

aaabc OEM Fellows



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PROGRAM HIGHLIGHTS

- » Latest Assessment of the xEV & xEV-Battery and Material Market
- » xEV Battery Technology Updates [Audi, Daimler, GM, Renault, Volvo, Volkswagen]
- » 14V Architecture Expansion [Audi, A123 Systems]
- » Batteries for 48V Systems [Valeo & Bosch]
- » Battery Durability, Field Experience and Modeling [Renault, Daimler, TUM & Imperial College]
- » Battery Safety Testing: Materials, Cells, Packs & In-Vehicle
- » New Initiatives for Cell Manufacturing
- » Post Li-Ion View from [Daimler & VW]
- » Raw Materials Market Drivers and Forecasted Consumption Trends
- » Lead-Based Batteries Technology & Innovation [Ford, BMW, Johnson Controls]
- » Specialty EVs and Their Battery Systems [MAN, Volvo, Bombardier, Bosch]

R&D SYMPOSIA

30 JANUARY	SUPERCAPS 	RAW MATERIALS
	31 JANUARY	CHEMISTRY
LEAD-BASED 		

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CONFERENCE TRACKS

1-2 FEBRUARY	xEV 	SPECIALTY EV
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Welcome!

I am pleased to share with you the excitement about AABC Europe 2017 and invite you to join us in Mainz this coming January.

In the past 12-24 months, we have seen diversification at the opposite ends of the xEV spectrum: EV batteries to power long-range EVs with capacities exceeding 80 kWh and in voltages up to 800V on the one hand, and low-voltage, low-capacity, high-power batteries, ranging from 0.12 to 0.6 kWh, at 14 to 48V, to support micro- and mild-hybrids on the other. In between the two extremes, improvement in battery technology allows for PHEV batteries with higher capacity and longer electric driving range.

While Lead-Acid batteries and supercapacitors are contenders for a low level of hybridization, Lithium-Ion chemistry is the dominant candidate for most applications. Yet, for each of them, some fundamental questions remain:

- What are the specific anode and cathode chemistries?
- Which cell design?
- Which pack design?
- Which supplier?
- At what cost?
- In what volume for each category?

These questions will be addressed at AABC Europe 2017, where chief battery technologists from major European automakers will present their development trends and projected battery needs, and their key suppliers will present their latest offerings and roadmaps for the future.

This is a pivotal time for the industry with production volumes starting to ramp up, the battery designs of 2nd generation products being completed, and roadmaps for third-generation products being drawn – Join us and our partners at Cambridge EnerTech in Mainz to start the year well-informed!










Sincerely,
Menahem Anderman
Conference Chair

Top Reasons to Attend

- » Learn first-hand about the technical and business directions of European automakers from seven of the major automakers currently active in the European market
- » Meet leading energy storage technologists from all automakers active in the European market
- » Hear the latest updates on advances in electrochemical capacitor technology and application
- » Learn about the newest advances in next-generation materials and cell technologies from some of the world's top battery materials experts
- » Participate in frank discussions on battery durability and safety validation
- » Network at the largest 2017 international gathering of advanced energy storage technology developers and integrators in Europe
- » Participate in expanded programming, including two new R&D Symposia [Raw Materials & Lead-Based]

Conference at-a-Glance

Monday		Tuesday		Wednesday–Thursday	
JANUARY 30		JANUARY 31		FEBRUARY 1-2	
TUTORIALS & SYMPOSIA					
Tutorials: see page 5		 Chemistry	 xEV		
 Supercaps	 Engineering		 Specialty EV		
 Raw Materials	 Lead-Based				

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“AABC is the **most important conference** for the Renault Battery Team.”

– *Masato Origuchi, Renault*

“Good conference, **best in class.**”

– *Udo Heim, Porsche AG*

“Posters are **great.**”

– *Johan De Backer, Toyota Motor Europe*

“**Complete overview,**
from material to system.”

– *Frank Moebius, BMW AG*

“Excellent conference to network with **expert OEMs.**”

– *Jeff Gough, GrafTech International*

“AABC Europe is the **best networking event** every year.”

– *Uwe Wiedemann, AVL*

“The networking at **AABC Europe is excellent.**
One week of AABC equals a one-month tour around the world to all major car OEMs.”

– *Tom Van Bellinghen, Umicore*

“Very good selection of topics and speakers. The place to meet the **key people of the battery world.**”

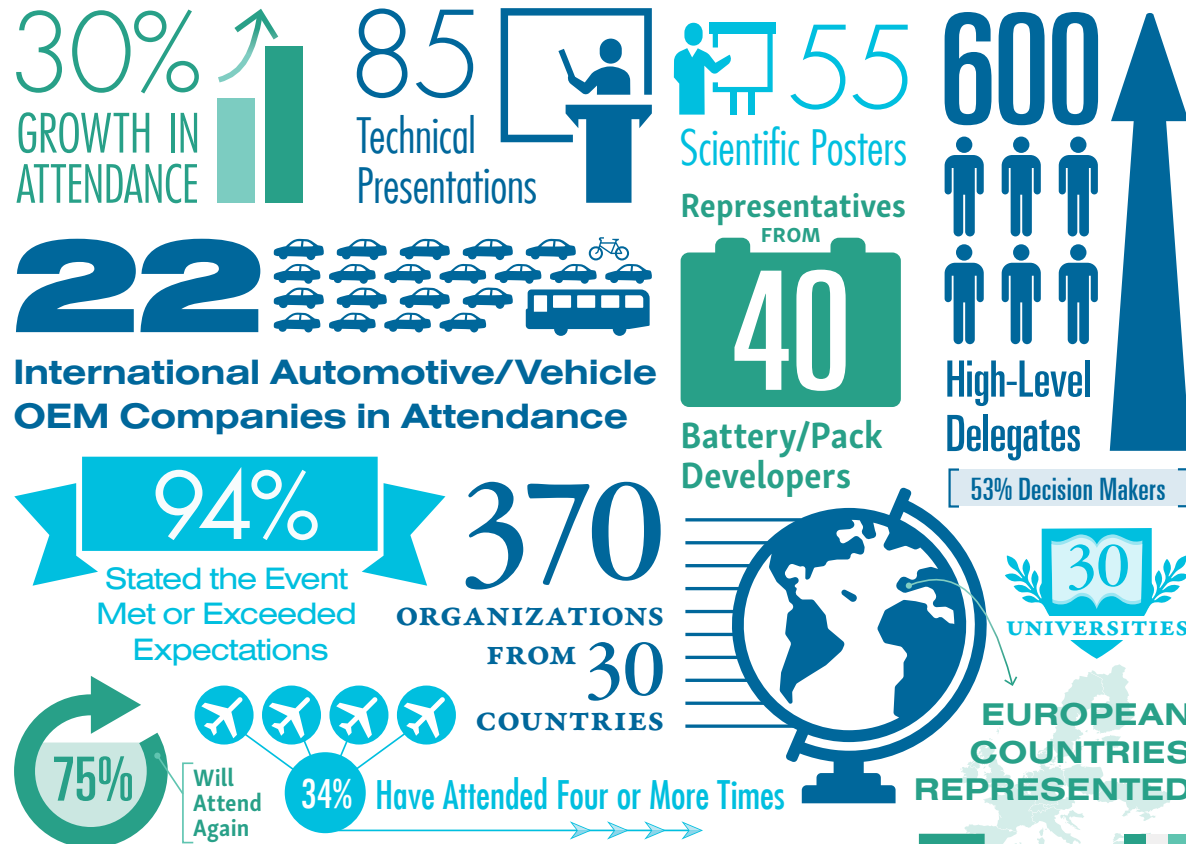
– *Roland Matthé, Adam Opel AG*



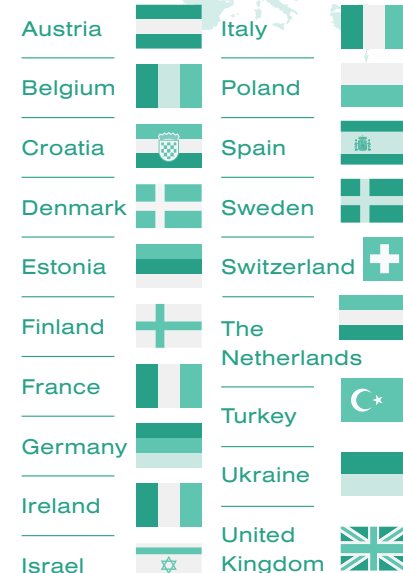
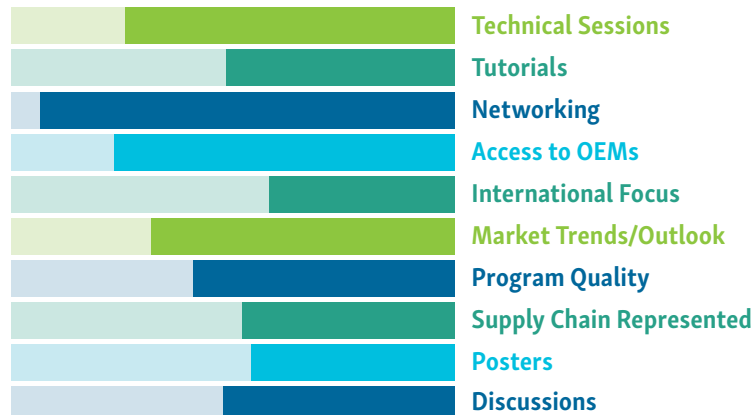
↑
Hear what your colleagues had to say
about the 2016 event in this video

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AABC Europe 2016



WE ASKED ATTENDEES: What was the most valuable part of the meeting?



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Cambridge EnerTech offers diverse sponsorship packages that provide your company the opportunity to showcase your products, services, and solutions to an elite group of delegates. All sponsorship packages are customizable to your company's specific marketing needs and budget.

PODIUM PRESENTATIONS WITHIN THE MAIN AGENDA

Showcase your solutions to a guaranteed, targeted audience through a 15- or 30-minute presentation during a specific conference program, breakfast, lunch, or separate from the main agenda within a pre-conference workshop. For the luncheon option, lunches are delivered to attendees who are already seated in the main session room.

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Exhibitors will enjoy facilitated networking opportunities with qualified delegates. Speak face-to-face with prospective clients and showcase your latest product, service, or solution.

