD, President, OnTo Technology LLC*

#### 8:40 A View on the Future of Battery Recycling in the European Market Context

*Charles Stuyck, Director, Battery Recycling Solutions, Umicore*

The future of closed battery material loops is regional. In view of current geopolitical drivers, there will be different priorities in some regions, leading to other key drivers of industry development in the different parts of the material loop. This talk will highlight a number of market drivers that are expected to be specific for Europe and that will likely impact the way circularity of batteries will materialize in Europe.

#### 9:00 ReCell's Developments in Direct Recycling

*Jessica Durham Macholz, PhD, Materials Scientist, Argonne National Laboratory*

The ReCell Center has recently expanded its program scope to cover Direct Recycling of Materials, Advanced Resource Recovery, Design for Sustainability, and Modeling and Analysis. The Center continues to scale-up its existing technologies and develop new technologies, applying them to the processing of both manufacturing scrap and end-of-life batteries. The presentation will highlight the expansion and progress of the Center's Direct Recycling of Materials focus area.

#### 9:20 Battery Recycling Markets, Economics, and Business Success Factors

*Thomas Schuldt, Senior Engagement Manager, Battery Accelerator Sustainability Team, McKinsey*

Electric-vehicle demand is accelerating rapidly and so is the need for EV batteries. As these batteries reach end-of-life, significant growth opportunities in the recycling space are emerging. Battery recyclers could adopt key levers to keep or gain an edge in the battery-recycling market.

#### 9:40 MODERATED Q&A: Session Wrap-Up

*Moderator: Steve Sloop, PhD, President, OnTo Technology LLC*

##### Panelists:

*Charles Stuyck, Director, Battery Recycling Solutions, Umicore*

*Jessica Durham Macholz, PhD, Materials Scientist, Argonne National Laboratory*

*Thomas Schuldt, Senior Engagement Manager, Battery Accelerator Sustainability Team, McKinsey*

#### 10:00 Grand Opening Coffee Break in the Exhibit Hall with Poster Viewing



#### 10:40 Future Scenarios for LIB Recycling in Each Region (Europe/US/China/Japan)

*Akihito Fujita, Co-Head, Research & Consulting, Nomura Research Institute America, Inc.*

Market trends, regulations, key players, and technological development surrounding LIB recycling vary significantly from region to region. Based on the future outlook of the EV market in each area, we will introduce our hypothesis on the risks and business opportunities in LIB recycling by considering multiple scenarios for the LIB recycling market.

#### 11:00 Lithium-ion Battery Manufacturing and Supply Chains

*Alan Ferguson, Commercial Vice President, Battery Supply, North America, Li-Cycle Corp.*

The global lithium-ion battery market is expected to grow significantly in the next decade. Developing a supply chain from manufacturing lithium-ion batteries to battery recycling is essential for a competitive edge in the lithium-ion global market and to create closed-loop supply chains. This presentation discusses Li-Cycle's patented Spoke & Hub Technologies—a low-cost, safe, and sustainable process which recycles all types of lithium-ion batteries and battery manufacturing scrap.

#### 11:20 Recycling LFP is a Strategic Imperative in Cost Reduction to reach a Mass Market for EV's and Energy Storage

*Chao Yan, Founder & CEO, Princeton NuEnergy*

Direct Recycling provides the ONLY truly economic method for recycling LFP. Why? It maximizes cost efficiencies, minimizes energy usage, waste, and CO2 emissions, keeping critical materials at home. Eliminating low-value processing, transportation steps, and hazardous chemicals. For LFP and other chemistries, conventional 'hydro-' and 'pyro-' recycling approaches are costly, resulting in "stranded investments". Let's explore the best way forward with economical direct recycling and upcycling for LFP and common battery formulations.



#### 11:40 MODERATED Q&A: Session Wrap-Up

*Moderator: Steve Sloop, PhD, President, OnTo Technology LLC*

##### Panelists:

*Akihito Fujita, Co-Head, Research & Consulting, Nomura Research Institute America, Inc.*

*Alan Ferguson, Commercial Vice President, Battery Supply, North America, Li-Cycle Corp.*

#### 12:00 pm Networking Lunch

## RECYCLING METHODS



#### 1:00 Chairperson's Remarks

*Alan Ferguson, Commercial Vice President, Battery Supply, North America, Li-Cycle Corp.*

#### 1:05 Deactivation and Extraction of Lithium from Lithium-ion Batteries and beyond

*Sascha Nowak, PhD, Head of Analytics & Environmental, Electrochemical Energy Technology, University of Münster*

Handling and transporting aged or defective battery cells is a key challenge in establishing an efficient battery recycling infrastructure. An important prerequisite for such a system is the development of suitable methods for the pretreatment and deactivation of lithium-ion and lithium-metal batteries. Additionally, the extraction of lithium is getting more attention to achieve an overall better recycling efficiency. Here, we present some of our latest results on the topic.

#### 1:25 BASF Battery Materials & Recycling: Tailored Closed-Loop Solutions Addressing the Market Needs

*Mark Szendro, Director, BASF Battery Materials, North America; CEO, BASF Toda America LLC, BASF Corporation*

BASF is the leading chemical supplier to the automotive industry. To ensure growth of EVs in North America it is critical to develop a robust supply chain for battery materials. BASF is well positioned in the eMobility value chain,







and has taken this approach by building a global network with cathode-active materials production in all key regions. This presentation covers battery materials supply chain, sourcing, and BASF's closed-loop recycling solution.

### 1:45 Direct Recycle Cathode-Healing and Battery Deactivation to Improve Cost and Safety of the Value Chain

*Steve Sloop, PhD, President, OnTo Technology LLC*

OnTo will share strategies to improve safety and decrease costs with service at the site. Render-Safe as a mobile, onsite service eliminates flammability hazards when and where they are identified. Cathode-healing is an innovative approach to recover any battery material for reuse, onsite at a factory, or for pretreatment for materials manufacturing. Dr. Sloop will update the progress with deactivation and cathode-healing of lithium-ion batteries.

### 2:05 MODERATED Q&A: Session Wrap-Up

*Moderator: Alan Ferguson, Commercial Vice President, Battery Supply, North America, Li-Cycle Corp.*

*Panelists:*

*Sascha Nowak, PhD, Head of Analytics & Environmental, Electrochemical Energy Technology, University of Münster*

*Mark Szendro, Director, BASF Battery Materials, North America; CEO, BASF Toda America LLC, BASF Corporation*

*Steve Sloop, PhD, President, OnTo Technology LLC*

### 2:20 Refreshment Break in the Exhibit Hall with Poster Viewing

*(Sponsorship Opportunity Available)*

### 3:00 Development of a Direct Recycling Process for LFP Based Lithium Ion Batteries

*Kamyab Amouzegar, PhD, Searcher, Hydro-Quebec Center of Excellence*

Hydro-Quebec has developed a unique direct recycling process to recover cathode material from spent LFP-based batteries based on a two-step process:

- Delithiation of LFP to FP using  $H_2O_2$  and  $CO_2$
- Relithiation of FP particles back to LFP using two innovative direct and indirect electrochemical approaches

For direct electrochemical approach, the FP is coated on a current collector and used as cathode in a cell containing  $Li_2SO_4$  or  $LiHCO_3$  solutions. In the case of indirect approach, the reducing agent is the reduced form of a redox couple that has a redox potential lower than the reduction potential of FP to LFP and higher than the hydrogen evolution reaction.

The new approach from Hydro-Quebec allows to achieve the main three objectives of being environmentally friendly, economically viable and the production of battery grade materials as final product.

### 3:20 Enhancing Lithium-ion Battery Recycling: Selective Recovery and Purification of Graphite for Sustainable Resource Utilization

*Anna Vanderbruggen, PhD, Process Engineer, GeoResources Institute, University of Lorraine*

Graphite, a critical anode material, presents recycling challenges in the lithium-ion battery industry. We propose a froth flotation process for highly selective recovery of graphite and metals. The recovered graphite undergoes EcoGraf purification, enabling its reuse in new batteries, promoting sustainable resource utilization. This integrated approach advances lithium-ion battery recycling, facilitating the circular economy for these vital materials.

### 3:40 Transforming the Landscape of LFP Battery Recycling with Innovative SPR Technology-Cyclewell

*Sun Zhi Prof. Sun, Chief Scientist, Cyclewell Technologies*

The recycling of LFP batteries poses significant challenges, particularly in achieving efficient and cost-effective recovery of lithium carbonate and iron phosphate. Cyclewell, a leading Chinese company in lithium battery recycling technology, has successfully overcome this obstacle with its disruptive SPR (Short Process Restoration) technology, and achieved an environmentally

friendly process with zero production wastewater discharge. Stay tuned as professor Sun, Cyclewell's Chief Scientist, unveils the latest developments with industry colleagues.

### 4:00 MODERATED Q&A: Session Wrap-Up

*Moderator: Alan Ferguson, Commercial Vice President, Battery Supply, North America, Li-Cycle Corp.*

*Panelists:*

*Kamyab Amouzegar, PhD, Searcher, Hydro-Quebec Center of Excellence*

*Anna Vanderbruggen, PhD, Process Engineer, GeoResources Institute, University of Lorraine*

### 4:20 Overview of the Dry Process for Recycling of Lithium-ion Batteries, Including Mechanical Treatment, Black Mass Drying, Electrolyte Recovery, Gas Treatment, and Sorting

*Barry A. Perlmutter, President, Perlmutter & Idea Development (P&ID) LLC*

Lithium-ion batteries (LIBs) recycling is a complex process with crushing and shredding, black mass drying, electrolyte recovery with gas treatment, and finally, classification and sorting. Each step must be integrated upstream and downstream for maximum safety, minimized environmental impacts, with maximum recovery and efficiency. This presentation reviews current "dry process" installations from pilot demonstration plants to full-scale production and illustrates recovery of black mass, copper, aluminum, plastic, and ferrous metals.

