

FINAL DAYS TO REGISTER

FINAL AGENDA



20th ANNUAL
**advanced
automotive
battery
conference**

NOVEMBER 3 - 5, 2020

2000 - 2020

CELEBRATING

20 YEARS

AdvancedAutoBat.com/US

2020 PROGRAMS

Tuesday and Wednesday, November 3-4

SYMPOSIA



CHEMISTRY



ENGINEERING



SPECIALTY EV



BATTERY
INTELLIGENCE

Wednesday and Thursday, November 4-5

CONFERENCES



XEV



RAW MATERIALS

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CLARIOS

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November 4 - 5, 2020

Tutorials*

WEDNESDAY, NOVEMBER 4 12:30-2:00 PM

TUT1: Solid State Batteries

Instructor:
Jeffrey Sakamoto, PhD, Associate Professor, Mechanical Engineering, University of Michigan
While recent efforts in developing solid-state batteries have focused on finding new electrolytes with ever-higher conductivity, at present, several types of solid electrolytes and active materials exhibit promising performance characteristics to enable a step change in energy density and safety. The next phase in solid-state battery technology involves solid electrolyte-solid electrode integration and prototype testing. Of particular importance is the stability and kinetics of the Li metal electrode interface. These and several other aspects will comprise this holistic perspective on cutting-edge solid-state battery development.

WEDNESDAY, NOVEMBER 4 2:30-4:00 PM

TUT2: Improving the Energy Density of Batteries with Silicon-Based Anodes

Instructor:
Dee Strand, PhD, CSO, R&D, Wildcat Discovery Technologies Inc.
This tutorial gives an overview on the benefits and challenges of using silicon-based anodes to improve the energy density of lithium-ion batteries.

WEDNESDAY, NOVEMBER 4 4:30-6:00 PM

TUT3: Managing and Understanding the Risks of Li-Ion Battery Safety

Instructor:
Brian M. Barnett, PhD, President, Battery Perspectives
This tutorial provides insights regarding processes that lead to thermal runaway in Li-ion cells, why all thermal runaway processes are not the same and how thermal runaway can be better understood and managed. There are fundamental differences between how cells respond to various stresses and, unfortunately, still too-common misunderstandings of the causes of thermal runaway. These misunderstandings can seriously complicate battery safety management. The tutorial continues to provide the basis for a clearer understanding of cell-level processes that result in thermal runaway.

THURSDAY, NOVEMBER 5 8:00-9:30 AM

TUT4: Battery Safety and Abuse Tolerance Validation

Instructor:
Shmuel De-Leon, CEO, Shmuel De-Leon Energy Ltd.
Batteries have become daily use components for many applications. New growing segments like EV and grid storage batteries extend the traditional ordinary battery applications. In the race for energy density, we shouldn’t forget the safety – as an example, the Samsung Galaxi Note 7 battery safety case. Unfortunately, we face daily safety events with injuries and severe damage. The tutorial focuses on portable, stationary and automotive battery safety along the battery cycle life (acceptance, testing, assembly, use, transportation and disposal). The training incorporates Shmuel De-Leon’s and other experiences on battery safety representing over 26 years of work in the field. The motivation behind the training is to provide attendees with the knowledge needed to safely handle the batteries in their organization and to support reduction in safety events.

THURSDAY, NOVEMBER 5 10:00-11:30 AM

TUT5: The Rechargeable Battery Market: Value Chain and Main Trends 2019-2030

Instructor:
Michael L. Sanders, Senior Advisor, Energy, Avicenne
This tutorial will present the +10-year automotive market forecasts from Avicenne and other analysts (micro|Hybrid|P-HEV|EV). Other coverage will include car makers’ strategies and advanced energy storage (advanced lead acid|NiMH|LIB). Additionally, LIB design for P-HEV & EV markets (cylindrical, prismatic, pouch cells) and LIB cell, module & pack cost structure 2019-2030 will be discussed.

THURSDAY, NOVEMBER 5 12:00-1:30 PM

TUT6: Materials for Next-Generation Batteries

Instructor:
George Crabtree, PhD, Director, Joint Center for Energy Storage Research (JCESR), Argonne National Laboratory
This tutorial will cover the materials and performance challenges for next-generation batteries for electric vehicles and the electricity grid. The needs and use cases for storage in these two applications will be analyzed, and the possibilities of advanced lithium-ion, lithium-sulfur and multivalent batteries for vehicles will be presented. Lithium and magnesium anodes, wide electrochemical window electrolytes and high voltage cathodes will receive special attention. New discovery approaches based on materials simulation and statistical learning will be discussed.

THURSDAY, NOVEMBER 5 2:00-3:30 PM

TUT7: Battery Pack Engineering for xEVs

Instructor:
Kevin Konecky, Director, Battery Systems, Fisker, Inc.
This tutorial will give an overview of battery systems design. An overall product development process will be discussed for a typical system. Design aspects of each individual subsystem will be explored with cost impacts of different design choices. Testing, validation and designing for safety will be other key areas of discussion.

THURSDAY, NOVEMBER 5 4:00-5:30 PM

TUT8: Battery Data Science for Automotive Applications

Instructor:
Tal Sholkapper, CEO & Co-Founder, Voltaiq
From the manufacturing floor to on-board vehicle diagnostics, each battery represents a potentially valuable stream of data. This tutorial will focus on a broad survey of “data science” tools that can help make these data streams useful.



Battery Chemistries for Automotive Applications

Recent Advancements in Battery Chemistries

TUESDAY, NOVEMBER 3

LITHIUM METAL AND LITHIUM-ION BATTERIES

9:00 am Engineering Lithium Metal Surface to Enable Long-Term Cycling with Carbonate-Based Electrolytes

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

9:20 Perspectives on the Opportunity and Challenge of Solid-State Automotive Batteries

Forrest Gittleson, PhD, Cooperations Manager & Senior Engineer, Battery Technology, BMW Group

While planning for future generations of automotive batteries, one must consider the viability of new cell technologies versus the anticipated state-of-the-art. Solid-state lithium batteries promise enhanced energy density and safety, yet they will be subject to the same set of requirements as forthcoming lithium-ion cells. Practical demonstrations are needed to validate the promised features. This presentation will provide a car manufacturer's perspective on the challenges these concepts must still overcome.

9:40 Battery 500 Consortium: Understanding and Addressing the Fundamental Challenges in Rechargeable Lithium Metal Batteries

Jie Xiao, PhD, Chief Scientist, Pacific Northwest National Laboratory

Although many approaches have been proposed to rescue Li metal anodes, most of the work has not been further validated at practically relevant conditions. This talk will start from the origin of uneven deposition of Li metal from the electrochemical point of view, followed by the discussion of developing a testing protocol to effectively validate new concepts for industry adaptation.

10:00 Coffee Break - View Our Virtual Exhibit Hall

10:20 Outlining the Faraday Institution's Integrated UK-wide Research Projects to Make Step Changes in Battery Chemistries and Systems to Improve Performance of Electric Vehicles

Peter G. Bruce, PhD, Wolfson Chair & Professor, Materials, University of Oxford

10:40 High-Energy-Density, Solid-Electrolyte-Based, Liquid Li-S and Li-Se Batteries

Yi Cui, PhD, Professor, Department of Materials Science & Engineering, Stanford University

Lithium-sulfur (Li-S) and Lithium-selenium (Li-Se) batteries are considered as promising candidates for next-generation battery technologies, as they have high energy density and low cost. However, due to the use of a solid Li-metal anode and a liquid organic electrolyte, the current Li-S and Li-Se batteries face several issues in terms of Coulombic efficiency and cycling stability, which have seriously impeded their development. We report solid-electrolyte-based, liquid Li-S and Li-Se batteries.

11:00 GEMX Cathode Platform, Applications (gLNO, gNMC, gNCA), and Extensions

Kenan Sahin, Ph.D., President, CAMX Power

CAMX has focused on high nickel cathode materials for over a decade, engineering the interior of the secondary particle, and receiving global patents for the inventions. We will motivate the need to enhance existing materials with the GEMX cathode platform, describe pathways to lower cobalt, highlight applications, and introduce extensions.



11:20 MODERATED Q&A: Session Wrap-Up

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

Panelists:

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

Forrest Gittleson, PhD, Cooperations Manager & Senior Engineer, Battery Technology, BMW Group

Jie Xiao, PhD, Chief Scientist, Pacific Northwest National Laboratory

Peter G. Bruce, PhD, Wolfson Chair & Professor, Materials, University of Oxford

Yi Cui, PhD, Professor, Department of Materials Science & Engineering, Stanford University

Kenan Sahin, Ph.D., President, CAMX Power

11:50 Lunch Break - View Our Virtual Exhibit Hall

ELECTROLYTES

12:20 pm Drop-In Materials' Technologies for Higher Energy and Safer Batteries

Gleb Yushin, PhD, CTO, Co-Founder, Sila Nanotechnologies; Professor, Georgia Institute of Technology

Advancements of Li-ion batteries slowed down over the last decade. As intercalation-type electrode materials approach theoretical limits, battery energy density gains come as trade-offs in safety or performance. I will delve into how to boost energy density and safety by implementing disruptive materials' technologies, discuss challenges with the development of new conversion-type materials compatible with battery production facilities, and the transition from academic studies to material manufacturing at large scale.