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

ONE-ON-ONE MEETINGS

Select your top prospects from the pre-conference registration list. Cambridge EnerTech will reach out to your prospects and arrange the meeting for

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Additional branding and promotional opportunities are available!

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- » Private meeting room for two days

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- » Choice of Monday Welcome Reception, Ride and Drive, or Battery Pavilion
- » Three main conference registrations



- » Company Video will be displayed on large screen monitor
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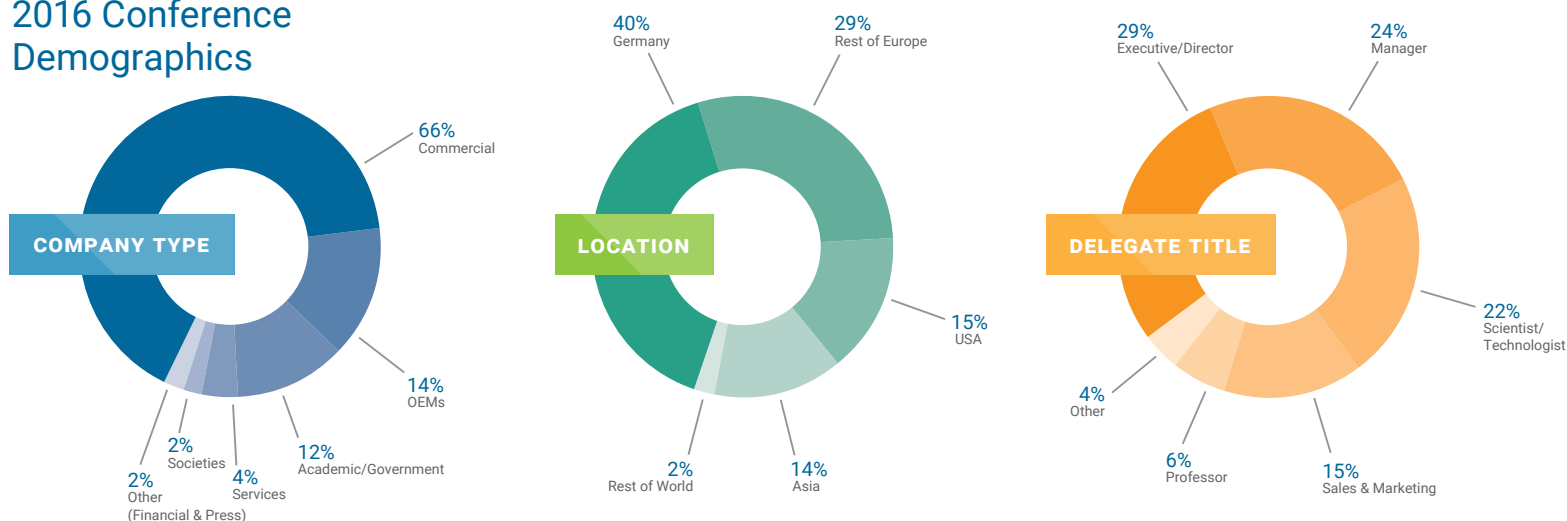
Platinum Sponsorship

- » Choice of Monday Welcome Reception, Luncheon or VIP Dinner (up to 15 guests)
- » Two main conference registrations

For additional information regarding sponsorship or exhibits, please contact:

Sherry Johnson
Manager, Business Development
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2016 Conference Demographics



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/Europe**MONDAY, 30 JANUARY 2017****10:20-12:20 Li-Ion Battery Design and Simulation***Topics to be covered include:*

- A Brief Survey of Software Tools
- Battery Design Basics (Energy & Power)
- Cell Design (Components, including electrodes, separators, electrolytes, collectors; Stacked Plate and Spiral; Empirical Models; Macro-Homogeneous Models; Microstructural Models)
- Module Design (Series/Parallel; Cooling Strategies)
- Simulation of Ageing
- Simulation of Abuse



*Instructor: Robert Spotnitz, Ph.D.,
President, Battery Design LLC*

Dr. Spotnitz is a leading developer of mathematical models that simulate battery operation. Dr. Spotnitz, who previously held several senior technical positions in materials and battery development, founded Battery Design in 1999 to provide consulting and develop custom software for battery developers and users. He is a well-known speaker on various aspects of battery engineering.

13:35-15:35 Effect of Electrode and Cell Production Steps on Lithium-Ion Battery Cell Performance and Costs*Topics to be covered include:*

- Overview process chain for electrode and cell production (conventional and alternatives)
 - dry mixing, wet dispersing, coating, drying, calendering, final drying, slitting, cell assembling, electrolyte filling, formation

- Importance of mixing and dispersing step for later cell performance, especially c-rate performance and cycle stability
- Critical aspects in coating and drying of LIB electrodes
- Calendering and final drying to improve cell performance and volumetric energy density
- Cell assembly for high reproducibility and low costs
- Electrolyte filling and formation as time consuming and performance relevant production steps
- Process-structure-performance relationships as tool for optimization of lithium ion battery cells
- Virtual cell design to determine cell performance as function of important production parameters
- Cell cost calculation based on detailed process chain consideration
- Ecological impact of battery cell production



*Instructor: Arno Kwade, Prof. Dr.-Ing.,
Battery LabFactory Braunschweig (BLB),
TU Braunschweig*

In 1996 Arno Kwade, who studied Mechanical Engineering with a focus on Process Technology, got his PhD in the area of Particle Technology at the University (TU) Braunschweig. After running a consultancy on milling and handling of bulk solids as well as managing a small size company he took over the Institute for Particle Technology of the University (TU) Braunschweig in 2005 and started research on the production of battery electrodes in 2007. Today he is speaker of the Battery LabFactory Braunschweig, a multidisciplinary research platform, and of the German cell production research cluster ProZell."

16:15-18:15 The Rechargeable Battery Market: Value Chain and Main Trends 2016–2026

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|Supercap|NiMH|LIB). Additionally LIB design for P-HEV & EV markets (Cylindrical, prismatic, pouch|Wounded, stacked, Z fold cells) and LIB cell, module & pack cost structure 2016-2026 will be discussed.



*Instructor: Christophe Pillot, Ph.D., Battery
Survey Manager, Avicenne Energy, France*
Christophe has built up considerable expertise in the area of battery market.

He joined Avicenne 18 years ago and spent 3 years in Japan analyzing the Japanese Electronic, Mobile & Battery market. Christophe has acquired extensive experience in marketing, strategy analysis, technology and financial studies for the battery and power management fields. He developed the battery market analysis for Avicenne, which serves more than 180 customers worldwide. Christophe has published several annual surveys such as "The rechargeable battery market 2012-2025." Globally, he has been involved in more than 200 projects for 100+ customers in the battery value chain. Before joining Avicenne, Dr. Pillot held a key position in France Telecom's innovation division. He has a degree in Chemistry and a MBA in Innovation Management from Pays IX Dauphine.

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Facilitate detailed communication with the entire automotive battery supply chain by participating in the OEM Battery Pavilion. Contact Dave Mello at dmello@CambridgeEnerTech.com or visit our website for more information.

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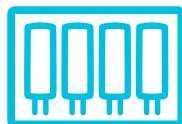
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R&D SYMPOSIUM 1

ELECTROCHEMICAL (EC) CAPACITORS



This symposium will examine the latest technological advancements in electrochemical capacitors for automotive applications. Session 1, Advances in EC

Capacitor Materials and Cell Design will explore the latest advances in materials—including the development of advanced materials and processes to meet the pricing threshold of important markets—and in capacitor design—including the development of advanced asymmetric ECs. Session 2, New EC Capacitor Products will review new capacitor products and EC business development activity. Leaders from key companies will discuss present and future products and business development strategies as they expand their product offerings to support the growth of energy-efficient industrial, utility, and transportation-related energy-storage systems. Session 3, EC Capacitor Storage System Applications will review EC module design and system engineering, including those related to transportation, to industrial energy conservation, and to the utility grid.

MONDAY, 30 JANUARY

ADVANCES IN EC CAPACITOR MATERIALS & CELL DESIGN

8:30 Symposium Registration and Morning Coffee

10:00 Chairperson's Opening Remarks

Katsuhiko Naoi, Ph.D., Professor of Chemistry, Institute of Symbiotic Science & Technology, Tokyo University of Agriculture & Technology

10:05 Future Perspective of Supercapacitors' Nanomaterials

Katsuhiko Naoi, Ph.D., Professor of Chemistry, Institute of Symbiotic Science & Technology, Tokyo University of Agriculture & Technology

To meet growing demands for electric automotive(xEV) applications, hybrid (battery+capacitor) EES can overcome the energy density limitation of the conventional EDLCs. In light of this, the author's group invented/developed an original material processing technology called "ultracentrifugation (UC)"

that allows to prepare varieties of ultrafast nanomaterials for hybrid supercapacitors.

10:25 Materials Selection for Asymmetric/Hybrid Supercapacitors

Margret Wohlfahrt-Mehrens, Ph.D., Head, Materials Research Accumulator (ECM), ZSW – Zentrum für Sonnenenergie- und Wasserstoff-Forschung, Baden-Württemberg, Germany

Hybrid supercapacitors using composite electrodes combining both high double layer capacitance and battery like lithium insertion materials provide much higher energy density compared to classical double layer supercapacitors (EDLC). Various new combinations of composite electrodes for anode and cathode will be presented. The presentation will discuss in detail: 1). Selection of lithium insertion materials for composite electrodes 2). Influence of composition ratio activated carbon/lithium insertion material 3). Influence of mass balancing of anode and cathode in complete cells.

10:45 Rational Design of Innovative Electrolytes for Supercapacitors

Andrea Balducci, Ph.D., Professor, Institute for Technical Chemistry and Environmental Chemistry, Center for Energy and Environmental Chemistry (CEEC), Friedrich-Schiller-University Jena

The development of innovative electrolytes is essential for the development of advanced electrolytes. In the near future new solvents, new salt as well as new ionic liquids should be identified and investigated. This search should generate a "new wave" of innovative electrolyte components, able to display a well-balanced set of properties, high safety and reasonable cost. In this presentation the use of computation screening for the identification of innovative electrolytes will be considered.