### 4:40 Achieving Scalable and Low-Cost Direct Recycling of Lithium-ion Batteries

*Zheng Chen, PhD, Assistant Professor, NanoEngineering, University of California San Diego*

There is a growing interest in low-cost and scalable recycling processes for spent lithium-ion batteries. This presentation will focus on our recent advancements in direct recycling of spent LIBs, aiming to produce new electrode materials capable of matching the performance of native materials. We will demonstrate successful recycling of various battery materials utilizing the direct regeneration approach, as well as integration of different operational steps into a scalable recycling pathway.

### 5:00 Battery Materials Circularity: Closing the Loop with Advanced Cathode Engineering

*Eric Gratz, PhD, Co-Founder & CTO, Ascend Elements*

The terms "circularity" and "closed-loop" are often used to describe battery recycling processes like pyrometallurgy and hydrometallurgy, but these traditional recycling processes are just the first steps in any round-trip journey of battery materials. This presentation puts recycled battery materials under the microscope, and explores the steps needed to engineer new, battery-ready cathode active material (CAM).

### 5:20 Future-Proof Battery Recycling: Scaling a Sustainable, Circular Supply Chain

*Mark Strauss, PhD, Research Engineer, Commercial & Business Development, Aqua Metals*

Aqua Metals is pioneering an innovative solution to sustainably recycle lithium-ion batteries using electricity as the primary reagent and catalyst to produce low-carbon metals for return to a circular battery economy. This presentation will cover how the company is developing and rapidly scaling this first-of-its-kind solution and building the partner ecosystem for a circular domestic supply chain for critical battery metals.



**5:40 MODERATED Q&A: Session Wrap-Up**

*Moderator: Alan Ferguson, Commercial Vice President, Battery Supply, North America, Li-Cycle Corp.*

**Panelists:**

*Barry A. Perlmutter, President, Perlmutter & Idea Development (P&ID) LLC*

*Zheng Chen, PhD, Assistant Professor, NanoEngineering, University of California San Diego*

*Eric Gratz, PhD, Co-Founder & CTO, Ascend Elements*

*Mark Strauss, PhD, Research Engineer, Commercial & Business Development, Aqua Metals*

**6:00 Networking Reception in the Exhibit Hall with Poster Viewing****7:00 Close of Day**

WEDNESDAY, DECEMBER 13

**7:40 am Registration and Morning Coffee****7:45 Interactive Breakout Discussions**

Roundtable discussions are informal, moderated discussions with brainstorming and interactive problem-solving, allowing participants from diverse backgrounds to exchange ideas and experiences and develop future collaborations around a focused topic.

**TABLE 1: Innovations in Recycling Battery Materials**

*Moderator: Steven E. Sloop, President, OnTo Technology LLC*

**TABLE 2: Battery Pack System Cost and Safety – Will Future xEV Battery Packs Increase in Complexity or Simplify and How Will Cost and Safety Be Impacted?**

*Moderator: Kevin Konecky, Battery and Energy Storage Systems Consultant, Total Battery Consulting*

**TABLE 3: Production Supply and Sustainability of a North American Supply Chain**

*Moderator: Rob Privette, Business Development Manager, North America, Umicore*

**TABLE 4: Li-ion NMC Fast Charging New Cells for E-Mobility**

*Moderator: Shmuel De-Leon, CEO, Shmuel De-Leon Energy, Ltd.*

**TABLE 5: Inactive Materials: Developments in Current Collectors, Separators and Electrolytes**

*Moderator: Sam Jaffe, Business Development, Addionics*

**TABLE 6: Building the Domestic Battery Raw Material Supply Chain**

*Moderator: Carl Thoemmes, Business Development, Battery Materials, Koura*

**TABLE 7: Battery Cost vs. Passport, CO2 Footprint & Lifetime Warranty – What Does the Battery Regulation Legislation Bring?**

*Moderator: Wenzel Prochazka, Senior Product Manager Electrification Systems, NXP Semiconductors Austria*

**TABLE 8: High Percentage Silicon-Content Anodes and Cells**

*Moderator: Benjamin Park, PhD, Founder & CTO, Enevate*

**TABLE 9: Battery Management Systems**

*Moderator: Sheldon Williamson, PhD, Professor & Canada Research Chair, Electrical & Computer & Software Engineering, University of Ontario Institute of Technology*

**TABLE 10: Battery Intelligence**

*Moderator: Eli Leland, PhD, CTO and Co-Founder, Voltaiq, Inc.*

**TABLE 11: Lithium Metal Batteries**

*Moderator: Brian Sisk, PhD, CTO, Sepion Technologies*

**TABLE 12: Battery Safety & Thermal Runaway**

*Moderator: Judith Jeevarajan, PhD, Vice President and Executive Director, Electrochemical Safety Research Institute, UL Research Institutes*

**TABLE 13: Silicon Anodes**

*Moderator: Manuel Wieser, Head of Energy Business, AnteoTech*

**RECYCLING METHODS & MARKET****8:25 Chairperson's Remarks**

*Anna Vanderbruggen, PhD, Process Engineer, GeoResources Institute, University of Lorraine*

**8:30 Lithium Battery Recycling Market Dynamics & Carbon Footprint of Current Mainstream Technology**

*Evelyn Chen, Senior Consulting Manager, New Energy, SMM Information & Technology Co., Ltd*

Shanghai Metals Market (SMM) provides an integrated internet platform of benchmark prices, analysis, news, consulting, and conferences of the metals & mining industry. We have extensive networks and deep-rooted relationships in SMM non-ferrous, ferrous, and EV metal industries. This presentation will cover key topics such as market trends for different scrap chemistry, black mass trading flows, scrap sourcing channel, pricing mechanisms, main recycling technologies, carbon footprint calculation, and carbon footprint for key recycling technologies.

**8:50 Low-carbon Footprint Bio-diluents for Solvent Extraction in Lithium-ion Battery Recycling**

*Zubin Arora, Global Market Manager, Sales & Marketing, TotalEnergies Fluids SAS*

TotalEnergies Fluids is a leader in the design, production, and sale of high-purity, biodegradable hydrocarbon solvents. This presentation elucidates the distinctive features of low carbon footprint bio-diluent Elixore Biolife EV 205; a detailed flowsheet illustrating the product's integral role in the hydrometallurgical process of Battery Recycling, underscoring its potential to significantly reduce Scope 3 emissions in Battery Recycling plants; and a live industrial project set to use Elixore Biolife EV 205.

**9:10 Analytical Solutions for Recycled Battery Materials**

*Chady Stephan, PhD, Director Applied Markets, Analytical and Enterprise Solutions, PerkinElmer Inc*



This talk will cover the analytical solutions needed across the battery recycling process. From black mass to the various isolated metals manganese, cobalt, nickel and lithium, we will cover sample preparation (extraction vs digestion vs fusions), selection of analytical technique for metal (ICP-OES vs ICP-MS) and residual electrolyte (TG-IR vs TG-IR-GC/MS) testing. We will discuss best practices for data collection and interpretation.

**9:30 Lithium-Battery Recycling**

*Travis Hesterberg, PhD, Director, Technology & Innovation, R&D, Ecobat Solutions*

Overview of Ecobat Solutions lithium-battery recycling process and operational footprint. Presentation will include overview of best practices in battery collections, transport, and storage, along with battery diagnostics and recycling.

**9:50 Clean and Economical Waste Base Recycle Technology**

*Yu Tack Kim, PhD, Special Expert, EFCOM*

The current recycling technology for lithium-ion batteries is largely adapted from IT battery recycling methods. Electric vehicle and energy storage system batteries, due to their larger size, offer the potential for incorporation of disassembly techniques. Another crucial aspect is that the primary materials in current battery recycling come from waste generated in the battery manufacturing process. However, recycling these process waste materials as part of end-of-life (EOL) battery disposal incurs financial losses. The material to be introduced in this presentation focuses on a technology that recycles unused battery materials from process waste, offering an innovative approach to recycling.





# Battery Recycling

Advanced Recycling Methods for Sustainable Battery Materials Supply

## 10:10 MODERATED Q&A: Session Wrap-Up

*Moderator: Anna Vanderbruggen, PhD, Process Engineer, GeoResources Institute, University of Lorraine*

*Panelists:*

*Travis Hesterberg, PhD, Director, Technology & Innovation, R&D, Ecobat Solutions*

## 10:25 Coffee Break in the Exhibit Hall with Poster Viewing

*(Sponsorship Opportunity Available)*

### PLENARY KEYNOTE

#### 10:55 Chairperson's Remarks

*Craig Wohlers, Executive Director, Conferences, Cambridge EnerTech*



#### 11:00 LG Leading the Battery Expansion in North America

*Robert Lee, President, North American & Chief Strategy Officer, LG Energy Solution*

LG Energy Solution is the leading lithium-ion battery manufacturer, working with the top OEMs globally in transforming the automobile industry. The market for EVs is expanding rapidly, driven by both consumer demand and regulatory incentives. In North America, there are unprecedented levels of investment to support EVs, by both OEMs and battery manufacturers. This presentation will discuss market growth projections, announced expansion plans, and the challenges ahead.



#### 11:20 A Sustainability Perspective on Near-Future Energy Storage Technologies

*Ulderico Ulissi, PhD, Manager, 21C Lab, Contemporary Amperex Technology Limited (CATL)*

In this presentation we will discuss sustainability and how it is linked to product development, to critically discuss the realistic opportunities to make batteries more sustainable in the near future. This will provide the audience more insights into the CATL carbon neutrality plan, and into its pledge to achieve carbon neutrality in its core operations by 2025 and across the battery value chain by 2035.



#### 11:40 USABC Battery Development Program Overview

*Matt Denlinger, Battery Research Engineer, Energy Storage Research, Ford Motor Company*

The United States Advanced Battery Consortium (USABC) is a subsidiary of USCAR. The organization supports advanced battery technology development and commercialization for electric vehicles via funding through a cooperative agreement with the Department of Energy. This talk will give an overview of current and past USABC programs, as well as future funding opportunities for US battery developers.