12:40 400Wh/Kg Is Here, a Practical Approach to Solid-State Lithium Metal Cells

Qichao Hu, PhD, Founder & CEO, SolidEnergy Systems Corp.

In semiconductors, there's Moore's Law, where the number of transistors doubles every 18 months; in battery, energy density doubles every 30 years. Li-metal cells can double energy density of conventional Li-ion. SolidEnergy has been developing a unique electrolyte system that enables Li-metal to perform safely and reliably at more than 400 Wh/kg. It has also built and demonstrated Li-metal at pilot scale, validated by customers in drones and electric vehicles.

1:00 Transitioning Solid-State Batteries from Lab to Market

Jeffrey Sakamoto, PhD, Associate Professor, Mechanical Engineering, University of Michigan

There is tremendous interest in making the next super battery, but state-of-the-art Li-ion technology is proven and has achieved widespread adoption. Supplanting Li-ion will require a battery technology that provides significant improvements in performance, safety, and cost. Recent material breakthroughs in Li metal solid-state electrolytes could enable a new class of non-combustible solid-state batteries (SSB), delivering twice the energy density (1,200 Wh/L) compared to Li-ion.

1:20 Sponsored Presentation (Opportunity Available)

1:40 Refresh Break - View Our Virtual Exhibit Hall

2:00 Solid-State Batteries: Composite Materials Formulations & Manufacturing Processes

Brian E. Hayden, PhD, Founder & CSO, Ilika Technologies

Ilika has developed solid-state lithium micro-batteries for deployment in biomedical, IoT, and other applications that benefit from autonomous sensing. Ilika is now engaged in the development of large-format, solid-state batteries targeting the automotive powertrain. The materials and manufacturing approach to achieve viable composite-layer, solid-state batteries will be presented, together with performance characteristics and our technical roadmap.

2:40 Beyond Dendrites: Cycling Li-Metal at High Current Density

Eric D. Wachsman, PhD, Professor & Director, Materials Science & Engineering, University of Maryland College Park

Solid-state Li-batteries are a transformational, intrinsically safe energy storage solution. However, progress has been limited by high solid-solid interfacial impedance, and reports of Li-dendrites and corresponding "critical current density". By surface modification to enable Li-metal wetting and fabricating tailored 3D microstructures using scalable ceramic techniques, we have overcome these limitations, achieving 10 mA/cm² room-temperature Li-cycling. Results for Li-metal anode/garnet-electrolytebased batteries with different cathode chemistries will be presented.

3:00 Printable Lithium Technology for Advanced Li-Ion and Solid-State Batteries Applications

Marina Yakovleva, MSc, MBA, Senior Global Commercial Manager, New Product and Technology Development, Livent

Livent has been supplying the Li-ion industry high-quality lithium products, including carbonate, hydroxide and metal, since the 1950s. To meet the world's growing demand for portable electronics, electric cars, and large-scale stationary storage facilities, Livent focuses R&D on testing and understanding new ways to improve energy storage and lithium delivery. Livent's printable lithium technology paves the way toward the commercialization of the next generation of advanced lithium-ion and solid-state batteries.

3:20 MODERATED Q&A: Session Wrap-Up

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

Panelists:

Gleb Yushin, PhD, CTO, Co-Founder, Sila Nanotechnologies; Professor, Georgia Institute of Technology

Qichao Hu, PhD, Founder & CEO, SolidEnergy Systems Corp.

Jeffrey Sakamoto, PhD, Associate Professor, Mechanical Engineering, University of Michigan

Brian E. Hayden, PhD, Founder & CSO, Ilika Technologies

Eric D. Wachsman, PhD, Professor & Director, Materials Science & Engineering, University of Maryland College Park

Marina Yakovleva, MSc, MBA, Senior Global Commercial Manager, New Product and Technology Development, Livent

3:50 Interactive Roundtable Discussions - View Our Virtual Exhibit Hall

Join your colleagues and fellow delegates for a focused, informal discussion moderated by a member of our speaking faculty. A small group format allows participants to meet potential collaborators, share examples from their own work and discuss ideas with peers.

ROUNDTABLE: Silicon Anodes and Cells

Benjamin Park, PhD, Founder & CTO, Enevate Corp.

- What is the maturity level of Si today?
- What different approaches are there with Si?
- What are the challenges and how can the industry work together to solve the problem?
- How does Si compare with other next-gen technologies such as solid-state/lithium metal?

ROUNDTABLE: Battery Failure Databank

William Q. Walker, PhD, Aerospace Technologist, NASA-Johnson Space Center

ROUNDTABLE: Electro-Magnetic Compatibility (EMC)



Challenges for Advanced BMS Design

Mark Gunderson, Engineering Manger, Electronics, Advanced Battery Systems, Clarios LLC

- How does EMC effect battery performance and safety?
- Why are there unique challenges to BMS EMC performance over other automotive systems?
- How can EMC risk be mitigated early in the product development cycle?
- What EMC performance improvement techniques can be employed in BMS design?

ROUNDTABLE: Battery Pack System Cost and Safety - Will Future xEV Battery Packs Increase in Complexity or Simplify and How Will Cost and Safety Be Impacted?

Kevin Konecky, Director, Battery Systems, Fisker, Inc.

- How will pack designs change to mitigate the increased failure modes of Nickel-rich chemistries?
- What materials might be added to increase safety?
- i.e. thermal event mitigation materials
- Will BMS designs increase or decrease in complexity?
- Redundancy for functional safety or de-contented BMS similar to NiMH?
- What system-level (non-cell) cost reductions are possible for 2025?

4:50 Close of Day

WEDNESDAY, NOVEMBER 4

ADVANCED CHARACTERIZATION TOOLS

9:20 am How Multiscale Characterization of Lithium Ion Cathode Materials Will Enable Better Batteries

William C. Chueh, PhD, Associate Professor, Materials Science & Engineering, Stanford University

9:40 Characterization of Degradation Processes in Li-Ion Cylindrical Cells

Robert Kostecki, PhD, Senior Scientist & Principal Investigator, Energy Storage & Distributed Resources, Lawrence Berkeley National Laboratory

Changes of the spatial distribution of lithium and electrolyte in the graphite anode in cycled Li-ion cells were monitored using neutron diffraction measurements at 150 K. Local loss of lithium and electrolyte, and their non-uniform distribution in the graphite anode in aged Li-ion cylindrical cells, were directly correlated with electrochemical performance degradation mechanisms, which are responsible for the observed cell-capacity fade and impedance rise.

10:00 Binder-Free Electrode Technology for High Energy Density Li-ion Batteries



Ben Cao, Ph.D, R&D Director - Advanced Energy Storage, Research & Development, Nanoramic Laboratories

Electrodes are limited in their electrochemical stability and electrical performance by polymer binders. Nanoramic® has developed an alternate solution -Neocarbonix™ - an electrode platform technology that effectively replaces polymer binders and toxic NMP solvents, allowing significantly improved performance of Li-ion batteries while also reducing the cost of manufacturing.



Battery Chemistries for Automotive Applications

Recent Advancements in Battery Chemistries

10:20 MODERATED Q&A: Session Wrap-Up

Moderator: Robert Spotnitz, PhD, President, Battery Design LLC

Panelists:

William C. Chueh, PhD, Associate Professor, Materials Science & Engineering, Stanford University

Robert Kostecki, PhD, Senior Scientist & Principal Investigator, Energy Storage & Distributed Resources, Lawrence Berkeley National Laboratory

Ben Cao, Ph.D, R&D Director - Advanced Energy Storage, Research & Development, Nanoramic Laboratories

10:50 Coffee Break - View Our Virtual Exhibit Hall

11:10 Close of Symposium

PLENARY SESSION PANEL: EMERGING TECHNOLOGIES AND INDUSTRY PERSPECTIVES

11:15 Plenary Solutions Theatre (Sponsorship Opportunities Available)

This panel session will feature a series of short podium presentations on emerging technologies and industry perspectives in vehicle electrification. Each speaker will have 7-8 minutes to present. After all speakers have presented, there will be a moderated Q&A between the speakers and attendees. The presentations are not meant to be a corporate or specific product pitch. Each speaker will focus on a technology and solution framed around a problem or issue related to the expanding market of advanced vehicles and how their organization is solving it.

11:15 Development and production challenges for the success of automotive battery systems to be Announced



Malli Veeramurthy, Lead Engineer, Battery Development, E-Mobility, FEV North America

The presentation will outline the key innovations FEV has implemented in designing the automotive battery packs to minimize pack factors < 1.5 thus maximizing the specific energy capacity of a pack. We will also be addressing the key design considerations for safety and durability while meeting the standards.

11:25 Testing Battery Sensitivities of EV Subsystems Using Battery Simulation and Hardware-In-the-Loop (HIL) Techniques



Grant Gothing, Chief Technology Officer, Bloomy

Many EV subsystems are sensitive to battery performance and behavior. The drivetrain, inverters, ECM and ECUs all interact with the battery, and are affected by SoC, SoH, imbalance, alarms, and DTCs. These interactions are difficult, expensive, and dangerous to replicate using actual EV batteries. Grant Gothing presents EV subsystem testing using the real BMS and COTS battery cell simulation hardware. Benefits include improved safety, reliability, repeatability, efficiency, cost and test coverage over real battery testing.