11:05 Networking Coffee Break with Poster Viewing

11:35 High Density Oxides for Aqueous Asymmetric Supercapacitors for Improved Volumetric Properties

Olivier Crosnier, Ph.D., Assistant Professor, Jean Rouxel Institute of Materials, University of Nantes, France
Pseudocapacitive electrodes can be of interest in order to improve the volumetric energy density of electrochemical capacitors. For example, an asymmetric FeWO₄/MnO₂ supercapacitor has been assembled. The full device can be operated between 0 and 1.4 V in a neutral aqueous electrolyte with remarkable cycling stability. The charge

storage mechanisms and the cell performance will be presented in this presentation.

11:55 Lithium-Ion Capacitor with Low Footprint Sacrificial Material for Graphite Pre-Lithiation

François Béguin, Ph.D., Professor, Power Sources Group, Poznan University of Technology, Poland

We continue our efforts to designing Lithium-ion capacitors (LIC) without auxiliary metallic lithium electrode. The strategy is based on the use in the positive activated carbon electrode of a sacrificial material from which lithium is irreversibly extracted and intercalated in the negative graphite electrode. After having explored irreversible oxides and organic compounds, we now investigate negligible footprint materials which are delithiated with gas evolution. The performance of the resulting LIC will be shown in detail.

12:15 2-D Materials for Capacitive Storage

Patrice Simon, Ph.D., Professor, Université Paul Sabatier

We will present latest results obtained on 2D titanium carbide (Ti₃C₂T_x MXene) in both organic and neat ionic liquid electrolytes. In neat EMI-TFSI electrolyte, a capacitive behavior was observed within a large electrochemical potential range (from -1.5 to 1.5 V vs. Ag). The intercalation and de-intercalation of EMI⁺ cations and/or TFSI⁻ anions, investigated by in situ X-ray diffraction technique, highlighted the presence of two different intercalation mechanisms, depending on the electrode polarity. These results open new path for designing high energy and power supercapacitors based on the use of MXene materials.

12:35 Q&A

12:50 Networking Lunch

14:15 Chairperson's Remarks

Andrew F. Burke, Ph.D., Institute of Transportation Studies, University of California, Davis

14:20 An Industrial Perspective on Supercapacitor Carbons

Ranjan Dash, Advanced Programs Technologist, Future Business, SABIC

Supercapacitor carbons have been the focus of extensive research over the past couple of decades. Carbon-carbon supercapacitors offer higher power, better cycle life, and higher reliability than batteries, but have much lower energy density and higher self-discharge. Recently, Lithium-ion capacitors, which combine a supercapacitor carbon

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cathode with a lithiated carbon anode, have been commercialized. Lithium-ion capacitors offer higher energy density and lower self-discharge than carbon-carbon supercapacitors; the capacity of the supercapacitor carbon cathode remains as the factor limiting energy density.

14:40 Carbon Black Additives for Electrochemical Capacitors: Impact on Capacity and Cycle Life

Miki Oljaca, Ph.D., Director, R&D and Applications, Cabot Corporation

Electrochemical capacitors (EC) are finding broader use in automotive and other applications. Carbon blacks are typically used as conductive additives to activated carbon electrodes used in EC devices. In this talk, we will discuss specialty carbon black additive with high capacitance similar to activated carbons. We will discuss use of this new additive in EC devices where it can be combined with activated carbons to improve both power and capacity of EC electrodes. We will also discuss how tailoring of carbon black properties can impact electrode density and cycle life of EC devices.

15:00 Coarse-Grained Carbide-Derived Carbon Supercapacitor Electrodes for Automotive Applications

Boris Dyatkin, NRC Post-Doctoral Researcher, U.S. Naval Research Laboratory

We have developed a novel energy storage electrode composed of 75 – 250 μm diameter particles with a finely tuned microporosity, a specific surface area in excess of 1700 m^2/g , and high capacitive performance. We successfully demonstrated high performance of 1 mm thick films, which has been, to date, unprecedented in supercapacitor technology, and increased areal capacitance above 8 F/cm^2 . Ionic liquid electrolytes extended the voltage window of electrodes above 3.1 V and improved their energy densities.

15:20 Q&A

15:35 Refreshment Break with Poster Viewing

NEW EC CAPACITOR PRODUCTS

16:10 Chairperson's Remarks

Andrew F. Burke, Ph.D., Institute of Transportation Studies, University of California, Davis

16:15 Review of Supercapacitors Performance Characteristics and Vehicle Applications in Combination with Batteries

Andrew F. Burke, Ph.D., Institute of Transportation Studies, University of California, Davis

In this paper, the present status of electrochemical supercapacitor performance will be reviewed based on testing of commercially available devices and proto-type devices being developed in various countries around the world. Test results are given for the energy density, power capability, and temperature characteristics of the devices from data taken at UC Davis.

16:35 Enhanced Energy of Water-Based Electrochemical Capacitor

Elzbieta Frackowiak, Ph.D., Professor, Poznan University of Technology

The application of aqueous electrolytes with a redox activity of halides (iodides, bromides) and pseudohalides is an attractive way to enhance capacitance values, in turn, capacitor energy. Additionally, a different combination of electrolytes for positive and negative electrodes has been utilized to increase the voltage range of capacitor. The capacitor characteristics obtained in aqueous electrolytes are comparable to the parameters obtained in organic medium.

16:55 Combined Battery/Supercapacitor Hybridised Energy Storage Systems for Hybrid Electric Vehicles

Wasim Sarwar, Energy Storage Systems Research Engineer, Jaguar Land Rover; Department of Mechanical Engineering, Imperial College London, UK
Automotive OEMs are striving to increase the electric driving range of electrified vehicles without

compromising performance. This requires an increase of both the energy and power density of the Energy Storage System (ESS), however in battery design these two attributes are generally mutually exclusive, therefore a compromise must be made. This presentation examines whether a Hybridised Energy Storage System could result in an ESS with improved energy and power density in comparison to a battery only system, and explores the system level implications.

17:15 Adding Energy to Supercapacitors

Vinod M. Nair, Ph.D., Senior Electrochemist, Supercapacitors, Calgon Carbon Corporation
The energy density of contemporary commercially available supercapacitors is limited to about 8 Wh/Kg (3.0 V, organic electrolytes). This is hindering their widespread applications in many emerging energy storage applications. FaradPower is engaged in developing a new class of supercapacitors with high energy density; while maintaining all the other excellent properties (long cycle life, high power density, and tolerance to deep-discharge) of supercapacitors.

17:35 Recent Developments in Ultracapacitor Technologies

Ken Rudisuela, Chief Technical Officer, IOXUS, Inc.
The talk will cover the technology behind IOXUS new high temperature EDLC. The significance of this development in durability, product life and market applicability will be explained. Finally, the new IOXUS engine start module will be introduced with its function and application described.

17:55 Q&A

18:15 Welcome Reception with Poster Viewing

19:15 Close of Day

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R&D SYMPOSIUM 2

GLOBAL BATTERY RAW MATERIALS



Understanding the complexities of the global supply chain for battery component materials is critical to the successful commercialization of EV applications. An examination of the drivers of end user demand with a focus on major new

projects in the pipeline and how that demand will evolve over the near and long term will be presented. This symposium will cover the global markets from multiple angles including advances in mining and processing with an emphasis on sourcing and cost control strategies by manufacturers with an outlook on the forecasted consumption trends for China, Japan, Korea, Europe and the United States. Don't miss your opportunity to network with the major players within the global battery supply chain.

MONDAY, 30 JANUARY

ADVANCED BATTERY MATERIALS

8:30 Symposium Registration and Morning Coffee

10:00 Chairperson's Opening Remarks

Simon Moores, Managing Director, Benchmark Mineral Intelligence, United Kingdom

10:05 Advancing Next-Generation Lithium Batteries

Marina Yakovleva, Global Commercial Manager, New Product and Technology Development, FMC Corporation

FMC continues its focus on customer applications and emerging technologies through its R&D efforts in developing new products and technologies that can meet the demand for higher energy density systems. The presentation will review FMC's outlook on the rechargeable Li-ion market. The role of lithium precursors in the development of the advanced cathode materials and FMC's road map for the advancements of the Li-ion and beyond Li-ion systems will also be discussed.

10:25 Pushing the Limits: Lithium-Ion Battery Cathode Materials for E-Mobility

Andreas Fischer, Ph.D., Vice President, Battery Materials Research, BASF

In order to enable a broad and affordable mass market penetration of electromobility continuous improvement on the material level is necessary. Total cost of ownership (TCO) is important from an end customer's point of view and beside other parameters influenced strongly by the proper choice of cathode material. There are several pathways and a rich toolbox available at BASF to improve cathode materials' performance and cost effectiveness that will be presented. Important factors are energy density, cycle life and cost balanced for optimized TCO.

10:45 Production of Lithium Hydroxide at Lower Cost

Jean-François Magnan, Technical Manager, Nemaska Lithium

Nemaska proprietary technology allows to produce lithium hydroxide directly at a lower cost than most of the actual lithium carbonate producers. Lithium hydroxide is required for the production of high-grade nickel cathode material having high energy density such as NCA and NMC. Also, depending on the chemistry and the process to synthesize the cathode material, lithium hydroxide has many technical advantages over lithium carbonate.

11:05 Networking Coffee Break with Poster Viewing

11:35 Natural Battery-Ready Graphite for Li-Ion Batteries

Donald Baxter, P.Eng., President and CEO, Alabama Graphite Corporation

Environmentally sustainable production of 'Energy Graphite,' namely natural specialty Coated Spherical Graphite (CSPG) engineered for Lithium-ion battery anodes. Commercial production via a halogen-gas-based low-temperature thermal purification process to achieve battery-grade purity, coupled with state-of-the-art micronization and spheronization processes, and the application of silicon-enhanced conductive surface coatings.

12:05 Environmentally Clean Production of Graphite Anode Materials

Jeremy Schrooten, Ph.D., Global Product Manager, Pyrotek Incorporated
Michael Sekedat, Energy Group Business Manager, Pyrotek Incorporated

The vast majority of graphite anode materials used in lithium-ion batteries are produced using "environmentally unfriendly" technologies. Pyrotek's use of renewable hydroelectric power with proprietary, low-emission furnace technology is the "environmentally friendly" alternative for a high purity and consistent anode material supply chain.