## 12:00 pm MODERATED Q&A: Session Wrap-Up



*Moderator: Craig Wohlers, Executive Director, Conferences, Cambridge EnerTech*

*Panelists:*

*Robert Lee, President, North American & Chief Strategy Officer, LG Energy Solution*

*Ulderico Ulissi, PhD, Manager, 21C Lab, Contemporary Amperex Technology Limited (CATL)*

*John Kwon, General Counsel of Global Legal & Strategy, Contemporary Amperex Technology Limited (CATL)*

*Matt Denlinger, Battery Research Engineer, Energy Storage Research, Ford Motor Company*

## 12:15 Networking Lunch *(Sponsorship Opportunity Available)*



## 1:15 Dessert Break in the Exhibit Hall with Poster Viewing

*(Sponsorship Opportunity Available)*

## 2:00 Close of Symposium



# xEV Battery Technology, Application, and Market

## Driving the Future Growth of Electric Vehicles Globally

**WEDNESDAY, DECEMBER 13****7:45 am Registration Open****2:00 pm Organizer's Welcome Remarks***Craig Wohlers, Executive Director, Conferences, Cambridge EnerTech*

### xEV MARKET EXPANSION

**2:05 Chairperson's Remarks***Dee Strand, PhD, CSO, R&D, Wildcat Discovery Technologies, Inc.***2:10 Lithium-Metal Battery Technology for EV Application: From Material Selection to Cell Design***Mei Cai, Director, Battery Cell Systems Research Lab, General Motors Global R&D Center*

Li-metal battery technology has been systematically investigated including electrode, separator, electrolyte, cell design, as well as cell manufacture process. In this talk, we would like to first share our perspectives on the development of lithium-metal batteries. We will then discuss the principle and logic for the cell material selection, cell component integration, as well as the overall cell design with supporting data from both the material and cell-level evaluation.

**2:30 Pathways to Faster Charging of EVs***Tobias Glossmann, Principal Systems Engineer, HV Battery Research and Test Lab, Mercedes-Benz Research and Development North America*

Fast-charging is a critical enabler for the adoption of electric transportation. Unfortunately, batteries with higher rate capability are often more expensive, having a negative effect on profitable EV business. In this talk, we take a broader look at new Li-ion developments, beyond Li-ion technology, as well as system considerations that offer different approaches and a positive perspective on the future of fast-charging EVs.

**2:50 Lithium-ion and beyond: Challenges in Integrating the Next Generation of Battery Cell Technologies into Stellantis Vehicles***Carrie Okma, Head of Lithium Ion Modules & Cell Product Release & Validation Center, Stellantis*

Requirements for battery cells to be used in electric vehicles range from the obvious to the subtle. A description of these requirements will be provided and then compared to the developmental status of a spectrum of next-generation lithium-ion and beyond-lithium-ion chemistries.

**3:10 MODERATED Q&A: Session Wrap-Up***Moderator: Dee Strand, PhD, CSO, R&D, Wildcat Discovery Technologies, Inc.**Panelists:**Mei Cai, Director, Battery Cell Systems Research Lab, General Motors Global R&D Center**Tobias Glossmann, Principal Systems Engineer, HV Battery Research and Test Lab, Mercedes-Benz Research and Development North America**Carrie Okma, Head of Lithium Ion Modules & Cell Product Release & Validation Center, Stellantis***3:25 Refreshment Break in the Exhibit Hall with Poster Viewing***(Sponsorship Opportunity Available)***4:10 Battery Degradation Mechanisms at High SOC & Elevated Temperature***Frederik Morgenstern, Senior Battery Technology Engineer, BMW Group*

This presentation will describe BMW's view of the role that different cell designs and chemistries can play in designing batteries for diverse EV applications. Specifically, the impact of cell design and charging protocol optimization on battery lifetime (calendar and cycle aging) will be discussed. Key challenges will be addressed with examples from BMW research projects.

**4:30 Accelerating Battery Development with Platform Technologies***Huaxin Gong, PhD, Senior Cell Design Engineer, Rivian*

Battery technologies are typically developed with a specific use-case and business-case in mind. However, taking an integrated approach to requirements definition, concept iteration, and validation may allow for more innovative design and manufacturing solutions. We explore the use of platform technologies in the laboratory, in prototyping, and in data analysis to hasten development cycles.

**4:50 Advanced Battery Sensing for Early Detection of Battery Thermal Runaway Events***Chavonne Yee, Director, Standards and Regulations, Electrification, Sensing & Safety Technologies, Honeywell***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.

**5:10 Liquefied Gas Electrolyte for Next-Generation Li-Ion Batteries****SOUTH 8 TECHNOLOGIES***Cyrus Rustomji, Co-Founder & Chief Science Officer, South 8 Technologies*

South 8 Technologies has developed a novel Liquefied Gas Electrolyte (LiGas®) to power the next generation of Lithium-ion batteries and advance the world's clean energy future. The team is the first to develop and commercialize a novel, patented LiGas® for next-generation Lithium batteries. Due to its low viscosity and freezing point, this unique ability allows EVs to maintain driving range in cold weather. In this talk, you will find LiGas® possibilities.

**5:30 MODERATED Q&A: Session Wrap-Up***Moderator: Dee Strand, PhD, CSO, R&D, Wildcat Discovery Technologies, Inc.**Panelists:**Frederik Morgenstern, Senior Battery Technology Engineer, BMW Group**Huaxin Gong, PhD, Senior Cell Design Engineer, Rivian**Chavonne Yee, Director, Standards and Regulations, Electrification, Sensing & Safety Technologies, Honeywell***5:50 Close of Day****THURSDAY, DECEMBER 14****8:30 am Registration and Morning Coffee****9:20 Organizer's Remarks***Craig Wohlers, Executive Director, Conferences, Cambridge EnerTech*

### xEV MARKET EXPANSION

**9:25 Chairperson's Remarks***Tobias Glossmann, Principal Systems Engineer, HV Battery Research and Test Lab, Mercedes-Benz Research and Development North America***9:30 Solutions for a Sustainable and Circular Battery Economy****Nanoramic LABORATORIES***John Cooley, Founder, Chief Products Officer, Nanoramic Laboratories*

Growth in battery demand for EV's and stationary applications, coupled with legislation and overall sustainability goals promoting circular economies, motivate rapidly deployable battery technologies with advantages in sustainability, cost and performance. Neocarbonix lithium-ion batteries are an important example of scalable technology that addresses these needs from a technology and a business model standpoint. Commercialization updates, aspects of circularity and implications for sustainability will be discussed.

**9:50 Toyota Prius Hybrid Electric Vehicle (HEV) and Prius Prime Plug-in Hybrid Electric Vehicle (PHEV) Improvements***Tina Singh, Principal Engineer, Sustainability & Regulatory Affairs, Toyota Motor North America*

The new Toyota Prius HEV and Prius Prime PHEV feature a more powerful and efficient hybrid powertrain, a more spacious interior, and aerodynamic exterior. Toyota is providing a wider range of advanced safety features, a higher-capacity battery pack, and more efficient battery management system. The Prime also features a longer electric-only range. These improvements offer a more fuel-efficient and sustainable way of transportation, making the Prius lineup popular with consumers.

**10:10 Optimizing Total Cost of Ownership of EV Battery Test Facilities****KEYSIGHT***Jim Duffy, EV & Powertrain Business Development Manager, Automotive and Energy Solutions (AES) Group, Keysight Technologies*

With shifting gear toward electric vehicles, automakers and battery manufacturers are facing the challenge to develop reliable products which will be introduced to



# xEV Battery Technology, Application, and Market

Driving the Future Growth of Electric Vehicles Globally

the market quickly. Energy consumption can add-up and reach limits of available power from the grid. Choosing a flexible and innovative test strategy can reduce investment and overall costs during operation.

## 10:30 MODERATED Q&A: Session Wrap-Up

*Moderator: Tobias Glossmann, Principal Systems Engineer, HV Battery Research and Test Lab, Mercedes-Benz Research and Development North America*

*Panelists:*

*Tina Singh, Principal Engineer, Sustainability & Regulatory Affairs, Toyota Motor North America*

*Jim Duffy, EV & Powertrain Business Development Manager, Automotive and Energy Solutions (AES) Group, Keysight Technologies*

## 10:45 Coffee Break in the Exhibit Hall with Poster Viewing

## 11:50 Computational Material Science in Advancing Battery Development

*Balachandran Radhakrishnan, Principal Researcher, Nissan USA*

Secondary batteries development has come a long way, having found applications in small electronic devices in its early stages, to powering the next revolution in automobile industry. While the initial stages of the development were fueled by rigorous and painstakingly long experiments, computational material science has been paving the way in accelerating the recent advances in batteries. In this talk, I will focus the role of computations in Nissan's R&D efforts.

## 12:10 pm 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.

## 12:30 Electrochemical Impedance Spectroscopy in Electric Vehicles: A Review of Applications and Practical Challenges

*Mahdi Alavi, PhD, Battery State Estimation Engineer, Stellantis*

*Yasaman Masoudi, Engineer, BMS Algorithm, Stellantis*

Electrochemical Impedance Spectroscopy (EIS) is a frequency-based characterization method with wide applications, including batteries, fuel cells, medicine, material characterization, and corrosion. Despite the promising advantages, adoption of EIS technique in electric vehicles (EVs) comes with challenges. This talk first reviews the EIS EV applications, and second, showcases some practical challenges based on evidence.

## 12:50 MODERATED Q&A: Session Wrap-Up

*Moderator: Tobias Glossmann, Principal Systems Engineer, HV Battery Research and Test Lab, Mercedes-Benz Research and Development North America*

*Panelists:*

*Balachandran Radhakrishnan, Principal Researcher, Nissan USA*

*Jeremy Bedine, Product Head, Volvo Energy*

*Mahdi Alavi, PhD, Battery State Estimation Engineer, Stellantis*

*Yasaman Masoudi, Engineer, BMS Algorithm, Stellantis*

## 1:05 Networking Lunch (Sponsorship Opportunity Available)

## 2:00 Dessert Break in the Exhibit Hall with Poster Viewing - Last Chance for Viewing (Sponsorship Opportunity Available)

## INNOVATIONS IN BATTERIES FOR xEVs

### 2:30 Chairperson's Remarks

*Jeremy Bedine, Product Head, Volvo Energy*

### 2:35 Progress in Liquid Electrolyte Development for Lithium-Metal Anodes

*Dee Strand, PhD, CSO, R&D, Wildcat Discovery Technologies, Inc.*

This talk will discuss progress in performance of liquid electrolytes for use with lithium-metal anodes. Rapid capacity fade and electrolyte consumption can occur with liquid electrolyte cells that contain lithium-metal anodes. However, these problems can be mitigated with advanced formulations. The effect of cycling protocol can also be quite dramatic and will be reviewed in this presentation.