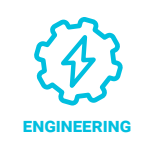
12:15 pm Lunch Break - View Our Virtual Exhibit Hall

“Not just the hype you sometimes get in purely research conferences.”

- Stanley Whittingham, PhD, Binghamton University

“People show what will be the future, but it’s also dealing with practical questions, it’s not just a dream.”

- Muriel Desaegeer, PhD, Toyota Motor Europe



TUESDAY, NOVEMBER 3

SAFETY

9:00 am High-Energy Long-Life Li-Ion (L3B) via Pre- and Continuous-Lithiation

Kandler Smith, PhD, Senior Engineer, Energy Storage, National Renewable Energy Laboratory

Kandler Smith, PhD, Vehicle Energy Storage Engineer, National Renewable Energy Laboratory

9:20 Lesson Learned from PPR Testing of 160 Wh/kg High-Power/ Voltage Battery

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

9:40 Battery Safety Enhancement: The Cell Cooling Efficient

Yatish Patel, PhD, Research Assoc Mechanics of Materials, Mechanical Engineering, Imperial College London

Lithium-ion cells can unintentionally be exposed to temperatures outside manufacturers’ recommended limits without triggering a full thermal runaway event. The question addressed in this paper is: Are these cells still safe to use? In this study, externally applied compression has been employed to prevent lithium-ion battery failure during such events.

10:00 Coffee Break - View Our Virtual Exhibit Hall

10:20 Sensorless Temperature Measurement Exploiting Online Electrochemical Impedance Spectroscopy

Alexander Gitis, Scientist Electrochemical Energy Storage Systems, Safion GmbH, RWTH Aachen University

A novel methodology, which is based on online electrochemical impedance spectroscopy (oEIS), is introduced. The experimental validation with commercial automotive lithium-ion cell shows that a high measurement of accuracy in the range of conventional temperature sensors was achieved even during demanding operation conditions

10:40 Sustainability of Battery Manufacturing, Use, and Recycling

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

This talk will cover evaluations of energy and environmental impacts of vehicle technologies, transportation fuels, and energy systems, assessment of the market potentials of new vehicle and fuel technologies, and examination of transportation development in emerging economies, such as China.

11:00 An Introduction to Battery Testing

Mike Sandoval, Vice President Business Development, Maccor, Inc

An introduction for new people entering the battery industry and for those who support the industry in non-technical ways but would benefit from a little technical knowledge. The information is the result of feedback from many of our existing customers.

11:20 MODERATED Q&A: Session Wrap-Up

Moderator: Kandler Smith, PhD, Senior Engineer, Energy Storage, National Renewable Energy Laboratory

Panelists:

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

Yatish Patel, PhD, Research Assoc Mechanics of Materials, Mechanical Engineering, Imperial College London

Alexander Gitis, Scientist Electrochemical Energy Storage Systems, Safion GmbH, RWTH Aachen University

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

Mike Sandoval, Vice President Business Development, Maccor, Inc

11:50 Lunch Break - View Our Virtual Exhibit Hall

ELECTRODES

12:20 pm Fabrication of Current Collector and Binder-Free Electrodes on Separators Used in Lithium-Ion Batteries

Daniel Belanger, PhD, Professor, Chemistry, University of Quebec Montreal

12:40 Considering the Opportunities and Challenges for Battery Thermal Management, Fast Charging, and High Voltage Configurations

Brian Robert, Research Engineer, Ford Motor Co.

With aggressive battery charging for vehicles comes concerns of reduced life and temperature stability. Enabling technologies, such as advanced thermal management and high voltage architectures, aid the charging gap and customer range anxiety. However, as automotive OEMs target increasing electrified vehicle range (≈300 miles) and decreasing charge time (≈15 min), trade-offs in system design create opportunities and challenges.

1:00 Structure-Property-Performance Relationships of Advanced Lithium-Ion Electrode Active Materials and Architectures

David L. Wood III, PhD, Senior Staff Scientist, Energy & Transportation Science, Oak Ridge National Lab

This presentation will focus on methodologies such as particle-size and pore-size grading of multilayer thick electrodes, laser ablation structuring and patterning of electrodes, and co-extrusion of interdigitated structures with high and low porosity. Challenges associated with thick, low-Co (high-Ni) cathode processing in water will be discussed. Perspectives on full-scale manufacturing methods for these structures and how they may be integrated with next-generation lithium-ion technologies and active materials will be given.

1:20 How to Launch an EV: Demystifying EV Pack Development from Cell Selection to Vehicle Integration

Eli Leland, CTO and Co-Founder, Voltaiq

Launching a new EV is a high-stakes game, where any problems encountered during development can jeopardize ship dates. We'll walk through each stage of EV pack development, and will highlight how an integrated Battery Intelligence platform can drive an on-time launch, while ensuring quality and traceability throughout the vehicle lifecycle.



1:40 Refresh Break - View Our Virtual Exhibit Hall

BATTERY MANAGEMENT SYSTEMS

2:00 A Predictive Modeling and Control Approach to Improving Lithium-Ion Battery Performance in Cells Exhibiting Large Voltage Hysteresis

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

2:20 Simple Low-Rate Pseudo-Steady-State Model of Lithium-Ion Battery Dynamics

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

Future BMS algorithms will use physics-based models of cells instead of presently used equivalent-circuit models because they can predict internal cell electrochemical variables that are precursors to degradation, and so enable controlling battery systems to effect a direct tradeoff between performance and life. However, it is a challenging task to develop methods to find the parameter values needed to build a physics-based model: clever lab-testing and data processing are needed.

2:40 A Model-Based Approach for Correcting State-of-Charge (SOC) Drift in Hybrid Electric Vehicles (HEVs)

Marcelo Araujo-Xavier, PhD, Research Engineer, Advanced Engineering & Control Methods, Ford Motor Co.

3:00 Contamination Control for Enhanced HV Battery Cooling System Robustness

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

Cooling of battery packs is essential to achieve lifetime requirements and to prevent thermal incidents. In addition to air and indirect liquid cooling, immersion cooling offers potential for effective thermal management for high C-rate charging and discharge. The presentation will focus on how to keep coolants in different cooling systems clean, thus preventing premature cell ageing caused by cooling system contamination.

3:20 MODERATED Q&A: Session Wrap-Up

Moderator: Marcelo Araujo-Xavier, PhD, Research Engineer, Advanced Engineering & Control Methods, Ford Motor Co.

Panelists:

Daniel Belanger, PhD, Professor, Chemistry, University of Quebec Montreal

Brian Robert, Research Engineer, Ford Motor Co.

David L. Wood III, PhD, Senior Staff Scientist, Energy & Transportation Science, Oak Ridge National Lab

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

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

Eli Leland, CTO and Co-Founder, Voltaiq

3:50 Interactive Roundtable Discussions - View Our Virtual Exhibit Hall

Join your colleagues and fellow delegates for a focused, informal discussion moderated by a member of our speaking faculty. A small group format allows participants to meet potential collaborators, share examples from their own work and discuss ideas with peers.

ROUNDTABLE: Silicon Anodes and Cells

Benjamin Park, PhD, Founder & CTO, Enevate Corp.

- What is the maturity level of Si today?
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ROUNDTABLE: Electro-Magnetic Compatibility (EMC) Challenges for Advanced BMS Design

Mark Gunderson, Engineering Manger, Electronics, Advanced Battery Systems, Clarios LLC

- How does EMC effect battery performance and safety?
- Why are there unique challenges to BMS EMC performance over other automotive systems?
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ROUNDTABLE: Battery Failure Databank

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4:50 Close of Day

WEDNESDAY, NOVEMBER 4

BATTERY PACKS & CHARGING

9:00 am Module & Battery Integration of All-Solid-State Lithium-Ion Cells – An Outlook to What Changes to Expect

Wenzel Prochazka, Senior Product Manager, Battery Systems, AVL List GmbH

Changing to all-solid-state cell will not be like today's battery upgrade by incorporating a new cathode active material; it will be more of a change to the whole battery and support system. But, what is it exactly that must change? Why and what consequences will this have? AVL is providing insight into a larger engineering study on integration of all-solid-state cells into modules and a pack for a future EV.

9:20 Battery Pack Architecture - Should Power Electronics be Contained Inside or Outside?

Anil Paryani, Founder & CTO, Auto Motive Power, Auto Motive Power

9:40 Fast-Charging in Practice – A Way to Get It Done!

Michael Schoenleber, Co-Founder & CTO, Batemo GmbH

By using a validated and physical battery model, one can, for any condition, assess the anode potential and use this knowledge to avoid Lithium-Plating. In our talk, we will use such a model to derive various practically feasible fast-charging strategies of different complexities. As a reality check, we will apply these strategies to real cells and discuss how well they perform with respect to charging time and aging.