12:35 Q&A

12:50 Networking Lunch

14:15 Chairperson's Remarks

Robert Baylis, Manager, Minor Metals Research, Roskill Information Services Ltd., United Kingdom

14:20 Lithium-Ion Battery Raw Material Supply and Demand 2016–2025

Christophe Pillot, Ph.D., Battery Survey Manager, Avicenne Energy, France

This presentation includes cathode, anode, electrolyte and separator demand. It will examine the major component suppliers and include a discussion on price evolution and major technical trends.

14:50 Industrial Mineral Recycling in Li-Ion Batteries: Its Impact on the Raw Material Supply Chain

Mike O'Driscoll, Director, IMFORMED Industrial Mineral Forums & Research, Ltd.

Li-ion battery use has increased markedly in recent years, but Li-ion battery recycling is still at an evolutionary stage. With at least one-third of production costs related to raw materials, developments in recycling industrial mineral components and its relationship with sourcing of primary raw materials is receiving much attention.

15:20 Q&A

15:35 Refreshment Break with Poster Viewing

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/Europe**SUPPLY, DEMAND & COST CONTROL****16:10 Chairperson's Remarks**

Robert Baylis, Manager, Minor Metals Research, Roskill Information Services Ltd., United Kingdom

16:15 Raw Material Supply in an Energy Storage Revolution

Simon Moores, Managing Director, Benchmark Mineral Intelligence, United Kingdom

Lithium-ion output is surging but how much thought has been given to the raw materials that serve this market? In the last two years, the battery raw materials of lithium, graphite and cobalt have had to re-evaluate future plans on the back of an evolving battery industry. Lithium has experienced its most extreme shortage and price spikes in history, battery-grade graphite supply has had to significantly expand, while cobalt has faced supply cuts across the board thanks to the low copper price. With battery megafactories coming on-stream between now and 2021, raw material supply is set to be the bottleneck that could significantly slow the lithium-ion surge.

16:35 Lithium-Ion Battery Raw Material Supply Chain Bottlenecks: Looking Beyond Supply/Demand/Price

Robert Baylis, Manager, Minor Metals Research, Roskill Information Services Ltd., United Kingdom

In recent years, the focus of participants in the Lithium-ion battery supply chain has shifted from global resource availability to supply and price implications, as sectors (EVs and ESSs) with transformatory growth projections start to gather pace, thus requiring more raw materials. This paper will present a scenario-based outlook for Lithium-ion battery raw material demand, and highlight the potential bottlenecks in meeting it from a supply-chain perspective, delving beyond the supply/demand/price equation.

16:55 Leveraging the Lithium-Ion Battery Supply Chain to Position Organizations for Continued Growth and Acceptance of Electric Vehicles

Chris Berry, Founder, House Mountain Partners, LLC

As Lithium-ion battery prices continue to fall by 8 to 14% per year, public policy lines up behind the need to de-carbonize. The implications for this shift across multiple industries, from mining, to battery manufacturer, to OEM, to utility are profound and it

appears that nobody is entirely sure what the next five years holds. With interest rates at historic lows around the world and generally sluggish growth accompanying this, companies and investors alike will need to find new markets that offer high growth opportunities to survive and thrive.

17:15 PANEL DISCUSSION: Barriers and Opportunities to Meeting Global Market Demand for Advanced Battery Materials

Moderator: Anthony Milewski, Vice President, Pala Investments

It is estimated that the global energy storage markets have the potential to reach over \$150 billion annually. These markets represent significant opportunities for investment and R&D. This international panel of experts will discuss meeting the challenges of increasing global demand with keeping costs low while continuing to advance technology. The panel will explore which organizations are well positioned to capitalize on the growth and where the key opportunities are for investment.

18:15 Welcome Reception with Poster Viewing**19:15 Close of Day**

PRESENT A POSTER!

Share your latest R&D findings with this exclusive group of technical and business development executives from major American and international battery companies, automotive technology centers and the global materials and energy industries. Accepted poster presenters also receive a **€150 discount*** off their registration fee.

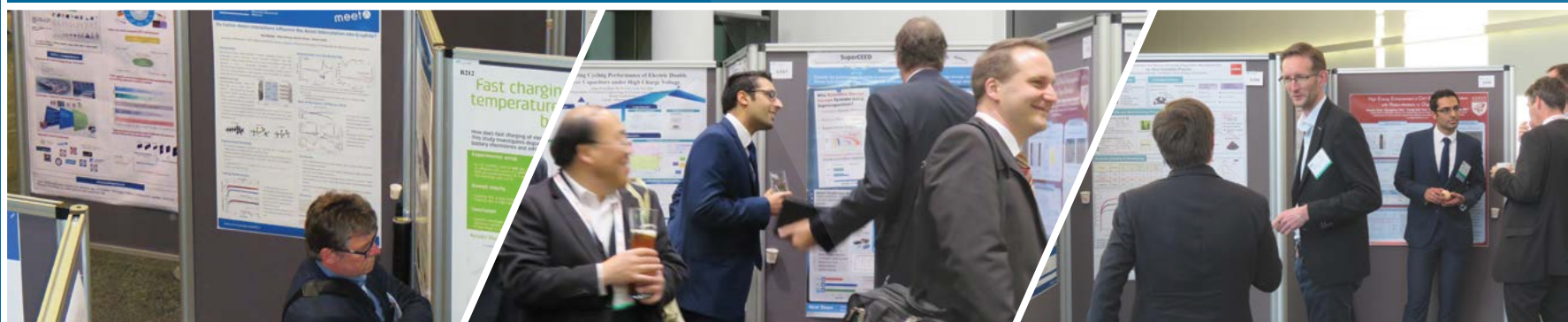
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Students* presenting a poster can attend AABC Europe for as little as €199.

The Student* poster rate is not eligible for €150 poster discount.

*Full-time graduate students including Masters and PhD candidates are eligible for the student poster rate.



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R&D SYMPOSIUM 3

LITHIUM BATTERY CHEMISTRY



The European Advanced Automotive Battery Conference attracts international thought leaders and battery technologists to discuss key issues impacting the electrification of vehicles. As the electric vehicle market expands

with increasingly strict regulatory deadlines, the need to improve batteries and enhance performance while lowering cost has never been stronger. AABC provides a scientific and interactive forum to explore these challenges.

In this session, leading materials R&D professionals will review the prospects of advanced cathodes, anodes, and electrolytes to deliver better performance, life, and safety, at equal or lower cost than current chemistries, and to provide enhanced value for large Li-Ion batteries.

TUESDAY, 31 JANUARY

RECENT ADVANCES IN LITHIUM-ION BATTERY MATERIALS

7:30 Symposium Registration and Morning Coffee

8:30 Chairperson's Opening Remarks

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

8:35 Development of High Performance Carbon Anode Material

Takafumi Izawa, Researcher, Battery Materials Research Laboratory, Kurashiki Research Center, Kuraray Co., Ltd.

This talk introduces development of high performance hard carbon with two axes. One axis is to provide more power to the battery and the other axis is more capacity. Our developmental target is to have more capacity in terms of both gravimetric (mAh/g) and volumetric (mAh/cc) than graphite.

8:55 Carbonaceous Anode Materials and Conductive Additives as Key to Higher Performance Lithium-Ion Batteries

Michael E. Spahr, Director, Research & Development, IMERYS Graphite & Carbon

The improvement of the graphite negative electrode materials and carbon conductive additives gives access to higher performing lithium-ion batteries for consumer electronics, automobile, and battery energy storage applications. The addition of nano-silicon to the graphite electrode overcomes the capacity limitation of the graphite negative electrode and may help to further increase of the driving range of the electric vehicles and decrease the required space for the battery.

9:15 Commercialization of Silicon Anodes for Electric Vehicle Applications

Jörg Kaiser, Ph.D., Specialist Application Engineering, Electronics Materials Solutions Division, 3M Germany

3M has pioneered the development of silicon-based anode compositions for lithium ion cells. With three times the volumetric and gravimetric energy density of graphite anodes, the silicon anode material with its water based coating process can increase the cell capacity by up to 40%, depending on cathode energy density and cell design. Over the past years, 3M has consequently ramped up its production capacity and keeps serving electronic and automotive customers.

9:35 Highly Conducting Carbon-Coated Current Collector "SDX™" for Large Li-Ion Batteries

Hideki Tomozawa, General Manager, Isehara R&D Center, Advanced Battery Materials Division, Showa Denko K.K.

SDX™ has been supplied to customers of the world which produce LIB or EDLC, since the mass production of SDX™ was started in 2008. Now, we are the leading company having mass productive facilities of carbon-coated current collector in Japan and China. The interface resistance that is one of the electronic resistance in cell was reduced by SDX™, so conducting additives in cathode were able to be reduced much. SDX™ can increase loading level of cathode electrode and it can reduce total material cost of cell.

9:55 Q&A

10:10 Grand Opening Coffee Break with Exhibit & Poster Viewing

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11:00 Chairperson's Remarks

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

11:05 New Battery Materials for BEVs – A Challenge

Joerg Huslage, Research Manager, Volkswagen

3M has pioneered the development of silicon-based anode compositions for lithium ion cells. With three times the volumetric and gravimetric energy density of graphite anodes, the silicon anode material with its water based coating process can increase the cell capacity by up to 40%, depending on cathode energy density and cell design. Over the past years, 3M has consequently ramped up its production capacity and keeps serving electronic and automotive customers.

11:25 The Impact of CO₂-Emissions and Energy Consumption During Li-Ion Battery Manufacturing on the Environmental Balance Sheet of BEV

Klaus Brandt, Individual Consultant

It has been shown that the large amount of energy required and the amount of CO₂ emitted during the manufacture of Li-ion batteries are a significant initial environmental burden on electric vehicles. Considering the energy and CO₂ balance sheet of battery manufacturing starting from raw materials, major contributions are from the cathode and anode materials. This environmental balance sheet can be improved in many ways, for example through the choice of cathode materials, manufacturing processes, improved material utilization and recycling.

11:45 Insights into NMC Degradation Processes for High Energy Systems: How Far Can We Push?

Stephane Lévassieur, Business Venturing, Battery Materials Division, Umicore, Belgium

If, in the last decade, the Li-ion technology imposed itself to the rechargeable battery market, serious challenges are ahead of us when it comes to energy density increase. This presentation takes a detailed look into degradation mechanisms of nickel-based compounds when used in high energy battery systems and gives an overview of the potential choices for the chemistries that will allow longer EV drive range.

