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October 28-31, 2019 | Hilton Tokyo Bay | Tokyo, Japan

CONFERENCE PROGRAMS

OCTOBER 29-30
Lithium-Ion Battery Chemistries

Conference Chair:
Martin Winter, PhD, Chair, Applied Material Science for Energy Conversion and Storage, MEET Battery Research Center, Institute of Physical Chemistry, University of Muenster

OCTOBER 29-30
Battery Engineering for Automotive Applications

Conference Chair:
Craig Wohlers, Executive Director, Conferences, Cambridge EnerTech

OCTOBER 30-31
Batteries For Hybrid & Electric Vehicles

Conference Chair:
Menahem Anderman, PhD, President, Total Battery Consulting, Inc.

Choose from Six Tutorials on Monday and Tuesday

Topics include the Chinese xEV Market, Pack Engineering, Safety, Cell Design, Silicon Anodes, Raw Materials Supply

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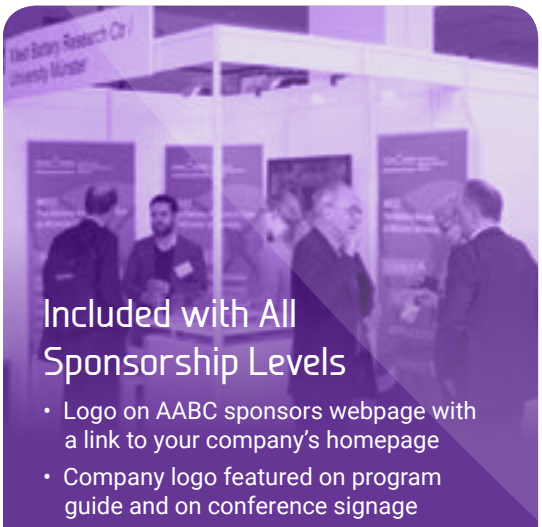

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CONFERENCE VENUE AND HOTEL:

Hilton Tokyo Bay
1-8 Maihama, Urayasu-shi
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TUTORIALS*

Cambridge EnerTech is pleased to offer tutorials taking place on Monday and Tuesday. The tutorials are designed to be instructional, interactive and provide in-depth information on a specific topic. They allow for one-on-one interaction and provide a great way to explain more technical aspects that would otherwise not be covered during the main conference programs that take place Tuesday-Thursday.

MONDAY, OCTOBER 28, 2019

8:00 - 10:00

TUT1: Battery Pack Engineering for xEVs

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.

Instructor: Kevin Konecky, Energy Storage Systems Consultant, Total Battery Consulting

10:30 - 12:30

TUT2: Managing and Understanding the Risks of Li-Ion Battery Safety

A wide variety of stresses and abuses of Li-ion cells can result in safety events involving significant, and sometimes even violent, energy release and thermal runaway. This tutorial provides a framework for a better understanding of how these safety events occur, how lithium-ion batteries respond to various stresses/abuses, how various stresses can lead to thermal runaway, and why differing stresses produce challenges to assessment of safety characteristics of Li-ion cells. For major types of stress/abuse, a flow chart identifying key process steps and characteristics of cell response helps provide important insights regarding similarities and important differences of various types of safety-related failures. A systematic understanding of similarities and differences of most types of stresses helps provide important perspective regarding management of Li-ion battery safety, as well as appropriate safety testing.

Instructor: Brian Barnett, PhD, President, Battery Perspectives LLC

14:00 - 16:00

TUT3: Li-Ion Cell Design and Manufacturing: Processes, Equipment and Quality Control

The rising demand for Internet of Things (IoT) and machine-to-machine (M2M) applications makes battery power an absolute necessity. However, reports about lithium-ion batteries exploding and catching fire continue to draw the public's attention. How do you balance the need for power, size, cost, and time-to-market, while still avoiding being the lead story on the evening news? Is it enough to qualify a cell manufacturer according to industry standards? The answer is that the majority of compliance-based testing is related to abuse tolerance. However, the vast majority of field failures do not occur under abuse scenarios, but happen under normal operating conditions due to manufacturing flaws or design and system tolerance issues that cause internal shorts. Internal shorts are unfortunately not mitigated by safety electronics.