10:00 Designing Optimized Advanced Battery Solutions

Stephan Lorenz, Global Engineering Manager, Software, Software Engineering, Clarios

Software Development Life Cycles are being compressed, scope demands and quality expectations increase. Where does your organization position itself, how do you prepare for the future to remain flexible and competitive? The presentation will answer these questions from a Clarios perspective.

10:20 MODERATED Q&A: Session Wrap-Up

Moderator: Wenzel Prochazka, Senior Product Manager, Battery Systems, AVL List GmbH

Panelists:

Anil Paryani, Founder & CTO, Auto Motive Power, Auto Motive Power

Michael Schoenleber, Co-Founder & CTO, Batemo GmbH

Stephan Lorenz, Global Engineering Manager, Software, Software Engineering, Clarios

10:50 Coffee Break - View Our Virtual Exhibit Hall

11:10 Close of Symposium



Battery Engineering for Automotive Applications

Building Better Batteries

PLENARY SESSION PANEL: EMERGING TECHNOLOGIES AND INDUSTRY PERSPECTIVES

11:15 Plenary Solutions Theatre (Sponsorship Opportunities Available)

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11:15 Development and production challenges for the success of automotive battery systems to be Announced



Malli Veeramurthy, Lead Engineer, Battery Development, E-Mobility, FEV North America

The presentation will outline the key innovations FEV has implemented in designing the automotive battery packs to minimize pack factors < 1.5 thus maximizing the specific energy capacity of a pack. We will also be addressing the key design considerations for safety and durability while meeting the standards.

11:25 Testing Battery Sensitivities of EV Subsystems Using Battery Simulation and Hardware-In-the-Loop (HIL) Techniques



Grant Gothing, Chief Technology Officer, Bloomy

Many EV subsystems are sensitive to battery performance and behavior. The drivetrain, inverters, ECM and ECUs all interact with the battery, and are affected by SoC, SoH, imbalance, alarms, and DTCs. These interactions are difficult, expensive, and dangerous to replicate using actual EV batteries. Grant Gothing presents EV subsystem testing using the real BMS and COTS battery cell simulation hardware. Benefits include improved safety, reliability, repeatability, efficiency, cost and test coverage over real battery testing.

12:15 pm Lunch Break - View Our Virtual Exhibit Hall

“The AABC meeting is what I consider the premier automotive battery meeting in the world.”

- Greg MacLean, PhD, General Motors

BENEFITS
OF AN



VIRTUAL

EVENT

- View more presentations than in-person as your Virtual registration includes On-Demand access
- No more FOMO as you don't have to choose between multiple presentations taking place at the same time
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- Live chat
- Product directories



EV Technology for Specialty Transportation

High-Energy Battery Development for Light to Heavy Duty Applications

TUESDAY, NOVEMBER 3

HEAVY DUTY ELECTRIC VEHICLE MARKET

9:00 am Incentives and Regulatory Drivers Supporting California's Transition to Zero-Emission Public Transportation and Goods Movement

Leslie Goodbody, Engineer, California Air Resources Board

This talk will provide an overview of CARB's regulatory strategies, incentive programs, and demonstration projects that are helping to further advance and commercialize the use of battery electric and fuel cell technology in trucks, buses and cargo-handling equipment.

9:40 Electric Vehicles: Emerging Markets, Battery Demand & Chemistry Choices

Alex Holland, PhD, Analyst, Technology, IDTechEx Ltd.

10:00 Coffee Break - View Our Virtual Exhibit Hall

10:20 Global EV Bus Market Outlook

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

EV busses are driving a successful penetration rate worldwide and specifically in China. What are the market drivers and how did the changes in the Chinese subsidies policy effect that market during 2019? Review of the main Li-ion cells chemistries used for that market. Review of the main e-bus cells and battery pack makers in China and out of China. Market expectations for 2020.

INNOVATIONS IN BATTERY SYSTEMS FOR HEAVY-DUTY APPLICATIONS

10:40 Kenworth's Electric Fuel Cell Truck Program

Brian Lindgren, Application Engineer, Kenworth Truck Company

11:00 Sponsored Presentation (Opportunity Available)

11:20 MODERATED Q&A: Session Wrap-Up

Moderator: Michael Baker, Air Resources Engineer, Mobile Source Control Division, California Air Resources Board

Panelists:

Leslie Goodbody, Engineer, California Air Resources Board

Alex Holland, PhD, Analyst, Technology, IDTechEx Ltd.

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

Brian Lindgren, Application Engineer, Kenworth Truck Company

11:50 Lunch Break - View Our Virtual Exhibit Hall

INNOVATIONS IN BATTERY SYSTEMS FOR HEAVY-DUTY APPLICATIONS

12:20 pm Operationalizing Battery Life Optimization in an All-Electric, Autonomous Vehicle Fleet

Ken R. Ferguson, PhD, Senior Engineer. Tech Operations, Cruise

The usage profile of a vehicle in an electric, autonomous vehicle fleet will be significantly different than the usage profile for a typical consumer vehicle. Due to the high cost of HV battery replacements in such a fleet, strategies for extending battery life will be critical to the viability of autonomous ride-share applications. In this talk we will explore methods

for techniques to extend battery lifetime in an autonomous fleet.

12:40 ACTIA Battery Packs for Zero-Emission Buses

Greg Fritz, EV Business Unit Manager, Strategy & Mgmt & Business Development, ACTIA Group

ACTIA will present specifications, field data and simulation results for battery packs used in zero-emission buses (ZEBs). The specific focus will be on the battery chemistries and pack designs used to meet the different requirements of fuel-cell versus fast-charge versus overnight-charge transit ZEBs.

1:00 Battery Performance in Fleet Electrification

James Castelaz, Founder & CTO, Motiv Power Systems Inc.

This presentation will focus on battery performance for fleets utilizing Motiv-powered all-electric trucks and buses and will highlight field operations data from several diverse fleets. Real-world examples include vehicle performance reports on routes and missions from a variety of industry verticals, including delivery services and school transportation. Motiv will also present data centered around its approach of using highly reliable and cost-effective mass-market battery packs to power these vehicles.

1:20 Sponsored Presentation (Opportunity Available)

1:40 Refresh Break - View Our Virtual Exhibit Hall

INNOVATIONS IN BATTERY SYSTEMS FOR HEAVY-DUTY APPLICATIONS

2:00 Battery and Battery Considerations for Medium and Heavy-Duty Electric Vehicle Applications

Andrew F. Burke, PhD, Research Engineer, University of California Davis

This paper is concerned with the specification and design of lithium batteries to be used in medium- and heavy-duty (MD/HD) electric vehicles of various types. Comparisons are made of cycle life, power density, and thermal management requirements for batteries in light-duty and MD/HD duty applications.

2:20 Case Study: Deployment of 27 Electric Heavy-Duty Trucks at 3 Facilities

Michael Baker, Air Resources Engineer, Mobile Source Control Division, California Air Resources Board

Through a State of California competitive solicitation, this project was awarded a grant to deploy 24 class 8 yard trucks and three class 5 service trucks for three different users at at two rail yards and one warehouse, and includes infrastructure (23 EVSE). With input from users of phase one yard trucks applied to design for an improved and more commercially-viable phase two version of the yard truck.

2:40 Electric Vehicle Battery Standards Development

Bhavya Kotak, Research Associate, Safe Electromobility, Technische Hochschule Ingolstadt

Electric vehicles (EVs) possess a high amount of energy within their batteries. During EV accidents, all this energy is released in one go and often causes a fire. This study demonstrates the gap that has been identified on standards such as ISO 12405, IEC 62660 and GB-T31485 that are essential to be addressed for the safety of battery and the EV consumer.

3:20 MODERATED Q&A: Session Wrap-Up

Moderator: Alex Holland, PhD, Analyst, Technology, IDTechEx Ltd.

Panelists:

Ken R. Ferguson, PhD, Senior Engineer. Tech Operations, Cruise

Greg Fritz, EV Business Unit Manager, Strategy & Mgmt & Business Development, ACTIA Group

James Castelaz, Founder & CTO, Motiv Power Systems Inc.

Michael Baker, Air Resources Engineer, Mobile Source Control Division, California Air Resources Board

Bhavya Kotak, Research Associate, Safe Electromobility, Technische Hochschule Ingolstadt

Andrew F. Burke, PhD, Research Engineer, University of California Davis

3:50 Interactive Roundtable Discussions - View Our Virtual Exhibit Hall

Join your colleagues and fellow delegates for a focused, informal discussion moderated by a member of our speaking faculty. A small group format allows participants to meet potential collaborators, share examples from their own work and discuss ideas with peers.

ROUNDTABLE: Silicon Anodes and Cells

Benjamin Park, PhD, Founder & CTO, Enevate Corp.

- What is the maturity level of Si today?
- What different approaches are there with Si?
- What are the challenges and how can the industry work together to solve the problem?
- How does Si compare with other next-gen technologies such as solid-state/lithium metal?

ROUNDTABLE: Electro-Magnetic Compatibility (EMC) Challenges for Advanced BMS Design

Mark Gunderson, Engineering Manger, Electronics, Advanced Battery Systems, Clarios LLC

- How does EMC effect battery performance and safety?
- Why are there unique challenges to BMS EMC performance over other automotive systems?
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- What EMC performance improvement techniques can be employed in BMS design?