### 2:55 Fast Charging of Lithium-ion Batteries: Pitfalls and Possibilities

*Daniel P. Abraham, PhD, Senior Materials Scientist, Argonne National Laboratory*  
State-of-the-art lithium-ion batteries (LIBs) can be fully charged in about 1h with minimal degradation in cell performance. However, full charging over shorter durations causes irreversible damage to the battery via losses in the mobile Li-ion inventory (capacity fade) and resistance increase (power fade). This presentation will describe reasons for this performance loss and illustrate efforts to enhance the charging ability of LIBs through material and electrode modifications.

### 3:15 Li-ion Battery Pack Optimization: A Key to Improving Electric Vehicle Safety

*Anurodh Tripathi, PhD, Business Development Manager, Chemical, Parker LORD*

The use of lithium-ion batteries in more devices from smartphones to EVs has significantly increased their energy density, providing device increased performance and longevity. However, the high energy density of these batteries also makes them susceptible to thermal runaway and other hazards, leading to safety issues for drivers and passengers of electric vehicles. To mitigate these battery safety hazards, various strategies are employed often together, including battery cell chemistry optimization, cell design improvements, better thermal management, use of advanced materials in battery packaging, and sophisticated battery management systems. This talk will provide an overview of EV battery safety, including the types of batteries and their hazards, the causes of battery failures, solutions for battery safety and the strategies for preventing or mitigating battery thermal events.

### 3:35 MODERATED Q&A: Session Wrap-Up

*Moderator: Jeremy Bedine, Product Head, Volvo Energy*

*Panelists:*

*Dee Strand, PhD, CSO, R&D, Wildcat Discovery Technologies, Inc.*

*Daniel P. Abraham, PhD, Senior Materials Scientist, Argonne National Laboratory*

*Anurodh Tripathi, PhD, Business Development Manager, Chemical, Parker LORD*

### 3:50 Networking Refreshment Break

### 4:00 Overcoming the Barrier of Deploying Second-Life EV Batteries for Storage Applications

*Chris Mi, PhD, Fellow, IEEE & SAE; Distinguished Professor, San Diego State University*

Batteries are costly, in both production and recycling. Handling retired EV batteries (SLBs) is thus important for the economy and environment. However, deploying SLBs will encounter serious issues such as lifetime, cost, safety, liability, and regulations. This talk will discuss the result of a recent CEC-funded project, including the aging mechanism, charge/discharge methods, thermal management, cell balancing, energy management, policy, standards, and fire codes related to the SLB storage systems.

### 4:20 2-Phase Immersion Cooling System for Thermoplastic Battery Enclosures to Reduce Climate-Related Driving Range Variation

*Gero Mimberg, Manager Thermal Systems, Kautex Textron GMBH*

As an enabling technology for fast charging, 2-phase immersion cooling enables very high heat transfer rates of measured 3400 W/m<sup>2</sup>\*K and, at the same time, maximum temperature homogeneity within the battery pack at optimal battery operating temperature. Thus, heat loads at charging rates of more than 6C can be safely and permanently managed by the battery thermal system.

### 4:40 MODERATED Q&A: Session Wrap-Up

*Moderator: Jeremy Bedine, Product Head, Volvo Energy*

*Panelists:*

*Chris Mi, PhD, Fellow, IEEE & SAE; Distinguished Professor, San Diego State University*

*Gero Mimberg, Manager Thermal Systems, Kautex Textron GMBH*

### 4:55 Close of Conference



# Global Battery Raw Materials

Balancing Supply, Demand, and Costs for Battery Component Materials

WEDNESDAY, DECEMBER 13

7:45 am Registration Open

2:00 pm Organizer's Welcome Remarks

*Craig Wohlers, Executive Director, Conferences, Cambridge EnerTech*

## SUPPLY CHAIN SUSTAINABILITY

2:05 Chairperson's Remarks

*Rohan Gokhale, PhD, Applied Technology Manager, Umicore Rechargeable Battery Materials*

2:10 Sustainable Lithium Supply—SQM at the Forefront of Transparent Mining Assurance

*Stefan Debruynne, Director of External Affairs, SQM International*

Lithium is an essential element in the global energy transition. It's critically important to stakeholders that it is mined in a sustainable and equitable way. Besides an update on SQM's progress on its Sustainable Development Plan, SQM's Innovation Roadmap toward water-neutral lithium production will be presented. Additionally, global lithium demand and SQM's expansion plan will be updated.

2:30 North America's Role in the Lithium-ion Economy

*Andrew Miller, COO, Benchmark Mineral Intelligence*

This presentation will address lithium-ion battery supply chain dynamics: challenges & opportunities as well as raw material bottlenecks; lithium, cobalt, graphite, nickel, and financing the EV supply chain; capital requirements to meet the EV demand of the coming decade.

*Taylor Shively, Principal Consultant, CRU Group*

3:10 MODERATED Q&A: Session Wrap-Up

*Moderator: Rohan Gokhale, PhD, Applied Technology Manager, Umicore Rechargeable Battery Materials*

*Panelists:*

*Stefan Debruynne, Director of External Affairs, SQM International*

*Andrew Miller, COO, Benchmark Mineral Intelligence*

*Taylor Shively, Principal Consultant, CRU Group*

3:25 Refreshment Break in the Exhibit Hall with Poster Viewing

*(Sponsorship Opportunity Available)*

## GLOBAL DEMAND FOR BATTERY RAW MATERIALS

4:10 Deal Making, Investment and Innovation in Lithium

*Alice Yu, Senior Research Analyst, Metals and Mining Research, S&P Global Market Intelligence*

The security of lithium supply and stability in the cost of lithium are paramount for refiners, battery makers and automakers. Framed upon our price outlook for lithium, this presentation will look at key trends in lithium capital spending and deal-making, shifts in supply geographies, and technical innovations that have come about to develop a lithium supply chain that meets interests of different markets.

4:30 Securing Battery Raw Materials Tantamount to Meeting the 50% EV Goals by 2030

*Kimberly Berman, Senior Consultant, SFA Oxford*

The lack of a cohesive plan to secure the necessary battery material supply chains will present numerous challenges for the many planned gigafactories to be built over the next 5 years. This presentation will demonstrate that re-shoring battery grade raw material production will only solve part of the problem, and there is a need to increase recycling capacity, as well as enter into trade agreements with resource rich countries.

4:50 Powering the EV Revolution: Accelerating Lithium Extraction with

Sustainable Innovation

*Sandro Mazzini, Chief Commercial Officer, Summit Nanotech*

The global demand for lithium is soaring due to its role in manufacturing EV batteries. Yet, traditional lithium mining methods present significant drawbacks – consuming extensive time, land, and freshwater while producing a low yield and placing undue stress on surrounding communities and ecosystems. By embracing innovative and sustainable Direct Lithium Extraction (DLE) technologies, we can deliver the greenest lithium to the market at an unprecedented pace.

5:10 Revolutionary Plasma Technology Producing Clean, Low-Cost Critical Battery Materials Domestically

*Arturo Gutierrez, PhD, Principal Scientist, 6K Energy*

Plasma technology is a solution for producing battery materials domestically. Unlike traditional processes, plasma technology can cut production time from days to hours, produce zero solid or liquid waste, and allows decreased dependency on foreign markets.

5:30 MODERATED Q&A: Session Wrap-Up

*Moderator: Rohan Gokhale, PhD, Applied Technology Manager, Umicore Rechargeable Battery Materials*

*Panelists:*

*Alice Yu, Senior Research Analyst, Metals and Mining Research, S&P Global Market Intelligence*

*Kimberly Berman, Senior Consultant, SFA Oxford*

*Sandro Mazzini, Chief Commercial Officer, Summit Nanotech*

*Arturo Gutierrez, PhD, Principal Scientist, 6K Energy*

5:50 Close of Day

THURSDAY, DECEMBER 14

8:30 am Registration and Morning Coffee

9:00 Organizer's Remarks

*Craig Wohlers, Executive Director, Conferences, Cambridge EnerTech*

## GLOBAL DEMAND FOR BATTERY RAW MATERIALS

9:05 Chairperson's Remarks

*Kimberly Berman, Senior Consultant, SFA Oxford*

9:10 The North American Electrolyte Market and the Need for Local Production 

*Tomasz Zukowski, Key Account Manager, E-Lyte Innovations GmbH*

In recent years, the lithium-ion battery has conquered many new applications such as automotive, medical or aviation. Each application places different demands on the battery. Liquid electrolytes are still omnipresent. This talk includes future electrolyte demands and announced production capacities in North America. It examines the major electrolyte producers and includes a discussion on price drivers and major technical trends.

9:30 Presentation to be Announced

9:50 Optimization of Cathode Materials for High Performance EV Batteries

*Rohan Gokhale, PhD, Applied Technology Manager, Umicore Rechargeable Battery Materials*

Umicore is a global leader in the battery cathode materials manufacturing space, with over 20 years of experience and expertise in development of specialized products using innovative processes, driven primarily by customer demand. This presentation will provide an overview of recent updates on localization of production in North America and toolkit used by CAM manufacturers to obtain best performance in the cathode product.



# Global Battery Raw Materials

## Balancing Supply, Demand, and Costs for Battery Component Materials

### 10:10 Scaling Eco-Friendly Synthetic Graphite Production in the United States



*Jeremy Schrooten, Ph.D., Vice President, Technology, Anovion Technologies*  
Scaling Eco-Friendly Synthetic Graphite Production in the United States

### 10:30 MODERATED Q&A: Session Wrap-Up

*Moderator: Kimberly Berman, Senior Consultant, SFA Oxford*

*Panelists:*

*Tomasz Zukowski, Key Account Manager, E-Lyte Innovations GmbH*

*Rohan Gokhale, PhD, Applied Technology Manager, Umicore Rechargeable Battery Materials*

*Jeremy Schrooten, Ph.D., Vice President, Technology, Anovion Technologies*

### 10:45 Coffee Break in the Exhibit Hall with Poster Viewing

### 11:50 Battery Raw Material Supply Response after Shortages

*William Adams, Head of Battery Research, Cobalt & Lithium & Battery Materials Research, Fastmarkets*

What should the market expect in terms of a supply response from battery raw material producers? What is the outlook for supply, demand, and prices in these complicated and fast-moving markets? The talk will look at recent developments in battery raw materials, the impact it has had on the supply chain, and the underlying trends in lithium, cobalt, and nickel.