Instructor: Vidyu Challa, PhD, Consulting Manager, Ansys-DfR Solutions

16:30 - 18:30

TUT4: In-Depth Analysis of the Chinese xEV Battery Industry – From Applications to Upstream Materials

As the world's biggest EDV market, Chinese xEV industry has become the most important pioneering target. However, specially planned economy, localized regulations, and multiple business models exist and make the international companies' decision-making more difficult. Therefore, this tutorial will try to provide a whole picture of the Chinese EDV battery market including policies & regulation, future forecasts, competitive analysis, battery technology strategies, upstream supply chain, and positioning for foreign enterprises.

Instructor: Mark Lu, PhD, Certified Senior Industrial Analyst, Industrial Economics & Knowledge Center (IEK), Industrial Technology Research Institute (ITRI)

**Separate registration required for Tutorials.*

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Lithium-Ion Battery Chemistries

From Raw Materials to the Latest Advancements in Battery Chemistries

October 29-30, 2019 • Hilton Tokyo Bay • Tokyo, Japan

TUESDAY, OCTOBER 29

8:00 Registration and Morning Coffee

ADVANCEMENTS IN ELECTROLYTES

9:00 Chairperson's Opening Remarks

Martin Winter, PhD, Chair, Applied Material Science for Energy Conversion and Storage, MEET Battery, Research Center, Institute of Physical Chemistry, University of Muenster

9:05 From Liquid to Solid: High Conductivity Electrolytes for Lithium Batteries

Andreas Hintennach, PhD, Professor, Research HV Battery Systems, Daimler AG

Novel and sustainable electroactive materials can help to decrease the ecological impact of novel battery concepts soon. While on the one hand, high energy density is required, the aspects of safety and lifetime get more important and often mean a challenge. All these requirements are met by very different approaches with different characteristics: all solid-state cells, high-energy materials, lithium-sulfur, and even different systems, e.g., Na- or Mg-ion.

9:55 Talk Title to be Announced

Young-Min Choi, Specialist, LG Chem

10:20 Grand Opening Coffee Break in the Exhibit Hall with Poster Viewing

Sponsored by TOYOTA

CATHODE MATERIALS

10:50 eLNO®: Next-Generation High-Energy Low-Cobalt Cathode Materials for Greater Stability and Safety

Joanna Clark, PhD, Head of Product Development, Materials, Johnson Matthey

Through materials and process engineering, JM has brought a world-leading high-nickel, low-cobalt offering to the market: eLNO. JM's rapid customisation model continues to push the energy, stability, and safety performance of these materials even higher, whilst further reducing cobalt content. In this talk, we aim to demonstrate the competitive advantage of eLNO and provide an insight into JM's strength of developing and tailoring material performance for the fast-paced automotive industry.

11:15 Talk Title to be Announced

Michael Kruft, PhD, Director, Research and Development, Umicore

11:40 Kynar® Fluoropolymers in LiB – Solutions for Cathode and Separator Coatings

Sponsored by ARKEMA

Thomas Fine, PhD, Global Market Manager – Battery, Technical Polymers, Arkema SA

Today Kynar Battery Solutions are represented by two flagship ranges – Kynar HSV electrode binder resins and Kynarflex LBG separator coating resins. During this presentation, Arkema will highlight its latest innovation in these two product lines to meet the always more demanding requirements in terms of performance and safety.

12:05 GEMX: Improving High-nickel Cathode Active Material Performance with Engineered Primary Particles and Grain Boundaries

Sponsored by CAMX Power

Kenan Sahin, Ph.D. President & Founder CAMX Power LLC

We will describe CAMX Power's advancements in particle engineering of lithium-ion battery cathode active materials, including GEMXTM technology for high-nickel cathode materials with greater stability and higher performance, even as cobalt content is reduced. Also discussed will be new results highlighting the benefits of combining cobalt grain boundary enrichment with previously developed approach of bulk stabilization by magnesium doping of the LNO class of active materials.

12:30 Q&A

12:50 Networking Lunch

13:45 Dessert Break in the Exhibit Hall with Poster Viewing

Sponsored by Elkem

14:15 Chairperson's Remarks

Martin Winter, PhD, Chair, Applied Material Science for Energy Conversion and Storage, MEET Battery, Research Center, Institute of Physical Chemistry, University of Muenster

14:20 From Lithium Metal Powder to High Energy Batteries

Adam Best, PhD, Principal Research Scientist & Research Grp Leader, Metal Industries, CSIRO Manufacturing

In order to enable higher energy batteries lithium metal is a key requirement for the anode. At present, there are a number of challenges to produce Lithium metal sustainably whilst ensuring that Lithium metal foils used in devices do not turn dendritic on continuous cycling. This presentation will address both of these topics and describe innovations which are being developed at CSIRO Australia.