ROUNDTABLE: Battery Failure Databank

William Q. Walker, PhD, Aerospace Technologist, NASA-Johnson Space Center

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- How will pack designs change to mitigate the increased failure modes of Nickel-rich chemistries?
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- What system-level (non-cell) cost reductions are possible for 2025?

4:50 Close of Day

WEDNESDAY, NOVEMBER 4

WIRELESS CHARGING SYSTEMS

9:00 am Wireless Charging Systems for Heavy-Duty Applications

Michael P. Masquelier, CEO & CTO, WAVE Wireless Advanced Vehicle Electrification

This session will cover the commercial viability of advanced wireless charging technology with examples of systems for transit, port, industrial, off-road, and other heavy-duty vehicles. Fully automated, hands-free charging operation enabled by ruggedized pads embedded in the roadway and vehicle-mounted receiving units with further discussion of high-power deployments and synergy with future autonomous vehicles will also be covered.

LIB CHEMISTRIES AND ALTERNATIVE APPLICATIONS

9:20 Unlocking the Full Potential of Li-Ion Batteries

Pavel Calderon, CCO, Nortical

Welcome to an in-depth session focusing on upcoming challenges of our sustainable future. How is our electric transport and power segment developing? What future challenges need to be met? How do we meet the urgent need for actions against climate change while creating a responsible and just battery value chain? How are the Nordic countries approaching these issues?

9:40 Cell Format Analysis for Urban Air Mobility

Martin Talke, Principal, Umlaut Inc.

This presentation will evaluate and analyze the advantages and disadvantages of each of the common cell types—round, prismatic and pouch—in a design of a battery pack that meets the requirements for safety, energy density and total costs of ownership eVTOLs and/or aircrafts.

10:00 Sponsored Presentation (Opportunity Available)

10:20 MODERATED Q&A: Session Wrap-Up

Moderator: Leslie Goodbody, Engineer, California Air Resources Board

Panelists:

Michael P. Masquelier, CEO & CTO, WAVE Wireless Advanced Vehicle Electrification

Pavel Calderon, CCO, Nortical

Martin Talke, Principal, Umlaut Inc.

10:50 Coffee Break - View Our Virtual Exhibit Hall

11:10 Close of Symposium

PLENARY SESSION PANEL: EMERGING TECHNOLOGIES AND INDUSTRY PERSPECTIVES

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12:15 pm Lunch Break - View Our Virtual Exhibit Hall




Battery Intelligence for Automotive Applications

How Smart Analysis of Your Battery Data Can Drive On-Time New Vehicle Launches, Optimal Performance, and Increased Margins

TUESDAY, NOVEMBER 3

INTRODUCTION TO BATTERY INTELLIGENCE SYSTEMS



9:00 am KEYNOTE PRESENTATION: Introduction to Battery Intelligence Systems (BIS)
Tal Sholklapper, CEO & Co-Founder, Voltaiq
While the industry is familiar with the battery and its battery management system (BMS), very few are aware of the critical need for a missing third layer, the Battery Intelligence System (BIS). The BIS is needed to unlock the significant advances in battery yield, energy density, and lifetime that the industry is calling for.

INTELLIGENT BATTERY MATERIALS DEVELOPMENT

9:20 Developing Better Materials Intelligently to Improve Cell Safety and Performance

Paul Homburger, Vice President, Business Development, NOHMS Technologies, Inc.

This talk describes efforts to organize and synthesize results during our extensive testing of electrolyte materials designed to improve the safety and performance of next-gen batteries. I will discuss how an intelligent systems approach allows us to develop better materials more efficiently. This approach allows for improved cell safety coming from the electrolyte level, so they themselves are indeed 'intelligent battery materials'.

9:40 ALD-Optimized NMC 811: Iterating Faster to Achieve Key Performance Metrics

Barbara Hughes, Director of Energy Storage, Forge Nano

The use of ALD to become an industry leader in materials optimization in the battery space is predicated on our ability to optimize coating solutions through an iterative process between coating the materials and electrochemical testing. In this work we have employed Voltaiq analysis software as a tool to efficiently explore ALD coatings as a means of stabilizing Ni-rich NMC surfaces, enabling increased capacity retention and high voltage utilization.

10:00 Coffee Break - View Our Virtual Exhibit Hall

10:20 Separator Innovation Unlocking Next-Generation Lithium Batteries

Travis Baughman, PhD, Vice President, Materials Innovation, Sepion Technologies

Sepion Technologies is developing advanced membranes to overcome barriers in the path to wide-spread electrochemical energy use and storage. Known fade mechanisms in Li-ion batteries associated with transitional metal crossover currently limit cycle life, thereby, reducing the impact of these technologies in electric vehicles. Our proprietary membrane technology works in concert with current separator technology to effectively block transition metal crossover resulting in increased energy density and cycle life.

11:00 Session Break

11:20 MODERATED Q&A: Session Wrap-Up

Moderator: Eli Leland, PhD, Co-Founder and Chief Product Officer, Voltaiq

Panelists:

Travis Baughman, PhD, Vice President, Materials Innovation, Sepion Technologies

Paul Homburger, Vice President, Business Development, NOHMS Technologies, Inc.

Barbara Hughes, Director of Energy Storage, Forge Nano

Tal Sholklapper, CEO & Co-Founder, Voltaiq

11:50 Lunch Break - View Our Virtual Exhibit Hall

INTELLIGENT BATTERY MANUFACTURING

12:20 pm Industry 4.0 Cell Manufacturing Factory Software Architectures Permit Improved Cell Yield

Bob Zollo, Solution Architect for Battery Testing, Keysight Technologies

Cell formation and grading section of the cell manufacturing line is the largest, most expensive, and most costly-to-operate portion of the manufacturing line. Some manufacturing lines on 20 year old technology because it is safe and reliable. Increased availability of process data and big data machine learning, it is further possible to feedback real-time insight and adapt the process on the fly to give the highest quality cell output.

12:40 Customizing Lithium-Ion Cells – From the First Materials Test to Series Production

Leopold Koenig, CEO, Custom Cells Itzehoe GmbH

Batteries are not a one-fit-all solution. CUSTOMCELLS develops tailor-made and optimized battery configurations that can meet very specific requirements such as high energy density and C-rates as well as installation space or temperature requirements. In order to offer the highest quality and thus a long cycle life and safety, we strive for high transparency and corresponding traceability during the development and production process.

1:00 In situ Electronics and Sensors for Intelligent Energy Storage

Joe Fleming, PhD, Assistant Professor, Coventry University

This work illustrates turning standard cells into intelligent cells, through the integration of *in situ* sensors and wireless communication systems during manufacturing, thus enabling significant advancements in performance mapping and cell monitoring technology. Furthermore, the technology demonstrated can be transferred to many cell chemistry and form factors.

1:20 Applied AI: Catapulting the Auto Battery Industry Forward

Fabrizio Martini, Co Founder & CEO, Electra Vehicles Inc

Applied AI technology catapults the automotive battery industry forward to meet customer demands in range, fast charging, and electrification. At Electra, we work to improve battery packs by leveraging automotive data to inform ML control models. EVE-Ai™ 360 Adaptive Controls consists of 6 modules that optimize battery pack performance and EVE-Ai Analytics manages fleet data. We carry our expertise into battery pack design with EnPower Design Suite and MATLAB Application.

1:40 Refresh Break - View Our Virtual Exhibit Hall

DATA STRATEGY, SECURITY, AND TRACEABILITY

2:00 Addressing Hidden Cyber Risks in Electrified Mobility

Mary Joyce, VP & GM, Automotive/ Mobility Division Connected Technologies, UL LLC

An electrified vehicle is potentially more susceptible to data breach and cyber attacks than one with a traditional propulsion system due to additional attack surfaces. These attack surfaces include smartphone apps that monitor and control charging, V2V/V2X interfaces, payment apps and possible vulnerabilities in charging infrastructure. How can we keep valuable data secure and critical systems safe from hackers, but available for diagnosis, maintenance and advanced warnings of trouble?

BATTERY INTELLIGENCE IN TRANSPORTATION

2:20 Data-Driven Machine Learning Methods for Battery Modelling and State Estimation

Pawel Malysz, PhD, PEng, SMIEEE, Senior Technical Specialist, Electrified Powertrain Systems Engineering, FCA USA LLC

The first part of the presentation will show methods into modelling battery cells using machine learning approached based on feed forward neural network (FNN) and recurrent neural networks such as Gated Recurrent Unit (GRU) and Long-term Short-term Memory (LSTM). The second part of the presentation shall focus on neural network based approaches for battery state-of-charge (SOC) estimation.

2:40 Data-Driven Safety Envelope of Lithium-Ion Batteries for Electric Vehicles

Juner Zhu, PhD, Postdoctoral Associate, Mechanical Engineering and Chemical Engineering, MIT; Co-Director, MIT Industrial Battery Consortium

We demonstrated the use of the powerful machine learning tool to develop the "safety envelope" of lithium-ion batteries for electric vehicles that provides the range of mechanical loading conditions ensuring safe operation. The daunting challenge of obtaining a large databank of battery tests was overcome by utilizing a high-accuracy finite element model of a pouch cell to generate over 2500 numerical simulations.