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/Europe**12:05 Simple Experiments Giving Deep Insights into Capacity Fade and Capacity Loss Mechanisms in Li Battery Materials***Martin Winter, Ph.D., Chair, Applied Material Science for Energy Conversion and Storage, MEET Battery, Research Center, Institute of Physical Chemistry, University of Muenster*

It is widely accepted that materials research in the field of electrochemical energy storage has to follow a system approach. In many cases, the understanding of materials in the cell system is only possible via complex experimental approaches. Here, we show how rather simple, but still uncommon electrochemical measurements help to understand the behavior of lithium ion battery materials in the cell system. For instance, we demonstrate, that, at contrast to common belief, oxidative electrolyte decomposition at "high voltage cathodes" has a rather minor contribution to the low Coulombic efficiency of these materials.

12:25 Solvay Special Chem Enlarged Offer for High Voltage Li-ion Batteries*Thomas Mathivet, Business Development Manager, Battery for Europe, SOLVAY*

Achieving high energy at an affordable cost and without compromising with safety is the Graal of the Li-ion, and of the whole battery industry. Solvay Special Chem has increased its efforts to propose innovating Electrolyte ingredients to the battery makers to enable High Voltage solutions.

Sponsored by **12:45 Q&A****13:00 Networking Lunch****14:15 Dessert Refreshment Break with Exhibit & Poster Viewing****BEYOND AND ASIDE LITHIUM-ION BATTERIES****15:00 Chairperson's Remarks***Doug Campbell, President & CEO, Solid Power***15:05 Post Lithium-Ion Technologies: Novel and Sustainable Materials for Energy Storage***Andreas Hintennach, Ph.D., Group Research Electrochemistry Mercedes-Benz Research & Development, Daimler AG*

Novel and sustainable electroactive materials can help to decrease the ecological impact of novel battery concepts in the near future. While on the one hand high energy density is required, the aspects of safety, 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.

15:25 Recent Progress in Lithium Sulfur Batteries*Stefan Kaskel, Ph.D., Professor, Department of Chemistry, Technical University of Dresden, Fraunhofer Institute Materials and Beam Technology*
Lithium sulfur (Li-S) batteries are considered as the next generation batteries due to their high gravimetric energy density up to 350-400 Wh/

kg. The progress in recent years, in materials, electrolyte, and cell development will be described. Fraunhofer IWS develops pouch type prototype next generation Li-S-cells.

15:45 Magnesium Batteries*Maximilian Fichtner, Ph.D., Executive Director, Nanomaterials & Nano Mikrostructures, Helmholtz Institute Ulm for Electrochemical Energy Storage***16:05 Solid State Materials***Jürgen Janek, Ph.D., Professor, Justus-Liebig University of Giessen, Institute of Physical Chemistry***16:25 Advances and Remaining Challenges in Electrolytes for Solid-State Batteries**

Doug Campbell, President & CEO, Solid Power
Solid-state batteries are leading candidates in the pursuit of both higher energy density and improved safety. To reach commercial viability, new solid electrolytes are needed with a high level of conductivity, stability, and processibility. This presentation will provide an overview of the current state of solid electrolytes along with remaining challenges. A particular emphasis will be placed on Solid Power, Inc., whose electrolytes and prototype cells show promise for displacing conventional Li-ion for several applications.

16:45 Q&A**17:05 Networking Reception with Exhibit & Poster Viewing****18:05 Close of Day****AABC and Cambridge EnerTech Are Proud to Announce The First Group of OEM Fellows**

Key automotive OEMs have played a special role in the success of AABC for more than 16 years, and the OEM Fellowship was created to reaffirm that this unique relationship will continue in the future. Additional OEM Fellows will be announced in the near future.

**Oliver Gross**

Technical Fellow

**Eckhard Karden, Ph.D.**

Technical Expert for Battery & Energy Storage Technology

**Arnold Lamm, Ph.D.**

Head of eDrive Technologies

**Ted Miller**

Senior Manager of Energy Storage Strategy and Research

**Mark Verbrugge, Ph.D.**

Director, Chemical and Materials Systems Laboratory



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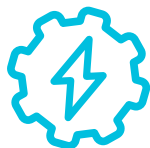
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R&D SYMPOSIUM 4

BATTERY ENGINEERING



The principal aim of materials, cell, and battery engineering is to create a battery product that makes the best use of the chemistry's capability while providing the vehicle with a cost-effective, reliable energy-storage system.

In this symposium, we will cover materials and cell engineering, mechanical, electrical, and thermal design and integration of packs, as well as output, safety, and durability of the key designs. Papers will highlight new developments in achieving a cost-effective design balance between performance, reliability, durability, and safety. Life modeling and lab and field validation as well as safety enhancement technology and abuse tolerance validation will be explored since ensuring safety and durability will have the greatest impact on market acceptance. Attendees will get an overview of the challenges and current progress of all aspects of battery engineering from materials to cell and packs, to results from laboratory and field tests for durability and safety.

TUESDAY, 31 JANUARY

LITHIUM-ION CELL PRODUCTION

7:30 Symposium Registration and Morning Coffee

8:30 Chairperson's Opening Remarks

Arno Kwade, Ph.D., Professor, Chemical Engineering, Materials Engineering, Mechanical Engineering, Technische Universität Braunschweig

8:35 Determination of Process-Structure-Performance Correlations and Development of Alternative Production Processes by the German Cell-Production Research Cluster "ProZell"

Henrike Bockholt, Ph.D., Materials Engineering, Chemical Engineering, Automotive Systems Engineering, Technische Universität Braunschweig

8:55 Challenges of High-Quality and High-Performance Cell Stacking

Jürgen Fleischer, Ph.D., Manager of Machines, Equipment and Process Automation, Karlsruhe Institute of Technology

Cell manufacturing is one of the main cost driver of the current production process of lithium-ion cells.

One reason are the complex and time-consuming stacking processes. In addition, the stacking technology influences the performance of the cell. For example, wounded cells and single sheet stacked cells have different performance characteristics. Thus, there is a conflict between quality and performance of the assembly processes. Therefore, the challenges and the development of advanced cell stacking technologies will be discussed.

9:15 Environmentally-Friendly Manufacturing of Li-Ion High-Capacity/High-Voltage Electrodes via Aqueous Processing

Idoia Urdampilleta, Head, Materials for Energy Unit, IK4-CIDETEC Research Center
Lithium-ion battery (LIB) technology has reached a very high degree of development and market share. However, several important manufacturing bottlenecks still impede further spreading of LIBs into the EV and stationary energy-storage market. Among them, their relatively high price and negative environmental impact are addressed by IK4-CIDETEC at the electrode manufacturing stage, by the replacement of toxic and expensive NMP organic solvent by water in the coating slurries. Upscaled manufacturing of electrodes in pilot coating line and validation in pouch cell prototypes will be shown, demonstrating the feasibility of industrial electrode manufacturing without sacrificing electrochemical performance or durability.

9:35 Experiences in Prototyping Li-Ion Cells for Automotive Applications

Andreas Huth, Ph.D., Manager Prototyping, Volkswagen Varta Microbatteries Forschungsgesellschaft mbH & Co KG
The presentation will focus on learnings from prototyping automotive cells based on Li-ion technology. The complete manufacturing process will be discussed briefly. Spotlights will be put on mixing, coating, roll pressing, laser welding and winding as well as single cell assembly in hard case applications.

9:55 Q&A

10:10 Grand Opening Coffee Break with Exhibit & Poster Viewing

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BATTERY LIFE, DESIGN, SIMULATION, AND TESTING

11:00 Chairperson's Remarks

Masato Origuchi, Chief Battery Engineer for EV/HEV, Renault

11:05 ZOE Battery Durability, Field Experience and Future Vision

Bruno Delobel, Ph.D., Electrochemistry Junior Expert, Renault

The ZOE was launched in 2012 and delivered to more than 50k customers since then. In order to better design the future batteries and to anticipate the usage of the battery, a deep analysis of the current customers' usage is a key point. This presentation will exhibit the first feedback from the field on the durability and its correlation with the predictive model and on field experience usage. To conclude this presentation, we will emphasize Renault's future vision for battery applications.

11:25 Methods for Aging Simulation and Reliability Prediction in Automotive Cells and xEV Battery Systems

Joerg Keller, Ph.D., Manager, RD/EKI, Daimler AG
Product reliability in automotive cells and xEV battery systems has ultimately to be proven under real-life stress in the field. Due to a weakness in the design, unforeseen vehicle driving profiles or unsteady production processes, components will fail unexpectedly early in vehicle lifetime. For a quality-oriented company like Daimler, it is mandatory to find and eliminate rapidly the root cause of the underlying failure mechanism, and to forecast as soon as possible the upcoming number of affected vehicles. Therefore a framework of statistical methods has been developed and is presented.

11:45 Volume Change from Materials to Cell Level and Its Influence on Battery Lifetime

Andreas Jossen, Ph.D., Professor, Electrical Engineering and Information Technology, Technical University Munich
Charge and discharge processes cause volume change in the anode and cathode active materials. An investigation starting from the lattice level up to the full cell level is presented. The measured characteristic is described in a micromechanical model to get the 2D/2D displacement of porous electrodes. On cell level cylindrical and pouch cells were investigated to analyze the displacement distribution over lifetime. The displacement

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shows a reversible and an irreversible part with an inhomogeneous distribution, influenced by the tap position and other parameters. Finally, design rules are discussed to minimize the effect on displacement on lifetime.

12:05 Detecting, Diagnosing, and Controlling Degradation in Lithium-Ion Battery Packs

Gregory Offer, Ph.D. Senior Lecturer, Mechanical Engineering, Imperial College London

The latest work of the electrochemical science & engineering group at Imperial College London in 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. A novel diagnostic method based on simple cell surface temperature measurements developed by our group will also be presented. The technique is capable of quantitatively determining the state-of-health of individual cells simultaneously.