### 12:10 pm Securing Critical Raw Materials at Competitive Costs and CO2 Emissions

*Wolfgang Bernhart, Senior Partner, Automotive Competence Center, Roland Berger Strategy Consultants GmbH*

Outlook on demand-supply balance for Li, Ni, Co, Mn. and graphite; alternative feedstock and processing routes; comparing costs and CO2 emission; strategies to secure critically raw materials adopted by major players; framework for holistic evaluation of raw material strategies.

### 12:30 Can Circular Economy and Cathode Chemistry Evolution Stabilize the Supply Chain of Li-ion Batteries?

*Ahmad Mayyas, PhD, Professor, Industrial & Systems Engineering, Khalifa University*

The exponential increase in electric vehicle sales in the last ten years has put increasing pressure on limited supplies of cobalt and lithium. Cathode evolution focuses on reducing the amount of cobalt in the cathode layers will not relieve the stress on critical material supplies. Adoption of effective recycling methods such as hydrometallurgical, pyrometallurgical, and mechanical means can partly but not fully offset the gap between demands and supplies.

### 12:50 MODERATED Q&A: Session Wrap-Up

*Moderator: Kimberly Berman, Senior Consultant, SFA Oxford*

*Panelists:*

*William Adams, Head of Battery Research, Cobalt & Lithium & Battery Materials Research, Fastmarkets*

*Wolfgang Bernhart, Senior Partner, Automotive Competence Center, Roland Berger Strategy Consultants GmbH*

*Ahmad Mayyas, PhD, Professor, Industrial & Systems Engineering, Khalifa University*

### 1:05 Networking Lunch (Sponsorship Opportunity Available)

### 2:00 Dessert Break in the Exhibit Hall with Poster Viewing – Last Chance for Viewing (Sponsorship Opportunity Available)

## MARKET OPPORTUNITIES IN BATTERY RAW MATERIALS

### 2:30 Chairperson's Remarks

*Wolfgang Bernhart, Senior Partner, Automotive Competence Center, Roland Berger Strategy Consultants GmbH*

### 2:35 Battery Raw Materials Refining—An Industry Overview

*Lukasz Bednarski, Associate Director, Battery Raw Materials, IHS Markit*

This talk will cover key aspects of battery raw materials industry. This presentation aims to highlight the current state of the refining industry, examining the technological advancements in refining processes, sourcing strategies, market dynamics, and the pressing issue of sustainability.

### 2:55 Sustainable, Locally-Produced, Bio-Based Anode Material

*Otto Kivi, Senior Business Development Specialist, Biomaterials, Stora Enso*

Stora Enso is a Northern Europe based biomaterial company, operating in 50 countries and turning over around 12 billion EUR. Stora Enso is piloting tree-based anode material, Lignode, for battery cells. With Lignode, it will be possible to have a local supply chain, and also reduce the CO2-footprint of the battery.

### 3:15 Innovating the Critical Minerals Midstream: An Introduction to NOVONIX's All-Dry, Zero-Waste Nickel-Based Cathode Materials



*Mark McArthur, PhD, Director, R&D Services, NOVONIX*

New methods of producing materials are required to sustain the growth of battery manufacturing in North America. NOVONIX, a leading battery materials and technology company, is revolutionizing the global lithium-ion battery sector. An introduction of NOVONIX's patent-pending all-dry, zero-waste synthesis process will be presented while highlighting the numerous advantages all-dry methods have over conventional NMC cathode manufacture tailored for the domestic supply chain using examples of materials generated on its 10 tpa pilot facility.

### 3:35 MODERATED Q&A: Session Wrap-Up

*Moderator: Wolfgang Bernhart, Senior Partner, Automotive Competence Center, Roland Berger Strategy Consultants GmbH*

*Panelists:*

*Lukasz Bednarski, Associate Director, Battery Raw Materials, IHS Markit*

*Otto Kivi, Senior Business Development Specialist, Biomaterials, Stora Enso*

### 3:50 Networking Refreshment Break

### 4:00 Raw Materials in the North American Lithium-Ion Battery Supply Chain Database

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

In this presentation, we will introduce the latest progress in the Database and focus on mining and raw materials production companies. Our database has identified more than 34 companies working in raw materials segment in 65 facilities. These reflect more than 50% increase compared to August 2022 indicated a relatively good growth in the North America in these areas and expected to be continued in the next 10 years.

### 4:20 Under Pressure: Battery Raw Materials in a Net Zero Scenario

*Max Reid, Principal Analyst, Battery & Raw Materials, Wood Mackenzie*

Achieving global net zero carbon emissions by 2050 will see an incredible shift across all industries—most powered by the metals & mining sector. Looking at road transport electrification alone, the challenges are monumental. This presentation quantifies the impact on battery raw materials markets in a net zero pathway from the surge in battery demand. Are there any mechanisms to ease pressures on mining sector?

### 4:40 MODERATED Q&A: Session Wrap-Up

*Moderator: Kyle Gordon, Senior Project Manager, Advanced Technology Center, Automotive & Industrials, Roland Berger*

*Panelists:*

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

*Max Reid, Principal Analyst, Battery & Raw Materials, Wood Mackenzie*

### 4:55 Close of Conference



# Battery Intelligence for Automotive Applications

Using Machine Learning and Artificial Intelligence to Optimize Battery Development from Materials to Manufacturing

## WEDNESDAY, DECEMBER 13

7:45 am Registration Open

2:00 pm Organizer's Welcome Remarks

Victoria Mosolgo, Conference Producer, Cambridge EnerTech

### BATTERY INTELLIGENCE IN AUTOMOTIVE SYSTEMS

2:05 Chairperson's Remarks

Nikolaus Keuth, PhD, Senior Group Product Manager, IODP XI Data Analytics Solutions, AVL List GmbH

2:10 Battery Health Monitoring: Integrating Data Analytics, Modelling Techniques, and Anomaly Detection for Enhanced Electric Vehicle Performance

Nikolaus Keuth, PhD, Senior Group Product Manager, IODP XI Data Analytics Solutions, AVL List GmbH

In today's and future sustainable mobility, electric powertrains play a pivotal role. Among all the components of electric vehicles, the battery holds the highest value. For manufacturers and mobility providers, the competition is determined by the total cost of ownership (TCO). To balance the reduction of TCO and battery costs while ensuring optimal performance, range, efficiency, and most importantly, lifetime, the continuous monitoring of the battery during operation is inevitable.

2:30 Overcoming Battery Hurdles through Software & ML/AI

Fabrizio Martini, Co-Founder & CEO, Electra Vehicles, Inc.

Join us to learn how Electra's Adaptive Digital Twin technology works with the power of AI/ML to unlock the next big innovations that are moving the energy and EV industries forward at record pace.

2:50 Artificial Intelligence (AI) and Machine Learning (ML) for Testing Batteries

Daniela M. Ushizima, PhD, Staff Scientist, Lawrence Berkeley National Laboratory

Lithium metal batteries with solid electrolytes offer enhanced performance but require rigorous quality control to mitigate risks like dendrite growth. Using HPC NERSC's Perlmutter, this study introduces batteryNet, a deep learning model, to detect lithium plating dynamics through in-operando X-ray tomography. The algorithm transforms high-resolution X-ray data acquired at DOE experimental facilities into precise measurements, revealing battery defects. Additionally, it evaluates new polymer electrolytes with potential to improve battery safety.

3:10 MODERATED Q&A: Session Wrap-Up

Moderator: Nikolaus Keuth, PhD, Senior Group Product Manager, IODP XI Data Analytics Solutions, AVL List GmbH

Panelists:

Fabrizio Martini, Co-Founder & CEO, Electra Vehicles, Inc.

Daniela M. Ushizima, PhD, Staff Scientist, Lawrence Berkeley National Laboratory

3:25 Refreshment Break in the Exhibit Hall with Poster Viewing

(Sponsorship Opportunity Available)

### LIFETIME ESTIMATIONS & PREDICTIONS

4:10 Machine Learning-Based Lifetime Prediction and Charging Optimization of Lithium-ion Batteries

Richard D. Braatz, PhD, Edwin R. Gilliland Professor, Chemical Engineering, Massachusetts Institute of Technology

This presentation will describe advances in machine learning-based techniques for addressing systems problems that arise for lithium-ion batteries. The specific systems problems include the prediction and classification of battery cycle lifetime (aka remaining useful life) and the determination of optimal charging protocols. The development of the

techniques and their application are in collaboration with materials science, physics, and computer science researchers at Stanford University, Toyota Research Institute, and MIT.

4:30 Uncertainty-Aware and Explainable Machine Learning for Early Prediction of Battery Degradation Trajectory

Arghya Bhowmik, PhD, Assistant Professor, Energy Conversion & Storage, Danish Technical University

We demonstrate an early prediction model with reliable uncertainty estimates, which utilizes an arbitrary number of initial cycles to predict the whole battery degradation trajectory. Our model will enable accelerated battery development via uncertainty-guided truncation of cell cycle experiments once the predictions are reliable.

4:50 Special Issue on Physics-Informed Machine Learning Enabling Fault Feature Extraction and Robust Failure Prognosis

David A. Howey, PhD, Professor, Engineering Science, University of Oxford

While models can work well on often small quantities of fault/failure scenarios that a training dataset has captured, they may fail to perform on so-called out-of-distribution cases not well-represented in the training dataset but are encountered in real-world system operations. ML models have the promise of making these models generalize better to unseen, out-of-distribution cases while at the same time explaining underlying physics.