3:00 Safety Testing Lithium-Ion Batteries for Aviation Applications

Thomas Bloxham, PhD, CRE, Battery Technology Lead, Uber

Aviation applications present a challenge to battery safety testing, and to the interpretations of the results of that testing, which is distinct from automotive applications both in its potential complexity and in the mitigation strategies for safety which may be possible. This presentation shall detail the potential for a whole network safety strategy from the cell to the Skypoint, and provide examples of early testing done in support of that strategy.

3:20 MODERATED Q&A: Session Wrap-Up

Moderator: Tal Sholklapper, CEO & Co-Founder, Voltaiq

Panelists:

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Joe Fleming, PhD, Assistant Professor, Coventry University

Mary Joyce, VP & GM, Automotive/ Mobility Division Connected Technologies, UL LLC

Leopold Koenig, CEO, Custom Cells Itzehoe GmbH

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Bob Zollo, Solution Architect for Battery Testing, Keysight Technologies

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4:50 Close of Day

WEDNESDAY, NOVEMBER 4

MACHINE LEARNING FOR BATTERIES

9:00 am Introduction to Battery Machine Learning

Christianna N Lininger, PhD, Application Engineer, Voltaiq Inc

The field of battery development and manufacturing is full of opportunities for the application of machine learning. Machine learning techniques have accelerated materials discovery at the fundamental atomic scale, and have also impacted the commercial and manufacturing scale, accelerating failure predictions. In this talk, we will be covering some case studies of impactful machine learning applications in the battery field, spanning these time, length, and cost dimensions.

9:20 Accelerating Battery Materials Discovery with Physics-Based Machine Learning

Austin Sendek, PhD, Founder/CEO, Aionics, Inc.; Visiting Scholar, Stanford University

Our research at Stanford University suggests that careful ML modeling can provide a significant acceleration in the rate of new materials discovery, even when trained on small amounts of data. In this talk, we present our research in using ML to accelerate electrode and electrolyte discovery, discuss best practices for the application of ML to materials design, and highlight the Aionics materials design software platform.

9:40 Prediction and Optimization of Battery Lifetime Using Machine Learning

Peter Attia, PhD, Senior Data Analyst, Tesla, Inc.

Battery lifetime testing is a major bottleneck in battery development due the number and the duration of required experiments. This talk presents work from my time at Stanford on both early prediction, which reduces the time per experiment by predicting the final cycle life using data from early cycles, and Bayesian optimization, which reduces the number of experiments by balancing exploration and exploitation to efficiently learn the parameter space.

10:00 Session Break



BATTERY
INTELLIGENCE

SYMPOSIUM

November 3-4, 2020 | All Times Eastern Standard (UTC-5:00)

Battery Intelligence for Automotive Applications

How Smart Analysis of Your Battery Data Can Drive On-Time New Vehicle Launches, Optimal Performance, and Increased Margins

10:20 MODERATED Q&A: Session Wrap-Up

Moderator: Eli Leland, PhD, Co-Founder and Chief Product Officer, Voltaiq

Panelists:

Peter Attia, PhD, Senior Data Analyst, Tesla, Inc.

Christianna N Lininger, PhD, Application Engineer, Voltaiq Inc

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10:50 Coffee Break - View Our Virtual Exhibit Hall

11:10 Close of Symposium

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11:15 Plenary Solutions Theatre (Sponsorship Opportunities Available)

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“It’s a great conference; it has a super-high bandwidth. You can learn a lot about what’s going on in the industry today.”

– Mark Verbrugge, PhD General Motors

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WEDNESDAY, NOVEMBER 4

12:15 pm Lunch Break - View Our Virtual Exhibit Hall

xEV MARKET EXPANSION

12:45 Vehicle Electrification – Where Do We Go from Here?

Ted J. Miller, Senior Manager, Electrification Subsystems and Power Supply Research, Ford Motor Company

During the past two decades, concerted development of large-format lithium-ion automotive cell technology with adequate safety, performance, and life has been jointly undertaken by automotive OEMs and cell producers. We are presently witnessing development and production of purpose-built cells for high-volume electric vehicle applications. Now our focus must turn to comprehensive automotive energy storage system optimization.

1:05 EDV, Battery, and Materials Business Possibility in China after 2020

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

1:25 How Fast Will EV Adoption Reach the Majority, and What Will Battery Demand Be?

Viktor Irle, Co-Founder & Market Analyst, EV Volumes

This presentation will give a worldwide overview of the BEV & PHEV market, with the latest actual registration figures for the different regions, countries and the respective sector share in the automotive market in these markets. A 2030 BEV & PHEV outlook will be presented, with basis in actual data, future model portfolios, average battery sizes, and the implications the outlook and trend data will have on future battery demand.

1:45 MODERATED Q&A: Session Wrap-Up

Moderator: Menahem Anderman, PhD, President, Total Battery Consulting, Inc. Panelists:

Ted J. Miller, Senior Manager, Electrification Subsystems and Power Supply Research, Ford Motor Company

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

Viktor Irle, Co-Founder & Market Analyst, EV Volumes

2:15 Refresh Break - View Our Virtual Exhibit Hall

2:35 Electric Vehicles: The End of the Beginning

Logan Goldie-Scot, Head of Clean Power, BloombergNEF

2020 will be another eventful year for the global EV industry. The phase-out of direct subsidies in big markets like China and the US contribute to the modest growth, but 2020 will be a breakout year in Europe. Many new EV models will hit the market but few are high-volume, and they are likely to come late in the year.

2:55 Lithium-Ion Batteries – New Business Models Emerging

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

This presentation will offer an outlook on the LiB market and technology trends, discuss the competitive situation in LiB (cell, pack), and examine the new business models in three steps: i) vertical integration – partnerships and JVs emerging, ii) battery-as-a-service – circular economy approach for additional profit pools, and iii) deep dive China – battery leasing and recycling.

3:15 Battery Module Assembly Materials for Design and Safety Considerations



Greg Becker, Technical Service and Development Specialist, Dow, Inc.

Engineers are continually focused on designing battery cells and modules for optimal performance, efficiency and most importantly safety. In the design phase, module assembly materials should be taken into consideration. A diligent approach to materials selection can aid in the manufacturing

process, help to ensure module reliability and address safety concerns. This presentation will examine the benefits of silicone encapsulants in regards cell protection and the mitigation of thermal runaway. Silicone foams can also provide the added benefit of light weighting in the application.

3:35 Refresh Break - View Our Virtual Exhibit Hall

BATTERIES FOR xEVs

3:55 Introduction of Prime Planet Energy & Solutions Inc. and Our State-of-the-art HEV Cell



Tetsuya Okado, Team Leader, Department 2, Prime Planet Energy & Solutions, Inc.

This presentation will give an introduction of Prime Planet Energy & Solutions, Inc., a Joint venture of Toyota and Panasonic, launched in April 2020. We offer a full range of xEV applications. In this presentation, our state-of-the-art HEV cell named “65D cell” will be introduced.

4:15 Glimpses into BEV Batteries on the Market – AVL Series Battery Benchmarking

Wenzel Prochazka, Senior Product Manager, Battery Systems, AVL List GmbH AVL's series battery benchmarking program provides a database for objective comparison in technical attributes as well as in engineering methodology for BEV battery market competitors for clear system target definition of high-performing, reliable and safe batteries. 270 different criteria are evaluated through AVL benchmarking metrics displayed in 8 high level attributes. The found integrated system performance values are pointed out to support current and future development programs.

4:35 GM's Ultium Battery Systems

Timothy M. Grewe, General Director Electrification, Electrification Center, General Motors

4:55 MODERATED Q&A: Session Wrap-Up

Moderator: Menahem Anderman, PhD, President, Total Battery Consulting, Inc. Panelists:

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Greg Becker, Technical Service and Development Specialist, Dow, Inc.

Tetsuya Okado, Team Leader, Department 2, Prime Planet Energy & Solutions, Inc.

5:25 Happy Hour - View Our Virtual Exhibit Hall

5:55 Close of Day

THURSDAY, NOVEMBER 5

BATTERIES FOR xEVs

9:00 am CO-PRESENTATION: Cost Modeling of Electric and Plug-In Hybrid Vehicles through 2030



Karim Hamza, PhD, Principal Engineer, R&D, Toyota Motor North America

Ken Laberteaux, PhD, Senior Principal Scientist, Toyota Motor North America

Jean Chu, PhD, Scientist, Toyota Motor North America

CHARGING & INFRASTRUCTURE

9:20 Ultra-Fast Charging Systems

Johanna Heckmann, Head of Charging Infrastructure, P3 Automotive GmbH P-3 is leading the VDA working group in Germany on HPCCV, where a new coupling device with up to 1MW charging power is under investigation for standardization.