14:45 Sulfide Glass and Glass Ceramic Electrolytes for All-Solid-State Batteries

Atsushi Sakuda, Assistant Professor, Applied Chemistry, Osaka Prefecture University

The most important component of all-solid-state batteries is a solid electrolyte. Some solid electrolytes have demonstrated lithium-ion conductivities of over 10^{-2} S cm^{-1}, which is greater than in conventional liquid electrolytes. In addition to the conductivity, understanding the mechanical properties and chemical stability in humid conditions is important to battery manufacturing and for long-term reliability. Our recent research on those properties of sulfide glass and glass-ceramic electrolytes will be introduced.

15:10 Refreshment Break in the Exhibit Hall with Poster Viewing

SOLID STATE BATTERIES

15:50 Developments in Large-Format All-Solid-State Batteries Produced Using Roll-to-Roll Processes

Doug Campbell, CEO, Solid Power

All-solid-state batteries (ASSB) have significant potential for providing greater energy and safety as compared to conventional lithium-ion batteries. However, one area of concern is manufacturability and associated costs for ASSBs. In 2019, Solid Power installed its first automated, roll-to-roll production line in order to achieve higher-quality ASSBs and at volume. Solid Power's talk will provide an overview of Solid Power's manufacturing approach, as well as preliminary performance data on ASSB cells produced using its small volume production line.

16:15 A Long-Cycling All-Solid-State Lithium Metal Battery with Sulfide Solid Electrolytes

Yong-Gun Lee, PhD, Samsung Advanced Institute of Technology (SAIT), Samsung Electronics

All-solid-state battery (ASSB) with a lithium metal anode is a strong candidate for surpassing conventional lithium-ion battery (LIB) capabilities. However, undesirable Li dendrite growth and low Coulombic efficiency impede their practical application. We report herein, an all-solid-state lithium metal battery with a sulfide electrolyte which exhibits high energy density and superior cycle life. An NMC cathode with high specific capacity (>210 mAh g-1) and high areal capacity (>6.8 mAh cm-2) was employed, and a newly designed anode comprising a silver-carbon (Ag-C) composite layer was used in the ASSB. Repeated Li metal plating and stripping between the Ag-C nanocomposite layer and the stainless steel (SUS) current collector during cell cycling was demonstrated. A prototype pouch cell (0.6 Ah) thus prepared exhibited high energy density (>900 Wh L-1), stable Coulombic efficiency over 99.8% and long cycle life (1000 times).

16:40 Engineering Lithium Metal Surface to Enable Long-Term Cycling with Carbonate-Based Electrolytes

Dee Strand, PhD, CSO, Wildcat Discovery Technologies

Significant progress towards the passivation of Li metal anodes must occur before any of the anode's potential can fully be realized. To this end, Wildcat Discovery Technologies has developed both *in situ* and *ex situ* surface passivation methods for lithium metal to significantly boost the cycling performance of lithium metal batteries. We will show investigation of passivation materials in combination with a variety of electrolyte compositions.

17:05 Sponsored Presentation *(Opportunity Available)*

17:55 Q&A

18:15 Close of Day

18:15 Tutorial Registration*

WEDNESDAY, OCTOBER 30

8:30 Registration and Morning Coffee

BINDERS & MATERIALS

9:00 Chairperson's Remarks

Martin Winter, PhD, Chair, Applied Material Science for Energy Conversion and Storage, MEET Battery, Research Center, Institute of Physical Chemistry, University of Muenster

9:05 Development of Functional Conductive Carbon for Li-Ion Batteries

Shuichi Ishimoto, PhD, Section Manager of Advanced Material Group, Basic Research Center, R&D Headquarters, Nippon Chemi-Con Corp.

In order to enhance the cycle durability of Li-ion batteries (LIBs) for xEVs, we have developed a novel conductive carbon material called NH Carbon. The NH Carbon has a unique coating ability on the active materials' surface in both negative and positive electrodes. Therefore, the cycle life of LIBs with the NH Carbon can be improved drastically. In the presentation, we will introduce the feature, effectiveness, and mechanism of the NH Carbon.