5:10 Reliable and Actionable Insights into the Health, Safety, and Performance of Electric Vehicles in the Field



Jonas Keil, PhD, Tech Lead Battery Analytics, TWAICE Battery Analytics Software

The demand for reliable and actionable insights on battery pack health, safety, and performance in the mobility sector is growing exponentially. TWAICE leverages battery modeling and machine learning on in-life mobility data to estimate and predict battery states. With our data-driven battery analytics product, we clearly and transparently define the battery's State of Health (SoH) and offer a performance guarantee backed by Munich Re.

5:30 MODERATED Q&A: Session Wrap-Up

Moderator: Nikolaus Keuth, PhD, Senior Group Product Manager, IODP XI Data Analytics Solutions, AVL List GmbH

Panelists:

Richard D. Braatz, PhD, Edwin R. Gilliland Professor, Chemical Engineering, Massachusetts Institute of Technology

Arghya Bhowmik, PhD, Assistant Professor, Energy Conversion & Storage, Danish Technical University

David A. Howey, PhD, Professor, Engineering Science, University of Oxford

Jonas Keil, PhD, Tech Lead Battery Analytics, TWAICE Battery Analytics Software

5:50 Close of Day

## THURSDAY, DECEMBER 14

8:30 am Registration and Morning Coffee

9:00 Organizer's Remarks

### DIAGNOSTICS & MODELING

9:05 Chairperson's Remarks

Mona Faraji-Niri, PhD, Assistant Professor, Energy Systems, Energy Innovation Centre, University of Warwick

9:10 How to Double Charge Speed by Understanding the Battery



Daniel Higgs, PhD, Director of Revenue, Business Development, Iontra Inc





# Battery Intelligence for Automotive Applications

Using Machine Learning and Artificial Intelligence to Optimize Battery Development from Materials to Manufacturing

This presentation will discuss why most advanced charging technologies fall short of fully maximizing the performance of today's batteries. We will present a case for the need to understand how current flows through a battery system and why this is critical for a cost-effective and scalable advanced charging solution that achieves double the charge speeds (without negatively affecting cycle life).

## 9:30 Fast and Reliable SOH Estimation with a Hybrid Diagnostic Algorithm

*Yeong Yoo, Research Officer, Energy Mining & Environment Research Center, National Research Council Canada*

A fast, accurate, and reliable SOH diagnostic algorithm based on a combination of time-domain diagnostics, parameterization, and machine learning (ML)-based regression and optimization will be presented. This unique algorithm can be utilized for a variety of applications such as mobile, stationary, marine, aviation, and EVSE, etc.

## 9:50 Advances in Multiscale Modelling of Electrochemical Systems

*Manan Pathak, PhD, Co-Founder & CEO, BattGenie, Inc.*

Model-based Battery Management System (BMS) can be used to improve the performance of current and next-generation lithium batteries. Recent results for life improvement, reduction in charging time for cells, packs, and modules, and next-generation batteries will be presented. The importance of physics-based electrochemical models, suitable algorithms, and experimental validation will be discussed.

## 10:10 Equivalent Circuit Model Uncertainty Quantification for Robust SoC Estimation

*Modjtaba Dahmardeh, Senior Battery Algorithms and Controls Engineer, Systems Engineering, AMP*

State estimation is the most significant element to ensure safety, performance, and extended lifetime in battery management systems. Kalman Filter-based methods are the most robust and reliable in literature and industry. Nevertheless, these methods have shortcomings, such as reduced accuracy for batteries with flat and non-monotonically increasing OCV-SOC relationships. Learn how a model bias characterized Kalman filter will eradicate these issues.

## 10:30 MODERATED Q&A: Session Wrap-Up

*Moderator: Mona Faraji-Niri, PhD, Assistant Professor, Energy Systems, Energy Innovation Centre, University of Warwick*

*Panelists:*

*Daniel Higgs, PhD, Director of Revenue, Business Development, Iontra Inc*  
*Yeong Yoo, Research Officer, Energy Mining & Environment Research Center, National Research Council Canada*  
*Manan Pathak, PhD, Co-Founder & CEO, BattGenie, Inc.*  
*Modjtaba Dahmardeh, Senior Battery Algorithms and Controls Engineer, Systems Engineering, AMP*

## 10:45 Coffee Break in the Exhibit Hall with Poster Viewing

## BATTERY INTELLIGENCE FOR MANUFACTURING AND BEYOND

### 11:45 Chairperson's Remarks

*Mona Faraji-Niri, PhD, Assistant Professor, Energy Systems, Energy Innovation Centre, University of Warwick*

### 11:50 Battery Intelligence: Why You Can't Afford to Wait

*Eli Leland, PhD, CTO and Co-Founder, Voltaiq, Inc.*

This talk will illuminate how companies can't afford to wait, as battery intelligence delivers immediate ROI and is in fact the key to accelerating in the midst of developing supply chains, evolving chemistries, and ever more demanding applications.

## 12:10 pm Explainable Machine Learning for Lithium-ion Battery Manufacturing

*Mona Faraji-Niri, PhD, Assistant Professor, Energy Systems, Energy Innovation Centre, University of Warwick*

Using AI and ML for lithium-ion battery modeling while answering questions regarding the predictability and accuracy of the models at various stages of manufacturing, leave the manufacturer with a black box model hard to explain. The XAI and XML have a significant roll in shedding some light on the model by explaining how the decision is made and how the values are predicted.

## 12:30 Cut Battery Development Time and Cost through Virtual Testing and Digital Labs

*Gerald Sammer, PhD, Principal Business Development Manager, Integrated & Open Development Platform, AVL List GmbH*

Testing hundreds or thousands of batteries and cells simultaneously in a multi-vendor lab is a huge challenge and time consuming. Efficient processes and an open toolchain for automated scheduling, monitoring, energy management, and data analytics are the key to success as part of that virtual testing can cut development time and cost, e.g., with model-based cell aging prediction or AI-based battery fleet data modelling.

## 12:50 MODERATED Q&A: Session Wrap-Up

*Moderator: Mona Faraji-Niri, PhD, Assistant Professor, Energy Systems, Energy Innovation Centre, University of Warwick*

*Panelists:*

*Eli Leland, PhD, CTO and Co-Founder, Voltaiq, Inc.*

*Gerald Sammer, PhD, Principal Business Development Manager, Integrated & Open Development Platform, AVL List GmbH*

## 1:05 Networking Lunch (Sponsorship Opportunity Available)

## 2:00 Dessert Break in the Exhibit Hall with Poster Viewing – Last Chance for Viewing (Sponsorship Opportunity Available)

## MODELING

### 2:30 Chairperson's Remarks

*Eli Leland, PhD, CTO and Co-Founder, Voltaiq, Inc.*

### 2:35 Integrating Physics-Based Modelling with Machine Learning for Lithium-ion Batteries

*Huazhen Fang, PhD, Associate Professor, Mechanical Engineering, University of Kansas*

Despite their merits, lithium-ion batteries still face significant performance and safety bottlenecks. Physics-informed machine learning has proven as a useful way to make batteries work better, and live up to their potential. In this talk, we will share our explorations on this topic, especially for modelling and condition monitoring for lithium-ion battery systems. We will further discuss prospective opportunities and challenges.

### 2:55 Battery Health Prognostics with Transfer Learning

*Yunhong Che, Aalborg University*

The effectiveness of various transfer learning strategies for performance improvement in battery health prognostics will be discussed in light of the accessibility of operating data and capacity labels. The fundamental concept and the applicability of various transfer-learning strategies will be shown. Specifically, the sparsely labeled data fine-tuning, unsupervised domain adaptation, and no source labeled data condition-driven self-supervised strategy will be discussed in this presentation.

### 3:15 Sponsored Presentation (Opportunity Available)



# Battery Intelligence for Automotive Applications

Using Machine Learning and Artificial Intelligence to Optimize Battery Development from Materials to Manufacturing

### 3:35 MODERATED Q&A: Session Wrap-Up

Moderator: *Eli Leland, PhD, CTO and Co-Founder, Voltaiq, Inc.*

Panelists:

*Huazhen Fang, PhD, Associate Professor, Mechanical Engineering, University of Kansas*

*Yunhong Che, Aalborg University*

### 3:50 Networking Refreshment Break

## BATTERY MANAGEMENT

### 4:00 Advanced Battery Management System for EV Application

*Saeid Habibi, PhD, Professor Mechanical Engineering, Center for Mechatronics & Hybrid Technologies, McMaster University*

This study presents a comprehensive review of the latest developments and technologies in battery characterization and their application in Battery Management Systems (BMS) for Electric Vehicles (EV).

### 4:20 Pulse Injection-Aided Machine Learning for Battery Pack State Estimation

*Matthias Preindl, PhD, Assistant Professor, Electrical Engineering, Columbia University*

Lithium-ion (LIB) battery degradation is often characterized at three distinct levels: mechanisms, modes, and metrics. ML can provide a unique multi-level perspective on characterizing LIB degradation and it can improve accuracy especially when combined with perturbation techniques. This pulse injection aided machine learning (PIAML) technique can be used for battery diagnostic and prognostics with high fidelity. LIB management systems can leverage this estimation framework to extend lifetime and reduce costs.

### 4:40 MODERATED Q&A: Session Wrap-Up

Moderator: *Eli Leland, PhD, CTO and Co-Founder, Voltaiq, Inc.*

Panelists:

*Saeid Habibi, PhD, Professor Mechanical Engineering, Center for Mechatronics & Hybrid Technologies, McMaster University*

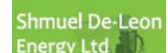
*Matthias Preindl, PhD, Assistant Professor, Electrical Engineering, Columbia University*

### 4:55 Close of Conference

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# Advances in Production & Automation for Global Battery Manufacturing

## Maximizing Production Efficiency & Quality to Deliver on Global Demand

WEDNESDAY, DECEMBER 13

**7:45 am Registration Open****2:00 pm Organizer's Welcome Remarks***Craig Wohlers, Executive Director, Conferences, Cambridge EnerTech*

### INNOVATION IN MANUFACTURING PRODUCTION

**2:05 Chairperson's Remarks***Ken Hoffman, Senior Expert, EV Battery Value Chain, McKinsey & Co.***2:10 Recent Progress of Na-ion Batteries and It's Commercial (EDV and ESS) Applications and Adaptability to Existing Battery Manufacturing Production Lines***John Zhang, PhD, CTO/CSO, Polypore International LP*

Na-ion is produced in relatively large scale at the Li-ion production line. Car with 500Km/percharge and \$8300 for 4 person is on sale now. Expect to reduce the battery price by another 50% within 2 years. ESS is running 2 years now with 1MWh station.