9:40 Demand Drivers for Charging Infrastructure – Charging Behavior of Plug-In Electric Vehicle Commuters

Gil Tal, PhD, Research Director, Plug In Hybrid & Electric Vehicle PH & EV Research, University of California Davis

The public as well as the private sector that includes automakers and charging network companies are increasingly investing in building charging infrastructure to encourage the adoption and use of plug-in electric vehicles (PEVs) as well as to ensure that current facilities are not congested.

10:00 Coffee Break - View Our Virtual Exhibit Hall

10:20 Ultra Power Dynamic Charging System for EV

Takamitsu Tajima, Chief Engineer, EV Development, Honda R&D Co. Ltd.

10:40 Fast Charging of Lithium-Ion Batteries at All Temperatures

Chao-Yang Wang, PhD, William E. Diefenderfer Professor, Mechanical Engineering, Pennsylvania State University

11:00 Operating Outside the Bubble: Understanding the Thermal and Safety Challenges in Next-Generation Battery Packs

Brandon Bartling, PhD, Advanced Research Specialist, 3M Company

We need to move outside the bubble of low-energy dense cells, narrow SOC ranges and moderate temperature operation. This presentation will focus on the material challenges that exist as we seek to operate the battery pack at optimum temperature and safety levels to drive greater EV adoption.

11:20 MODERATED Q&A: Session Wrap-Up

Moderator: Kevin Konecky, Director, Battery Systems, Fisker, Inc. Panelists:

Johanna Heckmann, Head of Charging Infrastructure, P3 Automotive GmbH

Gil Tal, PhD, Research Director, Plug In Hybrid & Electric Vehicle PH & EV Research, University of California Davis

Takamitsu Tajima, Chief Engineer, EV Development, Honda R&D Co. Ltd.

Chao-Yang Wang, PhD, William E. Diefenderfer Professor, Mechanical Engineering, Pennsylvania State University

Karim Hamza, PhD, Principal Engineer, R&D, Toyota Motor North America

11:50 Lunch Break - View Our Virtual Exhibit Hall

BATTERY LIFE & RELIABILITY

12:30 pm Setup of Full Integrated Battery Manufacturing Value Chains in North America with Taking into Account Carbon Emissions

Robert Stanek, Global Advisor, Business Strategy & Alternative Powertrains, P3 Automotive GmbH

12:50 Study of PHEV Batteries in Field Application

Bob Taenaka, xEV Battery Senior Technical Leader, Ford Motor Company

With a capacity much smaller than that in conventional BEVs, PHEV battery has to provide a much higher specific power to meet EV-driving vehicle performance, and to deliver more ampere-hour throughput to meet life target. This presentation features an analysis of energy consumption and battery usage of 4-year data collected on thousands plug-in electric vehicles. VIN-based investigation on energy consumption and potential factors driving PHEV battery.

1:30 MODERATED Q&A: Session Wrap-Up

Moderator: Bob Taenaka, xEV Battery Senior Technical Leader, Ford Motor Company

Panelists:

Robert Stanek, Global Advisor, Business Strategy & Alternative Powertrains, P3 Automotive GmbH

Brandon Bartling, Advanced Research Specialist, 3M Company

2:00 Interactive Roundtable Discussions - View Our Virtual Exhibit Hall

Join your colleagues and fellow delegates for a focused, informal discussion moderated by a member of our speaking faculty. A small group format allows participants to meet potential collaborators, share examples from their own work and discuss ideas with peers.

ROUNDTABLE: Li-Ion NMC Fast Charging New Cells for E-Mobility

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

- The needs for fast charging for E-Mobility
- Current solutions in the market
- New fast charging Li-Ion NMC cells under development

ROUNDTABLE: Electrolyte Developments: New Components and Approaches

Sam Jaffe, Founder & Managing Director, Cairn Energy Research Advisors

- Recent electrolyte advances and their impact on the battery
- Gauging cost/benefits to adding new components to electrolyte mixtures
- Super-concentrated salt electrolytes: recent research and implications
- Innovative solvent and additive approaches
- Emerging salt candidates for improved performance

3:00 Close of Conference



CONFERENCE

Global Battery Raw Materials

Balancing Supply, Demand & Costs for Battery Component Materials

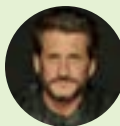
November 4-5, 2020 | All Times Eastern Standard (UTC-5:00)

Global Battery Raw Materials, Cont.

WEDNESDAY, NOVEMBER 4

12:15 pm Lunch Break - View Our Virtual Exhibit Hall

GLOBAL MARKET DEMAND FOR BATTERY RAW MATERIALS & REGULATION



12:45 KEYNOTE PRESENTATION: Changing the Metals Game: Ocean Nodules and the Future of EV Battery Supply Chains

Gerard Barron, Chairman & CEO, DeepGreen Metals Inc.

Pollution, sea level rise, extinctions and climate chaos are just some of the externalities wrought by our dependence on fossil fuels. DeepGreen CEO, Gerard Barron, will explore the benefits of deep-sea nodules and his mission to create a circular supply chain for lower-impact batteries.

1:05 The Regulatory Impacts of Chemicals Regulation on the Battery Sector

Adam McCarthy, President, Cobalt Institute

Cobalt is facing a number of regulatory measures in Europe which will have an impact on the ability to use cobalt in batteries. This presentation will focus on these regulations, their impacts and alternative approaches to regulations.

1:25 Active Supply Management of Critical Battery Raw Materials

Andrew Miller, Product Director, Benchmark Mineral Intelligence Ltd.

As electric vehicle makers continue to pursue ambitious electrification plans, a comprehensive technical and commercial battery strategy increases in importance. Beyond managing cell producers, OEMs have increasingly begun to participate in upstream materials management. In this talk, we explore the changing commercial models between OEMs and mining/chemical companies, as well as the new types of partnerships being struck between these upstream and downstream players.

1:45 MODERATED Q&A: Session Wrap-Up

Moderator: Denis Sharypin, Head, Market Research, MMC Norilsk Nickel

Panelists:

Gerard Barron, Chairman & CEO, DeepGreen Metals Inc.

Andrew Miller, Product Director, Benchmark Mineral Intelligence Ltd.

Adam McCarthy, President, Cobalt Institute

2:15 Refresh Break - View Our Virtual Exhibit Hall

GLOBAL MARKET DEMAND FOR BATTERY RAW MATERIALS & REGULATION

2:35 Impact of Market Corrections – Where Will Prices for Battery Raw Materials Head?

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

The lithium and cobalt markets are experiencing corrections from oversupply and China's subsidy phase-out. This presentation will look at where the markets, supply and prices for lithium and cobalt will be. The speed of electrification, battery choices and supply risks (political and new processing technologies) will be key.

2:55 Bridging the Streams

Sam Jaffe, Founder & Managing Director, Cairn Energy Research Advisors

Downstream Li-ion demand and upstream materials production are diverging significantly in the short term (supply outstrips demand), the medium term (demand outstrips supply) and the long term (demand massively outstrips supply). This presentation will look at forecasted demand and the materials required to satisfy that demand and how the mismatches might be solved over the next ten years.

3:15 Enhancing Natural and Synthetic Graphite with Cost-Effective ALD Treatment

Daniel Higgs, Business & Product Development, BD, Forge Nano, Inc.



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As the EV market grows, new graphite sources are coming online. However, many new graphites can be shy of performance requirements. This presentation focuses on commercial-scale, cost effective, ALD treatment of natural and synthetic graphites for improving performance in half and full cells.

3:35 Refresh Break - View Our Virtual Exhibit Hall

4:15 Pricing and Price Outlook for Battery Raw Materials

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

As the market for lithium-ion batteries grows rapidly in the years and decades ahead, a more efficient pricing system will be needed for the battery raw materials. This presentation will look at how battery raw materials are priced now, how this is changing and what are the outlooks for supply, demand and price for lithium, cobalt and nickel.

4:35 Lithium after the Crash: What Is the Medium- and Long-Term Outlook for Prices and the Supply Chain?

Alex Laugharne, Principal Consultant, Consulting, CRU International

This presentation will include an overview of new supply by type of deposit following a re-evaluation of projects in the new lower price environment, discussion of how the supply chain from mine to battery maker is evolving, and relative pricing between lithium products, looking into the longer term.

4:55 MODERATED Q&A: Session Wrap-Up

Moderator: Chris Berry, Founder & President, House Mountain Partners

Panelists:

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

Sam Jaffe, Founder & Managing Director, Cairn Energy Research Advisors

Alex Laugharne, Principal Consultant, Consulting, CRU International

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

5:25 Happy Hour - View Our Virtual Exhibit Hall

5:55 Close of Day

THURSDAY, NOVEMBER 5

BATTERY RAW MATERIALS SUPPLY

9:00 am How Do We Produce “Greener” Nickel and Cobalt for EV Batteries?

Anne Oxley, Technical Director, Brazilian Nickel PLC

Brazilian Nickel's Paiui project will produce nickel and cobalt feeds for EV cathodes using lower cost, less energy intensive, simple and flexible heap leaching process. Also, innovative ways to reduce the project carbon footprint, with the ultimate vision of being carbon neutral, will be presented.

9:20 Ni Market Update 2020

Denis Sharypin, Head, Market Research, MMC Norilsk Nickel

Assessing Ni market development in the light of the Indonesian ban and growing demand in batteries and other industries.