9:30 Functional Binders for High Energy LIB

Tatsuo Horiba, PhD, Professor, Department of Applied Chemistry, Tokyo University of Science

We have been demonstrating that water-soluble binders provide better electrode performance than PVdF, which is due to uniformly dispersed electrode materials, sufficient coverage of active material surface, etc. Therefore, we named such binders "functional binders." We will present some results on functional binders for lithium-ion batteries, with their feature, performance and working mechanism, focused on sodium polyacrylate (PANa), polysaccharides, lithium poly-γ-glutamate (LiPGlu), and styrene-butadiene rubber (SBR)/sodium carboxymethylcellulose (CMC).

9:55 Presentation to be Announced

10:20 Coffee Break in the Exhibit Hall with Poster Viewing

10:50 Advances and Issues in Developing Salt-Concentrated Battery Electrolytes

Akira Yamada, PhD, Professor, Toyko Institute of Technology

In the past few years, a major breakthrough in electrolyte materials was achieved by simply increasing the salt concentration in suitable salt/solvent combinations. This long-awaited, extremely simple, yet effective strategy can overcome most of the remaining hurdles limiting the present lithium-ion batteries without sacrificing manufacturing efficiency. I will try to provide timely information that will be valuable for designing more realistic batteries.

11:15 What Is Safety? Enhanced System Safety Using Advanced Electrolytes Designed around Ionic Liquids

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

11:40 Introduction to Neocarbonix: Binderless Electrodes for Lithium-ion Batteries

Sponsored by Nanoramic LABORATORIES

Nicolo Brambilla, CTO, 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 primers. Results have been demonstrated for both LIB cathodes and EDLC electrodes. Nanoramic's Neocarbonix electrodes have significantly lower ESR, better C-rate capabilities, longer lifetime at high temperature, and greater active material thickness for improved energy density, while also retaining or improving specific capacity.

12:05 Highly-Functionalized Binder for Lithium Ion Battery

Sponsored by ZEON

Mayumi Kaneko, PhD, Team Leader, Advanced Performance Material, Zeon Corporation

In recent years, it has been widely recognized that functional binders greatly affect the performance of lithium ion batteries, receiving much attention as a functional material to control the reaction at the solid-liquid interface.This presentation will show the latest technological trend including the evolution of binder technology contributing to high performance lithium ion battery.

12:30 Q&A

12:50 Networking Lunch

13:45 Dessert Break in the Exhibit Hall with Poster Viewing

14:15 Close of Lithium-Ion Battery Chemistries

Battery Engineering for Automotive Applications

Meeting the Global Demand for Safe, Higher Energy Batteries

October 29-30, 2019 • Hilton Tokyo Bay • Tokyo, Japan

TUESDAY, OCTOBER 29

8:00 Registration and Morning Coffee

BATTERY MANAGEMENT SYSTEMS

9:00 Chairperson's Opening Remarks

Brian Barnett, PhD, President, Battery Perspectives LLC

9:05 Addressing Key Battery Issues for Electromobility

Rachid Yazami, PhD, School of Materials Science & Engineering, Program Director, Energy Storage, Energy Research Institute, Nanyang Technological University, Singapore; Founding Director, KVI PTE, LTD

Lithium-ion batteries (LIB) are expected to play a major role in the future of electromobility owing to outstanding energy storage performances. Yet, several issues still need to be addressed to ensure a smooth mass-market acceptation and penetration. Among important issues are safety, long service life, and fast charging. At KVI, we have developed a thermodynamics-based technology, which proved to efficiently serve as a diagnosis tool to assess online LIB cell's state of charge, state of health, and state of safety.

9:30 Low Material Cost and High Safety Level High-Voltage BMS Concept

Jaehoon Park, Principal Engineer, Samsung SDI

General BMS description based on the difference between low-voltage (LV from below) & high-voltage (LV from below) BMS. The key features of HV BMS, in addition to the LV BMS feature, will be presented. Trade-off between safety and cost – generally speaking, high safety requirement is figured out to result in high material cost. However, it could be the opposite way, such that high safety requirement enforces to implement low cost BMS concept. The idea and justification will be presented.