**2:30 Improvement of the Weld Joint in Ultrasonic Welding by Laser Structuring of the Current Collectors***Hakon Gruhn, Research Associate, Technical University of Braunschweig*

A limiting factor in the manufacture of high-capacity cells in pouch format is the internal contacting of the current collectors with the arrester tab. Ultrasonic welding has proven to be a robust and quality-assured process there.

**2:50 Upscaling of 3D Electrode Architectures for High-Performance EV Batteries***Wilhelm Pflöging, PhD, Head of Group Laser Materials Processing/Lithium-Ion Batteries, Institute for Applied Materials (IAM-AWP), Karlsruhe Institute of Technology (KIT)*

3D architectures in high-mass-loaded electrodes have significant impact for electrochemical performance of lithium-ion batteries, such as cycle lifetime, lithium-plating, cell degradation, and high-rate capability. Fast charging and high power operation for high energy batteries with thick-film electrodes becomes possible. Ultrafast laser structuring of cathodes and anodes in roll-to-roll processes is currently being upscaled to push this technology towards TRL6 and beyond.

**3:10 MODERATED Q&A: Session Wrap-Up***Moderator: Ken Hoffman, Senior Expert, EV Battery Value Chain, McKinsey & Co.***Panelists:***John Zhang, PhD, CTO/CSO, Polypore International LP**Hakon Gruhn, Research Associate, Technical University of Braunschweig**Wilhelm Pflöging, PhD, Head of Group Laser Materials Processing/Lithium-Ion Batteries, Institute for Applied Materials (IAM-AWP), Karlsruhe Institute of Technology (KIT)***3:25 Refreshment Break in the Exhibit Hall with Poster Viewing***(Sponsorship Opportunity Available)***4:10 Advanced Fiber-Based Silicon Anode Designed for Performance and Scalability***Cameron Peebles, PhD, Battery Technical Manager, Alkegen*

In this talk, Alkegen will report on two things: 1) the rapid progression in material scaling and US-based manufacturing of SiFAB silicon anode materials in New Carlisle, IN, and 2) cell performance of the manufactured SiFAB silicon anode material with respect to rate capability, fast charge, swelling, and cycle life.

**4:30 Automated Leak & Integrity Testing of Batteries***Thomas Schwoerer, President, ZELTWANGER Leak Testing & Automation*

Giga factories require highly effective leak tests for cell packs and trays to catch up with China. This presentation shows solutions to advance the throughput of modern factories and fundamental principles of testing. Newest principles accelerate the high volume production and ensure batteries are safe and leak-proof. This presentation illustrates the physical principles and their practical application in machinery to build modern Li-ion batteries.

**4:50 Integrated Traceability and Quality Concept in Battery Cell Production and Implications for the U.S. Market***Bill Kephart, Associate Partner, P3 USA Inc*

Many cell manufacturers struggle with major obstacles while striving to achieve their announced production capacities. Especially, quality losses during the initial years of operations significantly impact the business plan. The major challenge for the cell manufacturers and equipment suppliers is to identify these potential quality threats and mitigate the risks.

**5:10 How in-line high-resolution ultrasound boosts yield, shrinks inventory, accelerates ramp-up and saves CAPEX.***Julian Bourne, VP of Sales and Business Development, Titan Advanced Energy Solutions*

Imagine being able to see morphologically within a cell. You'd be able to identify the tiniest imperfections that lead to voltage drop, elevated resistance, low capacity or accelerated aging. What if you could more precisely predict the cell's capacity without cycling? Learn how ultrasound is a transformational approach to gigafactory operations, planning and scaling.

**5:30 MODERATED Q&A: Session Wrap-Up***Moderator: Ken Hoffman, Senior Expert, EV Battery Value Chain, McKinsey & Co.***Panelists:***Cameron Peebles, PhD, Battery Technical Manager, Alkegen**Thomas Schwoerer, President, ZELTWANGER Leak Testing & Automation**Bill Kephart, Associate Partner, P3 USA Inc**Julian Bourne, VP of Sales and Business Development, Titan Advanced Energy Solutions***5:50 Close of Day**

THURSDAY, DECEMBER 14

**8:30 am Registration and Morning Coffee****9:00 Organizer's Remarks***Craig Wohlers, Executive Director, Conferences, Cambridge EnerTech*

### INNOVATION IN MANUFACTURING PRODUCTION

**9:25 Chairperson's Remarks***Cameron Peebles, PhD, Battery Technical Manager, Alkegen***9:30 Preparation for the Near-Future: Market & Technical Planning of the Asian xEV LIB Manufacturers***Mark H. L. Lu, PhD, Senior Industrial Analyst, Industrial Economics & Knowledge Center, Industrial Technology Research Institute*

This presentation will provide an overview of the above cell-makers' planning, especially covering both the technical comparison, market, and product segmentation to show the future development in Asian xEV LIB Manufacturers.

**9:50 Unleashing the Potential of Smart Gigafactories***Katharina Gerber, PhD, Account Development for Battery Vertical, Siemens Digital Industries Software*

A dive into the realm of Smart Gigafactories, where the convergence of cutting-edge technologies sets the stage for a battery production revolution. Presentation will explore the transformative power of Digital Twins, granting an unprecedented

# Advances in Production & Automation for Global Battery Manufacturing

## Maximizing Production Efficiency & Quality to Deliver on Global Demand

insight and control over manufacturing processes. The speaker will demonstrate how seamless integration of automation can maximize efficiency and reduce scrap rate.

### 10:10 Application of Ultrasonic Testing in Lithium Battery Safety

Tsing Bosch

*Yong Xiang, Ph.D, Material Processing Engineering, Professor-Level Senior Engineer, R&D, Tsinghua University*

Ultrasonic technology's detection capabilities in the lithium battery cell manufacturing process, such as electrolyte wetting, gas generation, lithium precipitation, SOC and SSOH estimation, and solid-state battery curing degree, have been widely recognized and applied. Furthermore, it offers an effective method for evaluating the quality of tab and tab-to-terminal welding in module and pack assembly processes.

### 10:30 MODERATED Q&A: Session Wrap-Up

*Moderator: Cameron Peebles, PhD, Battery Technical Manager, Alkegen*

*Panelists:*

*Mark H. L. Lu, PhD, Senior Industrial Analyst, Industrial Economics & Knowledge Center, Industrial Technology Research Institute*

*Katharina Gerber, PhD, Account Development for Battery Vertical, Siemens Digital Industries Software*

*Yong Xiang, Ph.D, Material Processing Engineering, Professor-Level Senior Engineer, R&D, Tsinghua University*

### 10:45 Coffee Break in the Exhibit Hall with Poster Viewing

### 11:50 Basic Characterization of Inductive and Conductive Electrode Drying for Lithium-ion Battery Production

*Tobias Krueger, Research Associate, Technical University of Braunschweig*

This study focuses on the development and prototypical implementation of two new drying processes based on electromagnetic induction and conductive heating. Based on the results, the transferability of the already known influence of the convective heating process on the properties of the electrodes to the inductive and conductive heating processes is evaluated.

### 12:10 pm Automated Quality Control of Ultrasonically Welded Cell Foil Tab Using Eddy Current

*Anthony Krause, NDT Engineer, InspecTech*

Eddy current is shown to be a feasible non-destructive testing technique for automated quality control of cell foil tabs that have been ultrasonically welded. The technique identifies over-welding, under-welding, missing foils, and lack of fusion.

## INNOVATION IN SOFTWARE DEVELOPMENT FOR MANUFACTURING

### 12:30 Software-Defined Imaging: AI Visual Inspection for Improved Quality & Yield

*Keven Wang, Co-Founder & CEO, UnitX*

80% of the challenge in machine vision is lighting. A good lighting, when coupled with state-of-the-art AI software, solves visual inspection with low false acceptance and false rejection. This talk covers the advances in lighting and unique approaches to imaging.

### 12:50 MODERATED Q&A: Session Wrap-Up

*Moderator: Cameron Peebles, PhD, Battery Technical Manager, Alkegen*

*Panelists:*

*Tobias Krueger, Research Associate, Technical University of Braunschweig*

*Anthony Krause, NDT Engineer, InspecTech*

*Keven Wang, Co-Founder & CEO, UnitX*

### 1:05 Networking Lunch (Sponsorship Opportunity Available)

### 2:00 Dessert Break in the Exhibit Hall with Poster Viewing – Last Chance for Viewing (Sponsorship Opportunity Available)

## INNOVATION IN MANUFACTURING PRODUCTION

### 2:30 Chairperson's Remarks

*Keven Wang, Co-Founder & CEO, UnitX*

### 2:35 Enhanced Li-Ion Battery Performance Through Commercially Viable High Performance Carbon Nanotubes

*Michael Fetcenko, Executive Chairman, CHASM Advanced Materials*

The potential technical advantages of carbon nanotubes for many applications have been recognized, including for battery applications. Commercial application has been hindered by the practical obstacles of manufacturing process scaling at viable cost. CHASM's unique approach to producing CNT materials will be presented, along with performance results and production status.

## OVERCOMING THE PITFALLS TO GIGAFACTORY CONSTRUCTION

### 2:55 Battery Gigafactory Construction, Planning, and Execution Success Factors

*Matt Oswalt, EV Battery Expert, McKinsey & Company*

The rapidly growing EV market has incited an equally accelerated need for the construction of battery gigafactories, which are critical components in closing the supply-demand gap for energy storage. Building these gigafactories demands careful planning, almost flawless execution, and a deep understanding of the construction landscape, material and equipment supply chains, and team culture.