12:25 Sponsored Presentation (Opportunity Available)

12:45 Q&A

13:00 Networking Lunch

14:15 Dessert Refreshment Break with Exhibit & Poster Viewing

LITHIUM-ION BATTERY SAFETY AND ABUSE TOLERANCE

15:00 Chairperson's Remarks

Arnold Lamm, Ph.D., EU-Projects and Energy Systems Analyses, Daimler AG

15:05 Requirements and Approaches for LIB regarding Vehicle Safety

Rainer Justen, Manager Vehicle Safety S-Class, MSA, AMG, E-Mobility, Mercedes-Benz Cars Development, Daimler AG

Electric vehicles are on the way to changing the future automotive market. Many countries have ambitious market penetration targets and, no later than 2020, electric vehicles will take significant

market shares. In order to prevent consequences in vehicle safety, the new safety challenges must be addressed accordingly. This is particularly true for the crash safety of modern Li-Ion batteries. The legal requirements are still under discussion in working groups and among experts in many countries. In this presentation, the current status of safety challenges and the safety performance of battery electric vehicles will be discussed, along with adequate concepts of solutions.

15:25 Assessment of Battery Testing Methods from a Policy-Making Perspective

Andreas Pfrang, Ph.D., Scientific Officer, Joint Research Centre, Directorate for Energy, Transport & Climate, European Commission

Multiple battery testing methods are described in scientific literature and standards to assess certain battery properties. At the European Commission's Joint Research Centre in Petten, battery testing is performed for assessing safety of battery technologies and for evaluating the suitability of testing methods for policy purposes. An overview of the experimental facilities and examples of policy-supporting investigations will be given.

15:45 Safety Testing for xEV Batteries – Comparison of Test Standards and Validation Procedures

Michael Geppert, Head of Laboratory, TÜV SÜD Battery Testing GmbH

16:05 Battery Safety Testing - The Status of Testing for Propagation of Single Thermal Runaway Cell Failures

Daniel Doughty, Ph.D., President, Battery Safety Consulting, Inc.

Evaluation of battery safety in electric and hybrid-electric vehicles is an important topic that is being addressed by both regulatory authorities and trade organizations. One of the most important, but least used, safety test is the Failure Propagation Test. This test requires the trigger of a single cell thermal runaway event in a module or battery pack, to determine if the thermal runaway event propagates to adjacent cells. The method of triggering the thermal runaway event will be discussed, as well as other details necessary to perform this test procedure. The status of

development of battery safety test standards that included a failure propagation test will be reviewed.

16:25 Beyond Teardown - AVL Series Battery Benchmarking

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

What are battery safety measures in the design of competitor's batteries? What about thermal protection? How about crash integration concepts? These questions are currently asked more intensely in the field of strongly electrified vehicles, like plug-in hybrids and pure electric vehicles, than in other fields. The growing customer acceptance for these alternative drivetrain concepts and its connected move to higher volume production, puts OEM development departments in front of new challenges and strong need for state-of-the-art technology knowledge and engineering methodology understanding. The collection and especially the comparison of technical information of batteries in electrified vehicles on the market – as well as an in-depth analysis of engineering requirements and even the targets behind those products – is a time consuming operation, as it requires a structured and methodic approach to derive the right information and compare across different cell technologies and integration concepts. AVL is trying to solve this problem by a battery benchmarking program going beyond teardown. The process starts at the vehicle level with the operation strategies and integration, continues with a classical tear down and goes well beyond it in the following engineering analysis to find out what were the criteria to design the component in the first place. The target is to provide information about engineering concepts and make this information comparable. During the benchmarking process, more than 240 criteria are measured, assessed and the benchmark attributes are calculated based on an AVL methodology, which we would like to give some insight to and present some actual work and results. Special focus is laid on extracting development targets so as to also support current and future battery development methodically.

16:45 Q&A 17:05 Networking Reception with Exhibit & Poster Viewing

18:05 Close of Day

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R&D SYMPOSIUM 5

CHEMISTRY & MATERIALS FOR LEAD-BASED BATTERIES



A significant spike in technological advancements have created smaller, light weight and long lasting lead-acid batteries that are critical to the development of the next generation of lead batteries for electrified vehicles. Using new composite materials and innovative design approaches, researchers are developing high specific energy batteries with long cycle life and low cost. In addition, creative improvements in the use of standard raw materials for lead-acid has led to a dramatic increase in the performance of these batteries. This session will provide an in-depth international overview of the industry including the latest trends, competitive analysis and examination of the key players and their strategies for market growth.

TUESDAY, 31 JANUARY

TECHNOLOGY & INNOVATION: DCA VS. HIGH TEMPERATURE DURABILITY

7:30 Symposium Registration and Morning Coffee

8:30 Chairperson's Opening Remarks

Eckhard Karden, Ph.D., Technical Expert Battery & Energy Storage Technology, Advanced Power Supply & Energy Management, Ford Research & Advanced Engineering, Europe

8:35 How Harmful Are Carbons in EFB for High Temperature Use Cases?

Eckhard Karden, Ph.D., Technical Expert Battery & Energy Storage Technology, Advanced Power Supply & Energy Management, Ford Research & Advanced Engineering, Europe

This paper will present a novel approach to derive high temperature durability requirements from practical use cases in state-of-the-art micro-hybrid vehicles. Simulations of realistic current/voltage/temperature profiles, with a weekly assessment of weight loss and resistance increase, will be shown for a variety of EFB types with and without carbon additives.

8:55 Water Consumption Testing and Analysis

Dirk Uwe Sauer, Ph.D., Professor and Chair, Electrical Engineering and Information Technology Department, RWTH Aachen University, Germany

9:15 Tailored Carbon Additives to Meet Requirements for High DCA and Low Water Loss – Wish and Reality

Jochen Settlein, Ph.D., Research Scientist, Center for Applied Electrochemistry, Fraunhofer Institute for Silicate Research ISC

Carbon additives for the negative active mass in modern lead-acid batteries are state-of-the-art. However, due to electrolyte decomposition there is a limit in further optimization of the dynamical charge acceptance. We will discuss if it is possible to design carbon additives to attain that ambitious target without increasing the water loss. By combining investigations on pure carbon electrodes and laboratory test cells one can correlate the electrochemical activity with the physical and chemical properties of the carbon particles and open the door for the development of tailored additives.

TECHNOLOGY & INNOVATION: NEW BATTERIES

9:35 A New Generation AGM Batteries with Enhanced Carbon Additive for μ -Hybrid Application

Olaf Sielemann, Director, Transportation R&D Europe, Exide

EXIDE Technologies is working on optimization of VRLA AGM batteries for μ -Hybrid application. The feedback from the application on AGM batteries is in general excellent. One behavior, the capacity and rechargeability loss cause by sulphation, is mentioned frequently by OEM's to be improved. The presentations will discuss the following highlights: 1). Cycle life improvement by stimulation of Oxygen cycle 2). Dynamic charge acceptance improvement 3). Enhanced carbons and corrosion resistance 4). Advantages of enhanced carbons in terms capacity and rechargeability caused by sulphation and/or low SOC usage.

9:55 Q&A

10:10 Grand Opening Coffee Break with Exhibit & Poster Viewing

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11:00 Chairperson's Remarks

Eckhard Karden, Ph.D., Technical Expert Battery & Energy Storage Technology, Advanced Power Supply & Energy Management, Ford Research & Advanced Engineering, Europe

11:05 The 2nd Gen UltraBattery for Advanced 14-V hybrids

Jun Furukawa, Ph.D., Senior Fellow, The Furukawa Battery Co., Ltd.

The UltraBattery comprises a capacitor integrated with lead-acid cell. The 2nd Gen UltraBattery was developed for the newest 14-V hybrids equipped with integrated starter-generator (ISG) for power-assist and enhanced regeneration function. The advantages of the 2nd Gen UltraBattery for 14-V hybrid vehicles will be discussed.

11:25 Dynamic Charge Acceptance (DCA) to Improve the Real World Emission Performance of Micro Hybrid Vehicles

Stewart McKenzie, CEO, ArcActive

Car companies want high and sustained Dynamic Charge Acceptance (DCA) to improve the Real World Emission performance of Micro Hybrid vehicles. However, the DCA of batteries that meet typical Water Consumption requirements remain low, and batteries with high carbon loadings for better DCA typically suffer from unacceptably high Water Consumption. ArcActive has developed a Carbon Fibre based negative electrode, which displays high and sustained DCA but with low Water Consumption. ArcActive will share the latest battery level data on a variety of performance attributes.

ADVANCED LEAD-BASED BATTERIES R&D ROADMAP

11:45 There Is a Lot of Life Left in Lead – Overview on Automotive Battery Market Trends, Battery Field Experience & Lifetime and Future Development Potential of Start-Stop Batteries

Christian Rosenkranz, Ph.D., Vice President, Engineering & Product Development EMEA, Johnson Controls Autobatterien GmbH

Jörn Albers, Ph.D., Systems and Simulation Engineer, Johnson Controls Autobatterien GmbH

The focus on automotive emission reductions creates an opportunity for a growing diversity of electrification versions of the vehicle power train. This paper will give an overview of the global power trains electrification trends and focus on the fastest growing segment, the

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global start-stop market. An outlook will be given, how the increasing requirements of future start-stop vehicles will drive the performance of the next generation of start-stop batteries and combinations of multiple energy storage solutions.

12:05 Production Quality of Advanced LABs – Fulfilling the Zero Failure Approach

Andreas O. Stoermer, General Manager QMT Alternative Powertrains, BMW Group

How to proof good quality without testing the battery? This presentation will cover design quality: product design (D-FMEA), "house of quality" (QFD), design to manufacture, production quality: process design (P-FMEA), QFD, design to quality, use of process simulation by finite element method (e.g.), as well as process stability, online-spc, kpis, 0-rework approach, traceability and process interlock.

12:25 Lead-Acid Batteries for Future Automobiles

Juergen Garche, Ph.D., Senior Professor, Ulm University

The main functions of micro-hybrid cars as start-stop, brake-energy recuperation and propulsion assist can be fulfilled by advanced lead-acid batteries (EFB, AGM). But the Li-ion battery technology could be, in the long run, a serious competitor. To maintain its leading market position the LAB must lower costs and weight as well as increase lifetime and dynamic charge acceptance. This required, however, a stronger R&D commitment of the LAB industry.

12:45 Q&A

13:00 Networking Lunch

14:15 Dessert Refreshment Break with Exhibit & Poster Viewing

ADVANCED LEAD-BASED BATTERIES R&D ROADMAP

15:00 Chairperson's Remarks

Christian Rosenkranz, Ph.D., Vice President Engineering & Product Development EMEA, Johnson Controls Autobatterien GmbH

15:05 Sponsored Presentation (Opportunity Available)

15:25 2030 Battery R&D Roadmap for Hybridization and E-Mobility

Alfons Westgeest, Executive Director, Association of European Automotive and Industrial Battery Manufacturers

This presentation reviews EUROBAT's hybridization and e-mobility battery R&D 2030 Roadmap[1].