9:55 A Prediction-Based Lithium-Ion Multi-Cell Battery-Management Approach to Address Performance Limitations Imposed by Weakest Cell

Scott Trimboli, PhD, Associate Professor, Department of Electrical & Computer Engineering, College of Engineering & Applied Science, University of Colorado

Electric vehicle (EV) battery systems require careful and continuous management to ensure safe and reliable performance. This presentation describes a novel multi-cell control approach (in the context of an active-balancing architecture) that monitors individual cell behavior and acts to mitigate the limiting effect of the weakest cell on overall pack performance.

10:20 Grand Opening Coffee Break in the Exhibit Hall with Poster Viewing

Sponsored by TOYOTA

10:50 On-Board Diagnostic Power Fade Monitoring as Function of State of Charge of Higher Energy Density Lithium-Ion Batteries

Pierrot Sassou Attidekou, PhD, Faraday Institution Research Fellow, School of Engineering, Newcastle University

Both energy and power density of Li-ion batteries degrade with aging and hence, impede their health. A realistic, accelerated aging driving cycling profile has been designed and applied to Kokam-type batteries. An *in situ* method was utilized to estimate the internal resistance. The resistance growth was monitored and modelled at three different voltage regions. The model shows that the batteries degrade less around the nominal voltage when compared to other voltage regions.

11:15 Closing the Gap Between the Features of the Individual Cells and the Performance of the Battery Pack

Hans Harjung, PhD, CEO & Founder, e-moove GmbH

Today's features of an individual automotive battery cell would enable EVs to run more than a million kilometers (3-5000 cycles of 3-500 km). But real-life-data shows a different and quite heterogeneous picture. The difference is based on the heterogeneous aging of the individual cells. Today's balancing strategies cannot get out the full potential of the battery. A completely new approach is needed: effective control of each individual cell by its health and aging parameters.

11:40 From Battery to BMS to Battery Intelligence System (BIS): Preparing Global Industry for the Electrification Tsunami

Sponsored by voltaiq

Tal Sholklapper, MS, PhD, CEO, Voltaiq

To accelerate battery development and qualification in order to meet aggressive new product launches, companies are making investments into personnel, equipment, and Battery intelligence Systems (BIS). This presentation introduces BIS and explains how they are enabling battery teams to work more efficiently to meet launch targets.

12:05 Understanding and Formulations of Material Selection for Battery Pack Designs

Sponsored by wevo

Terence Kearns, Manager, Business Development, WEVO-CHEMIE GmbH

WEVO-CHEMIE GmbH, years of research and amassed data from customers, applications and industry stakeholders, has complied a simpler guide for material selection. Explain the key attributes and boundaries of each chemistry. Considerations for processing and the consequent disparate influences. Formulated into an easy to understand engineering format.

12:30 Q&A

12:50 Networking Lunch

13:45 Dessert Break in the Exhibit Hall with Poster Viewing

BATTERY PERFORMANCE & ENGINEERING

14:15 Chairperson's Remarks

Tal Sholklapper, CEO & President, Voltaiq

14:20 How Ragone Plots Illustrate Performance Prospects for EVs

Brian Barnett, PhD, President, Battery Perspectives LLC

Power-Energy curves, now widely known as "Ragone Plots" were first employed in 1967 by David Ragone during US government hearings into air pollution and the prospects for electric vehicles. The first plots illustrated the status of batteries circa 1965, clearly demonstrating the challenges batteries faced to deliver both the required range and power for EVs. With EVs now a growing reality, much has changed. This talk uses Ragone plots to illustrate how battery technology changed and still can improve.

14:45 Increasing Battery Systems Performance and xEV Industry Trends Analysis

Kevin Konecky, Battery Systems Consultant, Total Battery Consulting, Inc.

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. Industry trends will be evaluated to show how the xEV industry has progressed over the recent wave of electrification.

15:10 Refreshment Break in the Exhibit Hall with Poster Viewing

15:50 Homogenized Cylindrical Cell Model for Thermal-Structural Simulation of the Module

Youngwon Hahn, PhD, Senior Industry Solution Manager, SIMULIA T&M Initiative, Dassault Systemes SIMULIA

In this talk, the methodology to build the numerical model for homogenized cylindrical battery cell model which can capture SOC-dependency and strain-rate dependency is presented. Some of the results in module-level structural and thermal simulation are also discussed.