### 3:15 MODERATED Q&A: Session Wrap-Up

*Moderator: Keven Wang, Co-Founder & CEO, UnitX*

*Panelists:*

*Michael Fetcenko, Executive Chairman, CHASM Advanced Materials*

*Matt Oswalt, EV Battery Expert, McKinsey & Company*

### 3:50 Networking Refreshment Break

## WORKFORCE DEVELOPMENT, INCENTIVES & POLICIES FOR MANUFACTURING GROWTH

### 4:00 Battery Industry Clusters: How Policies, Incentives, and Workforce Guide Where We Grow

*Nathaniel Dick, Business Development Manager, Economic Development Partnership of North Carolina EDPNC*

A deeper dive from the state-level perspective of the new policies built to encourage industry growth as well as an introduction to the incentives and workforce training programs commonly used to attract and grow the battery industry.

### 4:20 Digital Twins for Efficient Training of Engineers and Operators in Battery Manufacturing

*Alejandro A. Franco, PhD, Professor, Reactivity & Chemistry of Solids Lab, University of Picardie Jules Verne*

The manufacturing process of lithium-ion batteries is a complex procedure that encompasses multiple steps and various parameters. It is crucial to develop tools that can facilitate the preparation of future gigafactory workers for this intricate task. In this presentation, I will introduce a series of innovative virtual reality digital twins that have been developed in my research group.

### 4:40 MODERATED Q&A: Session Wrap-Up

*Moderator: Keven Wang, Co-Founder & CEO, UnitX*

*Panelists:*

*Nathaniel Dick, Business Development Manager, Economic Development Partnership of North Carolina EDPNC*

*Alejandro A. Franco, PhD, Professor, Reactivity & Chemistry of Solids Lab, University of Picardie Jules Verne*

### 4:55 Close of Conference

# HYDROGEN & FUEL CELLS

CO-LOCATED WITH **aabc** advanced  
automotive  
battery  
conference

WEDNESDAY, DECEMBER 13

7:45 am Registration Open

2:00 pm Organizer's Welcome Remarks

*Victoria Mosolgo, Conference Producer, Cambridge EnerTech*

## HYDROGEN INFRASTRUCTURE

2:15 Chairperson's Remarks

*Leslie Goodbody, Engineer, California Air Resources Board*

2:20 Fuel Cell World View

*Jackie Birdsall, Senior Engineering Manager, Toyota Motor North America*

Advancing the energy transition from the front lines of the Automotive and Regulatory Advocacy space, and helping Toyota achieve its environmental and sustainability targets.

2:50 Infrastructure and Hydrogen Hubs

*Leslie Goodbody, Engineer, California Air Resources Board*

Examining the intersection of modern infrastructure development and the emerging hydrogen economy, this talk covers the establishment of hubs leveraging hydrogen's clean energy potential. Emphasizing its pivotal role in decarbonizing diverse sectors, the discussion also addresses the accompanying infrastructure complexities and prospects for a sustainable future.

3:20 Refreshment Break in the Exhibit Hall with Poster Viewing

*(Sponsorship Opportunity Available)*

## HYDROGEN PRODUCTION

4:10 Hydrogen—The Flexible Energy Source to Accelerate Decarbonization

*Juan Carlos Galdamez, Director, Customer Programs, Plug Power*

The versatility of hydrogen as a catalyst for accelerated decarbonization is explored. This discussion goes into hydrogen's diverse applications and pivotal role in the clean energy transition, offering insights into its potential to drive a sustainable, low-carbon future.

4:40 Carbon Intensity of Hydrogen Production and End-Use Applications with the GREET Model

*Pradeep Vyawahare, PhD, Energy Systems Analyst, Argonne National Laboratory*

This presentation will provide an overview of well-to-gate carbon intensity of hydrogen production using the Greenhouse gases, Regulated Emissions, and Energy use in Technologies (GREET) model, developed by Argonne National Laboratory (ANL). The presentation will cover decarbonization potential of various end use applications of clean hydrogen supply.

5:10 Houston To Los Angeles (H2LA) – I-10 Hydrogen Corridor Project

*Bart Sowa, Research and Development, Manager, GTI Energy*

5:10 Close of Day

THURSDAY, DECEMBER 14

8:30 am Registration and Morning Coffee

## COST MODELING

9:15 Chairperson's Remarks

*Michael Harenbrock, PhD, Principal Expert, Engineering Electric Mobility, MANN+HUMMEL GmbH*

9:20 Cost-Effective Infrastructure Deployment

*Michael C. Lewis, Senior Engineering Scientist, Center for Electromechanics, University of Texas, Austin*

Hydrogen is a versatile clean energy carrier that can help solve the world's future energy needs where equitable access to low-carbon energy sources are needed to mitigate the impacts of climate change. Mr. Lewis will provide an overview of the role and potential for hydrogen energy storage, including UT's efforts on a DOE H2@Scale demonstration project where his team is developing a first-of-its-kind hydrogen proto-hub.

9:40 How to Solve the Conundrum of Cost Reduction and Prolonged Lifetime in PEM Fuel Cell Systems

*Michael Harenbrock, PhD, Principal Expert, Engineering Electric Mobility, MANN+HUMMEL GmbH*

This presentation will explain and demonstrate the market product approach and provide a detailed perspective on filtration and separation in PEM fuel cell systems and beyond.

10:10 PEM Electrolyzers

*Iryna V. Zenyuk, Associate Professor, Chemical & Biomolecular Engineering, University of California Irvine*

Decarbonization of the transportation sector is critical to achieve net-zero emissions economy by 2050. Department of Energy (DOE) has issued Hydrogen Shot aiming to produce 1 kg of hydrogen for \$1 in 1 decade. This target is ambitious, as currently the challenges of electrolyzers' cost, durability, and scale-up to MW-scale need to be addressed. Proton exchange membrane water electrolyzers (PEMWEs) are promising technologies to reach these targets.

11:00 Coffee Break in the Exhibit Hall with Poster Viewing

## MEDIUM & HEAVY-DUTY APPLICATIONS

11:45 Chairperson's Remarks

*Conghua Wang, PhD, CTO, TreadStone Technologies*

11:50 H2@Rescue: A Novel Fuel Cell-Powered Emergency Vehicle  
*Nicholas M. Josefik, Mechanical Engineer, US Army Construction Engineering Research Lab*

H2@Rescue, our zero-emission fuel cell-powered emergency vehicle capable of driving 180 miles round trip, providing 25 kW load-following exportable power for 72 hours on a single tank of hydrogen. The boxed bed is climate-controlled and acts as a mobile command center or warming/cooling shelter. H2@Rescue, which produces water for use during the emergency, is a class 7 medium-duty truck weighing ~33,000 lbs. carrying 176kg of hydrogen at 700bar.

DECEMBER 13 - 14, 2023 SAN DIEGO, CA

# HYDROGEN & FUEL CELLS

CO-LOCATED WITH  advanced  
automotive  
battery  
conference

## 12:20 pm Toyota HD Truck Related Activities

*Genis Turon, PhD, Senior Principal Engineer, Vehicle Electrification, Toyota North America*

Hydrogen fuel cells are becoming the zero-emission technology of choice for heavy-duty longer-range applications. Toyota will give an overview of the development history as well as information on their latest efforts towards commercialization of next-generation hydrogen fuel cell products.

## 12:50 Networking Lunch *(Sponsorship Opportunity Available)*

**2:00 Dessert Break in the Exhibit Hall with Poster Viewing – Last Chance for Viewing** *(Sponsorship Opportunity Available)*

## ELECTROLYSIS

### 2:30 Chairperson's Remarks

*Conghua Wang, PhD, CTO, TreadStone Technologies*

### 2:35 Low-Cost Metal Substrate Coatings for Electrolysis

*Conghua Wang, PhD, CTO, TreadStone Technologies*

Advancements in the development of cost-effective coatings for metal substrates in electrolysis processes will be covered. We introduce innovative techniques and materials that promise to enhance the efficiency and affordability of critical hydrogen production methods.

### 3:05 Electronic Structure Studies of Graphene and Graphene Based Functional Materials by Soft X-Ray Absorption Spectroscopy and Spectromicroscopy at Canadian Light Source

*Jigang Zhou, PhD, Senior Industrial Scientist, Industry Services, Canadian Light Source, Inc.*

Understanding graphene's electronic structure for fuel cells is crucial. X-ray absorption (XANES) offers insights into chemistry. Soft X-rays yield surface (5-10 nm) and subsurface (100 nm) details, even operando. Scanning transmission X-ray microscopy (STXM) provides nanoscale chemical imaging, linking structure to performance. This talk at CLS highlights XANES and STXM/PEEM, focusing on C and O K-edge and transition metal L-edge XANES for non-precious metal fuel cell catalysts.

### 3:35 Enhanced Water Electrolysis Using Layered Coaxial Nanowire Electrodes

*Jacob S. Spendelow, Scientist, Los Alamos National Laboratory*

To enhance hydrogen production efficiency in PEM water electrolyzers, the innovative Layered Coaxial Nanowire Electrode (LCANE) has surfaced. LCANE electrodes incorporate vertically-aligned coaxial nanowires adorned with Pt and IrO<sub>2</sub> clusters on the Pt shell, improving electronic conductivity and transport efficiency. Remarkably, LCANE achieves a significant reduction in Ir loading, as low as 0.1 mg/cm<sup>2</sup>, without compromising performance, offering a compelling avenue for advancing PEM electrolysis technology.

### 4:05 Close of Conference

# ➔ Join us in San Diego!

## CONFERENCE VENUE & HOST HOTEL

Town & Country Resort

500 Hotel Circle North

San Diego, CA 92108 USA

Discounted Room Rate: \$219

Discounted Room Rate Cut-off Date: November 7, 2023

For hotel reservations,  
please go to the Travel page of  
[AdvancedAutoBat.com/US](https://AdvancedAutoBat.com/US)

### Top Reasons to Stay at Town & Country Resort

- No Commute! The conference is taking place at the same location.
- A beloved landmark since 1953, the resort has recently completed a multimillion-dollar transformation, renovating everything from top-to-bottom and adding a host of new restaurants and amenities.
- Modern guestrooms, chef-driven dining, and a sprawling pool complex.
- Access to all San Diego has to offer. With a central location in Mission Valley, you're adjacent to luxury shopping and golf, and within minutes of the airport, beautiful beaches, hiking, biking and world-class attractions.



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