EUROBAT is the Association of European Automotive and Industrial Battery Manufacturers.

The European Union (EU) aims at reducing emissions in the transport sector. Among a portfolio of other technologies available for road transport, vehicles based on various hybrid and electric powertrains are the most promising option for achieving these targets. Lead-based batteries are significantly contributing by the large take up of start-stop and microhybrid solutions in virtually all traditional car models coming onto the market in Europe already today.

15:45 Recent Advancements in Automotive Lead Batteries and the 2016-2018 ALABC Program Aimed at Further Improvements in Lead Battery Performance

Boris Monahov, Ph.D., Program Manager, Advanced Lead-Acid Battery Consortium (ALABC) – a program of the International Lead Association (ILA)

Alistair Davidson, Ph.D., Director, Products and Sustainability, International Lead Association

Based on two decades of successful basic battery advancement projects, ALABC has been involved

in a number of vehicle demonstration programs with companies such as Ford, Honda and Hyundai/Kia which have yielding significant results. This paper will provide an overview of recently analysed lead battery performance data for 12V start-stop and micro-hybrid applications and 48 V mild-hybrid applications. Insight will also be given regarding recent and future battery science developments in line with the new 1618 ALABC Program and their potential application for future vehicles.

16:05 PANEL DISCUSSION: Automotive Lead-Acid: An Endangered Species? Can Innovation Help and Where?

Moderator:

Dirk Uwe Sauer, Ph.D., Professor and Chair, Electrical Engineering and Information Technology Department, RWTH Aachen University, Germany

Panelists:

Eckhard Karden, Ph.D., Technical Expert, Battery & Energy Storage Technology, Advanced Power Supply & Energy Management, Ford Research & Advanced Engineering, Europe

Christian Rosenkranz, Ph.D., Vice President, Engineering & Product Development EMEA, Johnson Controls Autobatterien GmbH

Alfons Westgeest, Executive Director, Association of European Automotive and Industrial Battery Manufacturers

Boris Monahov, Ph.D., Program Manager, Advanced Lead-Acid Battery Consortium (ALABC) – a program of the International Lead Association (ILA)

17:05 Networking Reception with Exhibit & Poster Viewing

18:05 Close of Day

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PLENARY SESSIONS

WEDNESDAY, 1 FEBRUARY

**OPENING PLENARY SESSION:
xEV AND xEV-BATTERY MARKET**

8:40 Chairperson's Opening Remarks

Menahem Anderman, Ph.D., President, Total Battery Consulting, Inc.

8:45 Electromobility Globally: Regulations, Vehicles, and Markets

Wolfgang Bernhart, Ph.D., Senior Partner, Automotive, Roland Berger Strategy Consultants GmbH

This presentation will discuss the current status and outlook on BEV and PHEV sales, LiB capacity, demand, and announced expansion, the implications on prices, battery industry structure, and supply chain risks, and the strategic implications for OEMs.

9:05 Ongoing Changes in the Chinese xEV Market and How They Relate to the Battery Industry

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

In 2016, the Chinese xEV market still continued to expand. Therefore, this presentation aims to provide information regarding the market status and policies affecting this. Statistics showing a breakdown of this market will also be provided. Moreover, the leading OEMs and their battery providers will be identified. In addition, a comparison of battery specifications (such as ED/PD, material portfolio & formats) among the leading cellmakers will be given. Finally, the audience will be given a number of points that should be remembered when considering potential opportunities in this booming Chinese xEV market.

9:25 CO2-Emission Reduction for European Fleets

Greg Archer, Program Manager, Transport and Environment

9:45 Market Outlook for the New Prius Plug-In

Muriel Desaeger, Ph.D., General Manager, R&D Center, Toyota Motor Europe

Almost five years after the introduction of Toyota's pioneering first model, the stage is set for the all-new Prius Plug-in Hybrid to redefine the experience of plug-in hybrid vehicles all over again. By building on the foundations of the latest generation Prius – which showcases a more dynamic drive and an all-new full hybrid system – the intuitive, silent and responsive Prius Plug-in Hybrid's (PHV) is the perfect fit for those who want a Hybrid car with the benefits of extended Electric Vehicle (EV) driving. The Prius Plug in has a top electric speed as high as 135km/h and a range as far as 50km (subject to final vehicle homologation) thanks to the Prius Plug-in Hybrid's dual motor drive with 68kW EV power rating. And with the super-efficient 4th generation hybrid system, the new Prius Plug-in Hybrid is estimated to sip fuel at a mere 1.0l/100km (subject to final vehicle homologation) when it reverts to hybrid operation. This presentation will review the technical features including the larger Li-on battery pack, dual motor drive and heat pump among others which help

define the driving characteristic of the Prius Plug in. Dr. Desaeger will also discuss how the Prius Prime fits within the electric market in Europe.

10:05 Coffee Break with Exhibit & Poster Viewing Sponsored by



10:55 xEV Expansion, Key Technology, and Market Development

Menahem Anderman, Ph.D., President, Total Battery Consulting, Inc.

In this presentation, electrified-vehicle market expansion and battery technology and market development from micro-hybrids to full EVs will be discussed. Regarding battery technology, the key challenge is to enhance performance—to ease battery packaging in the car and reduce cost, while maintaining or improving durability, reliability, and safety. Market trends in Europe, the U.S., China, and Japan will be discussed with the pace of market growth depending predominantly on government regulations and incentives and on battery pricing.

11:35 The Supply Chain Heat Map for Key Materials in Li-Ion Batteries

Kurt Vandeputte, Vice President, Rechargeable Battery Materials Business Unit, Umicore

The number and complexity of Li-Ion battery applications are still growing significantly and, combined with an acceleration of demand for Li-Ion batteries, this has resulted in increasingly complex raw-material supply chains. It is recognized that supply chain disruptions during the first acceleration phase of the LIB-market due to electro mobility could limit growth. The author will present insights in the supply-demand balance for a number of key materials used in Li-Ion batteries. A more detailed analysis will be given, using specific examples, resulting in a supply chain heat map for key materials used in Li-Ion battery production.

11:55 Q&A

THURSDAY, 2 FEBRUARY

CLOSING PLENARY SESSION: BATTERY CHARGING, GRID INTEGRATION, AND LOGISTICS

14:05 Chairperson's Remarks

Jan Fritz Rettberg, Ph.D., Head of E-Mobility, ie³ Institute of Energy Systems, Energy Efficiency and Energy Economics, TU Dortmund University

14:10 The Path to Fast Charging—How to Solve the Drawback of Charging Times

Michael Keller, Senior Manager, Energy Functions, Volkswagen AG

This presentation will review the drawbacks and the technologies of fast charging as well as the possible solutions.

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14:30 Overview of Vehicle Electrification and the Grid

Jan Fritz Rettberg, Ph.D., Head of E-Mobility, ie³ Institute of Energy Systems, Energy Efficiency and Energy Economics, TU Dortmund University
 Extensive provision of fast-charging infrastructure will challenge power grids. Especially when it comes to charging processes with up to 350 KW and higher for high-performance batteries in next generation e-cars, e-busses or e-trucks. Nevertheless, it is mandatory to provide these charging infrastructures with electricity from renewable sources. Technological solutions will appear that enable grid-friendly fast-charging processes by using generation flexibilities and additional storage. Therefore, possible effects of DC fast-charging infrastructure like peak load, circuit feedback or grid expansion should be discussed in the search for locations.

14:50 Lithium Batteries – Important Tests (UN38.3, New Package Standards) & Safety Check Sheets

Sebastian Spies, Ph.D., Safety Advisor Dangerous Goods, Daimler AG
 We will review all important aspects of transporting automotive-size Li-Ion batteries, including: examples of existing large Li-Ion batteries for automotive (Li-Ion Battery Orchestra, Daimler), international regulations in road, sea, and air transport (incl. ADR, IMDG-Code, ICAOTI/IATA-DGR and 49 CFR), transport testing requirements (e.g. 2.9.4 UN Recommendations and 38.3 UN Manual of Tests and Criteria), assessments for risk determination before transport, prototype and tested type (serial) batteries, potentially damaged, defective and unsafe batteries, packaging, marking, labelling and documentation (packaging at all performance levels).

15:10 Refreshment Break

15:25 Current Processes for Lithium Battery Recycling and Research Needs for Increased Efficiency

Bernd Friedrich, Ph.D., Director, IME Institute for Process Metallurgy and Metal Recycling, RWTH Aachen
 We intend to present and compare chemical (<200°C) and metallurgical (>300°C) processes being developed up to now for Lithium Battery Recycling with respect to efficiency, environmental footprint, and scalability. Special emphasis will be placed on robustness against sorting failures in the field, the potential use for future electrode systems as well as the recovery potential for Lithium and other economy-strategic metals. The identification of optima between mechanical pre-processing and a minimum-waste metallurgy demand will be discussed. Finally, research needs will be addressed.

15:45 Trash to Fresh – Real Recycling of Lithium-Ion Batteries

Christian Hanisch, CEO, Lion Engineering GmbH
 Recycling Li-Ion batteries is resource saving, environmentally friendly, and economically feasible with a process that enables the recovery of a mass fraction of 75% and more on a material recycling basis from Li-Ion batteries. This is better than state of the art. Combining different process steps such as discharging, dismantling, shredding, sifting, and air-jet separation, good recycling yields and purities can be obtained. Thinking further, battery manufacturers will soon use such recycled materials. A modified and simplified process works to directly recycle scraps from Li-Ion battery production to protect both environment and stakeholder.

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TRACK 1

ADVANCED AUTOMOTIVE BATTERY TECHNOLOGY, APPLICATION, & MARKET



In this track, we will discuss the development of the hybrid and electric vehicle and advanced automotive battery markets and the prospects of advanced batteries in the various architectures. Automakers will present vehicle development and energy-storage requirements for micro- and mild-hybrid vehicles, plug-in hybrid and full EVs. Battery developers will discuss their chosen battery designs and

present the latest achievements in meeting the requirements of the various hybrids and full EV architectures. EV and infrastructure developers and related stakeholders will discuss plans to address the technological and commercial challenges associated with vehicle electrification, including charging technology, grid integration, transportation, maintenance, secondary use, and recycling. Attendees will get a comprehensive overview of the drivers and challenges that govern the expansion of the xEV market, and of battery technology advances.