16:15 Analysis of LV-xEV Applications and Battery Design Optimization with SCiB™

Masahiro Sekino, Chief Specialist, Battery System Application Engineering Department, Toshiba Corporation

Low-voltage hybrid vehicles (LV-xEV) with lithium-ion battery will prevail to be mainstream in the near future. On the other hand, a difference in system voltage (12V through 48V) will be evident depending on region (Japan and Europe). In

this presentation, the energy and power requirement of various components for a LV-xEV system will be analyzed in the viewpoints of fuel efficiency and CO2 emission. Furthermore, optimized battery design with SCiB will be proposed.

16:40 Detecting, Diagnosing, and Controlling Degradation in Lithium-Ion Battery Packs

Gregory Offer, PhD, Senior Lecturer, Mechanical Engineering, Imperial College London

The latest work of the electrochemical science & engineering group at Imperial College London on understanding how thermal management affects performance and degradation, and how thermal techniques can be used to detect and diagnose path-dependent degradation will be presented. A comparison of surface cooling vs. tab cooling shows that surface cooling limits useable capacity considerably and causes accelerated degradation.

17:05 Innovative and State-of-Art LASER Technologies for Battery Manufacturing

Sponsored by COHERENT.

Shigeto Mizutani, Market Development Manager, Sales Development, Automotive, Coherent Japan Inc.

Laser has been expected as a cost- and energy-saving process tool that enables material processing more precise and faster. Batteries, especially for EV, are demanded to be lighter weight with higher capacity. Coherent is introducing new laser developments for EV materials processing utilizing the unique process expertise and know-how.

17:30 Sponsored Presentation *(Opportunity Available)*

17:55 Q&A

18:15 Close of Day

18:15 Tutorial Registration*

WEDNESDAY, OCTOBER 30

8:30 Registration and Morning Coffee

BATTERY SAFETY

9:00 Chairperson's Remarks

Kevin Konecky, Battery Systems Consultant, Total Battery Consulting, Inc.

9:05 Mechanism, Exiting Status, and Approaches of Battery Safety in 3C, ESS, and EDV

John Zhang, PhD, Senior Technical Executive Officer, Asahi Kasei Separator

Various safety incidents associated with Li-ion batteries happened in the EDV, 3C, and ESS, creating many concerns about the Li-ion applications. In this presentation, we will address the fundamental mechanisms of Li-ion battery safety and thermal runaway and discuss the possible reduction methodologies of the Li-ion safety incidents. Also, it is very important for all of us to understand the clear definitions and relations of safety incidents and abnormal abuses. The practical experiments and theoretical considerations are well-matched.

9:30 Safety Testing of Cells Helping in Design of Battery Packs

Johannes Roessner, Global Focus Segment Manager NEV, Transportation Testing, TÜV SÜD

Safety testing of cells does not only give insights into the behavior of the cell, but also helps to draw conclusions about the design of the module and pack. This helps to speed up development time and gain results more efficiently.

9:55 Numerical Prediction and Countermeasure Evaluation for Cell Venting and Thermal Runaway in Lithium-Ion Battery Systems

Daniele Suzzi, PhD, Lead Engineer HV-Battery & EE Thermal, CFD Simulation, Engineering and Powertrain Systems, AVL LIST GmbH

While the failure of a single cell leads to a rather limited hazard, the propagation to adjacent cells may release the whole energy stored in the battery pack, leading to severe conditions, such as fire and fierce explosions. These investigations are of significant relevance for developing strategies to prevent or postpone TR propagation, as well as to meet safety requirements for LIB modules in electric vehicles.

10:20 Coffee Break in the Exhibit Hall with Poster Viewing

10:50 Lessons Learned from Post-Mortem Analysis of Degraded Li-Ion Batteries

Mariyam Darma, Institute for Applied Material-Energy Storage System, Karlsruhe Institute of Technology

Tremendous works on post-mortem analysis have successfully revealed the most dominant mechanisms for battery degradation in correlation with the cycling and storage histories of the cells, such as charge rate, depth of discharge, operating voltage window, temperature, and state of charge. Interesting questions: How do relevant industries (automotive and battery) take benefit from the results? For battery second-life application: Can we use the current know-how to recommend a robust routine to predict the main degradation mode of batteries that have reached their end of life?

11:15 Comprehensive Degradation Analysis of the PEFCs Operated in Different Conditions by Morphological and Chemical Structure Analysis

Tsuyoshi Akiyama, Senior Research Chemist, Organic Analysis Laboratory, Toray Research Center

Degradation analysis of the respective sites (catalyst layer, electrolyte membrane, and wastewater) of polymer electrolyte fuel cell (PEFC) subjected to the start-stop cycle test and the load cycle test were performed by morphological structure analysis (X-ray CT, SEM, EPMA) and chemical structure analysis (GPC, IC, LC/MS, LC/CAD). As a result, the morphological and chemical structure changes were different between two type cycle tests.