9:40 The 21st Century Paradox: Challenges and Opportunities with “Green Growth”

Chris Berry, Founder & President, House Mountain Partners

It is all but certain that renewable energy and vehicle electrification are trends where “the horse has left the barn.” While this is a net positive for humanity, it raises some challenging questions around how supply chains are built with sustainability in mind and allowing for optimal returns through management of capital allocation. Opportunities and threats along supply chains will be examined in depth.

10:00 Coffee Break - View Our Virtual Exhibit Hall

10:20 Sustainable Lithium for a World in Motion

Stefan Debruyne, Director, Business Development, Lithium, SQM Europe

10:40 Chvaletice Manganese Project: Developing a Globally-Significant New Source of Green and Ultra-High Purity Manganese Products in Europe

Marco Romero, President & CEO, Euro Manganese Inc.

Euro Manganese Inc. is advancing steadily with the development of a strategic new source of ultra-high purity manganese products in the Czech Republic to serve Europe's rapidly emerging lithium-ion battery ecosystem. These products will assure customers impeccable provenance and a minimal environmental footprint, as they will be made by reprocessing old mining waste.

11:00 Advances in Electrolyte Ingredients & Specialty Polymers for Li-Ion Batteries

Larry Hough, PhD, Senior Research & Innovation Manager, Battery Platform, Solvay

Learn about the latest developments in Solvay's electrolyte ingredients and specialty polymers that enable our customers to improve the safety and performance of Li-ion batteries while meeting automotive industry requirements. We partner with growing companies who want to address new solutions based on high nickel, high silicon, and high voltage.

11:20 MODERATED Q&A: Session Wrap-Up

Moderator: Sam Jaffe, Founder & Managing Director, Cairn Energy Research Advisors

Panelists:

Anne Oxley, Technical Director, Brazilian Nickel PLC

Marco Romero, President & CEO, Euro Manganese Inc.

Stefan Debruyne, Director, Business Development, Lithium, SQM Europe

Denis Sharypin, Head, Market Research, MMC Norilsk Nickel

Chris Berry, Founder & President, House Mountain Partners

11:50 Lunch Break - View Our Virtual Exhibit Hall

BATTERY RAW MATERIALS SUPPLY

12:30 pm The Shift in the Role of Manganese to High-Performance Batteries

Raymond Malcolm Oei, CEO, PT Stern

Manganese originally had a stabilising function in the NMC cathode material and becomes now a dynamic cathode material able to exchange 2 electrons like high-capacity nickel cathode materials. Manganese is a very affordable and available raw material with less capital investment cost than other battery raw materials to assure affordable EV prices to the majority of people. The challenges are in mining and processing technologies within an environmentally friendly ecosystem.

INNOVATIONS IN RECYCLING BATTERY MATERIALS

12:50 Low-Cobalt Recycling: The Brave New World for xEV Sustainability

Steve E. Sloop, President, OnTo Technology LLC

The US DOE cost goals associated with large-scale EV adoption require low-cost (i.e. \$10/kg) cathode. Cobalt thrifting is a strategy to achieve manufacturing cost goals, but it is counter-productive for cobalt recovery – can the recycling industry survive? This presentation will discuss recycling methodologies in light of cost goals and market realities and how OnTo's approaches are technically appropriate for the EV industry.

1:10 An Updated Perspective on EV Battery Second Use and Its Impact on Battery Material Supply

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

By 2025, it is estimated that 3.5 million used PEVs may be retiring worldwide with commutative capacity of around 150 GWh and roughly equivalent of 1 million tons of cell materials including cobalt, lithium, and nickel. We will discuss barriers and opportunities for the PEV battery second use and how it could impact the supply chain.

1:30 MODERATED Q&A: Session Wrap-Up

Moderator: Steve E. Sloop, President, OnTo Technology LLC

Panelists:

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

Raymond Malcolm Oei, CEO, PT Stern

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- Recent electrolyte advances and their impact on the battery
- Gauging cost/benefits to adding new components to electrolyte mixtures
- Super-concentrated salt electrolytes: recent research and implications
- Innovative solvent and additive approaches
- Emerging salt candidates for improved performance

3:00 Creating a Secondary Source for Critical Battery Materials

Kunal Phalpher, Chief Commercial Officer, Business Development & Operations, Li-Cycle Corp.

This presentation will explore the need for ‘mega’ scale lithium-ion battery resource recovery globally, the challenges of lithium-ion (Li-ion) recycling and how Li-Cycle™ is able to overcome these challenges to recover 80-100% of critical materials from Li-ion batteries. Li-Cycle Corp., (Li-Cycle) is a clean technology company that strives to solve the global Li-ion battery end-of-life problem and to meet the rapidly growing demand for critical battery materials.

3:20 Battery Recycling as a Solution to Balance the Supply-Demand Curve

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

Evolution of Li-ion battery suggests that less amount of cobalt will be used in the cathode (kg/kWh basis). Installations are also expected to increase sharply in the coming years. Recycling cobalt from the end-of-life batteries represents an economic solution for many battery manufacturers to secure their supply chain.

3:40 Advances in Lithium-Ion Battery Recycling Processes at the ReCell Center

Bryant J. Polzin, Process Engineer & Deputy Director, ReCell Center, Argonne National Laboratory

The ReCell Center, an advanced battery recycling program funded by the DOE's Vehicle Technologies Office, is working to develop, scale-up, and demonstrate recycle processes that reduce cost and increase revenue to improve the economics of responsible end-of-life lithium-ion battery management. This presentation will summarize ReCell's work in direct recycling to create a profitable battery recycling system as it enters its second year.

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

Moderator: Steve E. Sloop, President, OnTo Technology LLC

Panelists:

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

Bryant J. Polzin, Process Engineer & Deputy Director, ReCell Center, Argonne National Laboratory

Kunal Phalpher, Chief Commercial Officer, Business Development & Operations, Li-Cycle Corp.

4:20 Close of Conference

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PRICING AND REGISTRATION INFORMATION

See website for complete details including discounts for groups and On-Demand participation

ALL ACCESS REAL-TIME VIRTUAL PRICING

(Includes Real-Time access to ALL tutorials, symposia, conferences, virtual event benefits, plus On-Demand access for one year.)

	Commercial	Academic, Government
Late Registration Rate after October 30	\$1399	\$1199

INDIVIDUAL SYMPOSIUM REAL-TIME VIRTUAL PRICING

(Includes Real-Time access to one symposium, virtual event benefits, plus On-Demand access for one year. Excludes conferences and tutorials. You are allowed to move between virtual presentations taking place at the same time.)

Late Registration Rate after October 30	\$799	\$699
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INDIVIDUAL CONFERENCE REAL-TIME VIRTUAL PRICING

(Includes Real-Time access to one conference, virtual event benefits, plus On-Demand access for one year. Excludes symposia and tutorials. You are allowed to move between virtual presentations taking place at the same time.)

Late Registration Rate after October 30	\$799	\$699
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TUTORIAL ONLY REAL-TIME VIRTUAL PRICING

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One Tutorial	\$199	\$99
Two Tutorials	\$299	\$199
Three Tutorials	\$399	\$299
Four Tutorials	\$499	\$399
Five Tutorials	\$549	\$449
Six Tutorials	\$599	\$499
Seven Tutorials	\$649	\$549
Eight Tutorials	\$699	\$599

PROGRAM SELECTIONS

NOVEMBER 4-5, 2020

TUT1: Solid State Batteries
TUT2: Improving the Energy Density of Batteries with Silicon-Based Anodes
TUT3: Managing and Understanding the Risks of Li-Ion Battery Safety
TUT4: Battery Safety and Abuse Tolerance Validation
TUT5: The Rechargeable Battery Market: Value Chain and Main Trends 2019-2030
TUT6: Materials for Next-Generation Batteries
TUT7: Battery Pack Engineering for xEVs
TUT8: Battery Data Science for Automotive Applications

NOVEMBER 3-4, 2020

S1: Battery Chemistries for Automotive Applications
S2: Battery Engineering for Automotive Applications
S3: EV Technology for Specialty Transportation
S4: Battery Intelligence for Automotive Applications

NOVEMBER 4-5, 2020

C1: xEV Battery Technology, Applications, and Market
C2: Global Battery Raw Materials

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NOVEMBER 3-5, 2020

GROUP PRICING Have your colleagues or entire team attend the virtual event. Purchase one virtual registration at full price, and participants from the same organization will receive a 25% discount when registering on the Group registration page. For more information on group discounts contact Joseph Verange at 781-247-6263.

POSTER DISCOUNT
\$50 discount

POSTER SUBMISSION - DISCOUNT (\$50 OFF): Poster materials are due by October 2, 2020. 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. If you do not receive this email within 5 business days, please contact jring@cambridgeenertech.com.

Please see website's poster page for more information about posters at AABC.

Twitter, LinkedIn, Facebook or any other promotional discounts cannot be combined.

Additional Registration Details:

Want to Register by Phone?
Contact our Registration department at 781-972-5400 or Toll-free in the US 888-999-6288.

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