11:40 Novel Additives Enhanced Performance and Safety of Lithium-Ion Batteries

Peter Chu, Department of Chemistry, National Central University

Advanced lithium battery incorporating novel formula to provide higher power and high energy density are actively pursuit to meet the increasing need for telecommunication electronic devices and the explosive growth of electric vehicle. Additionally, longer battery life cycle, more durable high temperature performance, faster rate capability and increased safety features are challenging but realistic goals to meet in these advanced lithium ion batteries. Although safety being the most sought-after property in these advanced battery, dependable and fundamental discovery to ensure "total battery safety" appears to be missing.

In this work, we will report the discovery of novel chemistry of some functional organo-metallic (f-OM) moiety which enhanced the advanced lithium battery performance. The ingredients can be administered separately or in combination to four battery components, either during or before battery manufacturing: (1) On cathode: assists resilient SEI coating, (2) On electrolyte: as property enhancing additive, (3) On membrane: to improve porous binder/adhesive on ceramic coat and (4) On battery packaging material which served as flame retardant. The improvement on lithium battery by f-OM and its effects and remediation will be examined with 10Ah pouch cells in terms of increased cycle life stability; stable high temperature performance, stable performance under overcharge, and effectively avoided thermal run away which ensures battery safety.

12:30 Q&A

12:10 Battery Degradation Modeling Based on FIB-SEM Image Features Extracted by Deep Neural Network

Yoichi Takagishi, PhD, Group Leader, Computational Science Center, Kobelco Research Institute

We propose a modeling strategy based on machine learning / deep learning for predicting Li-ion battery degradation, and present advantages of data-driven approaches by comparing with conventional Physico-chemical modeling approaches [1]. Test cells composed of NCM-SiO have been prepared, and charge/discharge cycle tests on condition of various upper/lower cutoff voltage and temperature have been performed. Convolutional Neural Network (CNN) were built in order to classify pristine or degraded of FIB-SEM images of SiO, and feature importance masks were obtained via gradient of loss function [2]. From the masks, the important statistical quantities such as average thickness of heterogeneous phase on active materials have been listed and determined using Random Forest algorithm. In order to predict the capacity degradation with cycles of the batteries, we have applied Gaussian Process Regression on the sequential change of the important features.The calculation results show the prediction of battery capacity by the data-drive approach have higher accuracy than the physical modeling. This suggests that the former approach has successfully extracted the features of battery degradation whereas the latter approach requires assumption of the mechanism in advance. In addition, was adopted in order to predict variation of degradation in battery module and the difference between both models was discussed.

12:50 Networking Lunch

13:45 Dessert Break in the Exhibit Hall with Poster Viewing

14:15 Close of Battery Engineering for Automotive Applications

Batteries for Hybrid & Electric Vehicles

October 30-31, 2019 • Hilton Tokyo Bay • Tokyo, Japan

WEDNESDAY, OCTOBER 30

13:00 Registration

xEV BATTERY BUSINESS EXPANSION

14:15 Chairperson's Opening Remarks
Menahem Anderman, PhD, President, Total Battery Consulting, Inc.

14:20 EDV, Battery, and Materials Business Possibility in China after 2020
Mark Lu, PhD, Certified Senior Industrial Analyst, Industrial Economics & Knowledge Center (IEK), Industrial Technology Research Institute (ITRI)
Since China occupied a half of the worldwide EDV market, the present status and future possibility of the Chinese EDV market has become the hottest issue. This presentation will try to cover both the technical development and Chinese EDV battery material market, and the future strategies of the Chinese battery maker. Also, the leading OEM and EDV product development and policies will be included.

14:45 Latest Analysis of xEV and LIB Battery Technology and Market Trends
Takeshi Miyamoto, Senior Vice President, B3 Corporation
BEV/PHEV markets are continuing to grow significantly in these years as a countermeasure to the near-future tighter environmental regulations. B3 will provide the LIB industry's real market information, including supply/demand status and future forecast and will describe noteworthy moves in this industry."

15:10 Effect of Li-Ion Chemistry Global Split on Raw Materials: Past, Present, and Future
Nicolo Campagnol, PhD, Senior Knowledge Analyst, Basic Materials Institute, McKinsey & Company
The demand for nickel, cobalt, and lithium from batteries and other applications is compared with proprietary supply forecasts for each of them. Insight into potential price regimes, raw materials specs, and global logistics will be presented.

15:35 Refreshment Break in the Exhibit Hall with Poster Viewing

16:10 Key Development in International xEVs
Menahem Anderman, PhD, President, Total Battery Consulting, Inc.
The presentation will assess the growth of the xEV and xEV-battery market by vehicle architecture and geographical region. It will review key battery designs and value-proposition enhancements against market requirements and consumer expectations.

16:50 Global & Regional EV Sales Outlook, Growth Trends, & Implications for Wh Demand
Viktor Irle, Market Analyst, EV-Volumes.com
Viktor Irle, Co-founder & Market Analyst at EV-volumes.com will give a presentation on the Global & Regional EV Sales Outlook, Growth Trends & implications on Wh demand. It will give detailed statistics of sales by brands, regions and models, it will also show forecasts based on EV-volumes' research for BEV & PHEV vehicle sales, and the implications for Li-ion battery Wh demand / OEM.

17:15 Q&A

17:45 Networking Reception in the Exhibit Hall with Poster Viewing
Sponsored by CLARIOS

19:00 Close of Day

THURSDAY, OCTOBER 31

8:30 Morning Coffee

xEV BATTERY DEVELOPMENT

9:00 Chairperson's Remarks
Wenzel Prochazka, PhD, Manager, Battery Benchmarking Program, AVL List GmbH

9:05 Talk Title to be Announced
Heinz-Willi Vassen, Director, C/EE Development Electric/Electronics, Audi (China) Enterprise Management Co., Ltd.

9:30 Batteries for the Chinese xEV Market
Mike O'Kronley, Executive Director - Corporate Strategy, A123 Systems

9:55 Continued Glimpses into xEV Batteries on the Market – AVL Series Battery Benchmarking
Wenzel Prochazka, Manager, Battery Benchmarking Program, AVL List GmbH
The program provides a database for objective comparison in technical attributes in engineering methodology with market competitors for clear system target definition of high performing, reliable and safe batteries. 270 different criteria are evaluated through AVL benchmarking metrics grouped in 8 high level attributes. The integrated system performance values in cell, mechanical and electrical system are pointed out to support development programs. With a special focus on safety systems three exemplary vehicles are compared, the Tesla Model 3, Nio ES8 and Audi etron.

10:20 Coffee Break in the Exhibit Hall with Poster Viewing

11:00 EVs That Even Climate Change Deniers Will Agree Are More Convenient than Gas Cars
Jarvis Tou, Executive Vice President, Marketing & Products, Enevate Corporation
Unlike powder-based graphite anodes or silicon technologies which involve adding silicon-containing additives to graphite-dominant anodes, Enevate's silicon-dominant technology offers many unique benefits for Electric Vehicles (EVs) including high energy density, greater than 4C extreme fast charge, wide temperature operation, and safety. Data showing the benefits and the applicability to acceleration of electrification of the fleet will be shown.

11:25 Silicone Material Solutions In Battery Pack Assembly
Sponsored by DOW
Hiroaki Yoshida, Lead Technical Service & Development Manager, Electronics & Advanced Assembly, Dow Consumer Solutions
Assembly and integration of EV/HEV batteries and modules require thermal management, vibration damping, fire protection, mechanical fixing but also EMI shielding. We provide DOWSIL™ solutions for all of these applications. Silicone-based materials enable customers to cost-effectively manage the challenges in their next-generation EV/HEV battery designs. A wide range of Silicone Solutions from Dow for EV Battery Pack Assembly is going to be introduced to the audiences.

11:50 Battery Development for Electric Vehicle and Expectations for the Future
Yoshiaki Nitta, Expert Leader, Nissan Motor Co., Ltd
Based on the experiences of battery development for Nissan LEAF that has been supporting production results for 10 years, expected requirements for future battery systems will be discussed. The expectations and challenges for the all solid-state battery system, which is regarded as one of the future battery systems with higher potential compared to the conventional LIB, will be taken into consideration

12:15 Q&A

12:45 Networking Lunch

13:30 Dessert Break in the Exhibit Hall with Poster Viewing

SPECIALTY EV MARKET DEMAND