WEDNESDAY, 1 FEBRUARY

8:00 Conference Registration and Morning Coffee

9:00 Opening Plenary Session
See [Plenary Sessions](#).

12:20 Networking Lunch

13:30 Dessert Break with Exhibit & Poster Viewing *Sponsored by* 

ENERGY STORAGE FOR LOW-VOLTAGE HYBRIDS

14:15 Chairperson's Remarks
Eckhard Karden, Ph.D., Technical Expert, Ford Aachen

14:20 Challenges for Electrical Energy Storage from Increasing Vehicle Electrification
Stephen Pickering, Technical Specialist - Power Supply Systems, Jaguar Land Rover Ltd.

Significant efforts have been dedicated to the development of improved energy storage systems which are necessary to support increasing vehicle electrification; however, they are typically evaluated against metrics pertinent to lead-acid battery technology. These metrics are often inadequate for use in assessment against the requirements of future vehicles or, at worst, irrelevant. This presentation aims to highlight the problems that are considered to exist and to discuss the approach necessary to allow electrical energy storage systems to be confidently specified for increasingly electrified and automated vehicles.

14:40 Recent Advances in Enhanced Flooded Battery for Smart Mild Hybrid Powertrains

Debasish Mazumdar, Executive Vice President, SF-R&D, Exide Industries Limited, India

To serve the battery demand for Smart Mild Hybrid Vehicles under tropical climate, EIL has developed Generation-2 EFB technology which passed drive cycles of SBA, NEDC and EUCAR satisfactorily. EFB is superior in terms of active material formulation, special grid alloy, electrolyte additives which resulted in significant increase in SBA cycle life, DCA and PSoC cyclic operation. Suppression of PCL effects due to grid interface passivation, negative lug thinning and softening of PAM/NAM have been achieved. We throw light on EFB battery technology development and evolution for major players Suzuki, Nissan, VW and others in India

15:00 Energy-Storage Requirements Derived from Low-Voltage Electrical Architectures and Power-Supply Usage

Armin Warm, Supervisor Advanced Power Supply & Energy Management, Ford Research & Advanced Engineering Europe

Two development trends are currently influencing low voltage electrical systems in the automotive industry. CO2 reduction is leading to all kind of hybridization at the low voltage level as well as new vehicle operation modes. The second trend is adding new functions or features to the vehicle, mostly based on electrical components with transient currents. Combining the two trends, a new set of requirements is appearing driving the specifications of low voltage energy storage. This presentation will describe potential power supply solutions and the related requirements for the energy storage device.

15:20 Design of a 14v Nominal Dual Battery System

Johannes Gehrmann, 14V Dual Battery Systems Manager, Audi AG
The necessary reduction of CO2 emissions confronts the automobile industry with the challenge of also making progress in defining measurements that can easily integrate into conventional vehicles. "Easy integrability" creates the condition of using the measurements for the entire product range. Based on the previous developments in StartStopp-Technologies, new low-voltage Battery Systems enhance the degree of electrification. Compared to high-voltage systems, low-voltage solutions provide significant advantages in cost and weight. In this presentation a 14-voltage Dual Battery System will be introduced.

15:40 Refreshment Break with Exhibit & Poster Viewing

16:30 12V Li-Ion Batteries – Ready for Mainstream Adoption
Christoph Fehrenbacher, Executive Director European Technical Center, A123 Systems
Automotive 12V Li-Ion batteries have been in production since 2011, but there have been technical hurdles for a broader applicability of the technology to all vehicle types and classes. The most significant challenges that have been discussed more recently are cold cranking, underhood packaging, crash behavior and readiness for high volume manufacturing. This talk will show how the challenges have been addressed and overcome in the latest technology and product design advances and will also highlight technology features, like CO2 benefits, that have been quantified recently at A123 and in test campaigns of mainstream vehicle manufacturers.

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16:50 Characteristics of 48V Batteries Targeted for Boost Recuperation Systems

Sven Grundmann, Ph.D., Director, 48V Battery, Robert Bosch

Global emission regulations are one of the main drivers of technical innovation for powertrain solutions. Improved injection or after treatment technologies assure compliance with regulations, but also imply higher product costs with further increasing emission regulations. 48V Boost Recuperation Systems (BRS) are an additional option to cope with further required emission reductions and can offer additional end customer benefits on a competitive cost level. This presentation will introduce a 48V battery optimized for CO2 reduction by giving an overview of design decisions of its key characteristics.

17:10 48V Systems Development for the European and Chinese Markets

Yejin Jin, System & Hybrid Integration Department Manager, Valeo

To reach Europe's CAFE 95g/km and China's CAFE 117g/km targets in 2020~2021, Valeo is developing a whole panel of e-machine solutions in low and high Voltage. Among these solutions, 48V became one of the main development targets for both markets, thanks to a highly interesting CO2 reduction potential for a relatively low system cost. 48V system is also considered for better drivability and for European market NOx reduction effect for Diesel engines. Various 48V hybrid architectures, their benefits, and the challenges for 48V batteries to offer the most cost-effective hybrid solutions will be discussed.

17:30 48V Battery Systems and the Possibility/Challenges of Standardization

Peter Pichler, Ph.D., Director Product Management, Samsung SDI Battery Systems GmbH

17:50 Q&A

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18:20 Networking Reception with Exhibit & Poster Viewing

19:50 Close of Day

THURSDAY, 2 FEBRUARY

8:00 Registration Open

8:30 Continental Breakfast Roundtable Discussions

Join your colleagues and fellow delegates over breakfast 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. Visit our website to see the full listing of topics and moderators.

9:30 Coffee Break with Exhibit & Poster Viewing

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HIGH-VOLTAGE xEV BATTERY TECHNOLOGY

10:15 Chairperson's Opening Remarks

Matthias Ullrich, Ph.D., Manager Advanced Battery Technology, Volkswagen

10:20 Volvo S90 T8 Twin Engine Battery Design and Performance

Patrik Larsson, Technical Specialist Battery Technology, Volvo Car Corp.

The Volvo S90 and the Volvo V90 are the second and third vehicles based on the Scalable Platform Architecture, following the Volvo XC90. SPA is a Volvo Cars platform developed with electrification in mind from the beginning. The HV battery system is integrated in the transmission tunnel area without stealing any noticeable volume from the passenger compartment or luggage area. The HV battery system will be presented from a mechanical and electrical point of view. The HV battery system typical data as useable energy and peak power, and corresponding vehicle attributes as electrical range and performance will be presented.

10:40 "Citius, Altius, Fortius" – Progress of Automotive Battery Systems at General Motors

Roland Matthé, GM Technical Fellow Global Battery Systems – Manager Electrification Architecture, Adam Opel AG

The Olympic motto "Citius, Altius, Fortius" can also be applied to automotive Battery Systems, challenged by several, sometimes contradictory requirements. Progress is driven by the need for long EV range, good acceleration, fast recharge, long life, and low cost. Battery systems have greatly improved in recent years and this presentation shows how General Motors battery systems have improved from Gen 1 (e.g Opel Ampera, Chevy Spark EV) to Gen 2 (e.g Chevy VOLT 2 and Bolt, Opel Ampera-e). The potential areas for further progress will be outlined to indicate required areas of innovation.

11:00 Trends in High-Voltage Battery Electronics

Holger Opfer, Manager, Traction Battery Technology, Volkswagen

Within its strategy 2025, Volkswagen Group plans to release more than 20 new electric and hybrid electric vehicles by 2020. Electric components play an increasingly important role in minimizing system costs. Moreover, the electronic component's package directly influences electric driving range. One of the keys to lowering electronic package and cost is the replacement of electro-mechanic contactors and fuses by semi-conductor power switches. Electric, mechanical, and thermal design constraints have been investigated. Key performance figures and constraints will be presented.

11:20 Battery System for the A6 PHEV

Steve Lehnert, Technical Project Manager PHEV Battery A6/A8, Audi AG

The Audi A6 PHEV is sporty, comfortable, and also highly efficient. It is the first plug-in hybrid with the flat package battery system from Audi. Like all Audi hybrids, the A6 has also been designed as a parallel hybrid. The Li-Ion battery consists of 104 high-quality battery cells and is fluid-cooled. With a capacity of 14.1 kWh, its electric range is over 50 km. This presentation will give an overview of the battery system (mechanical overview, advantages/disadvantages of common battery package), and introduce its architecture (cooling system, modular set part concept, advantages of set part concept).

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11:40 Advanced xEV Battery Development at CATL

Liang Tao, Ph.D., CATL

Nowadays most OEMs have targeted an energy density higher than 300Wh/kg for near future. What is the difficulty to realize such a goal? What would the design and product like? CATL will give his own answer to these questions from both material and cell aspects, meanwhile a recent development progress of advanced xEV battery will be shown in this presentation.

12:00 Q&A

12:20 Networking Lunch

13:05 Dessert Break with Exhibit & Poster Viewing

14:00 Closing Plenary Session

See [Plenary Sessions](#).

16:35 Close of Conference

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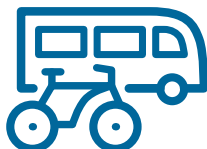
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TRACK 2

EV TECHNOLOGY FOR SPECIALTY VEHICLES



Zero-emission EVs for specialty transportation applications present great commercial opportunities for advanced high-energy batteries. Battery requirements vary with the applications, offering viable opportunities for multiple technologies. In this track, we will discuss the development of hybrid and electric vehicle battery systems and

the prospects for advanced batteries to be commercialized within the specialty battery market while assessing consumer demand, competing technologies, and overcoming the challenges to commercialization.

WEDNESDAY, 1 FEBRUARY

8:00 Conference Registration and Morning Coffee

9:00 Opening Plenary Session
See [Plenary Sessions](#).

12:20 Networking Lunch

13:30 Dessert Break with Exhibit & Poster Viewing



COMMERCIAL XEVs & THEIR BATTERY SYSTEMS

14:15 Chairperson's Remarks

Axel Thielmann, Ph.D., Deputy Head, Competence Center for Emerging Technologies, Fraunhofer ISI

14:20 Cell and Battery Development at MAN Truck & Bus AG

Sebastian Kratzer, Engineer, EPAH, MAN Truck & Bus AG
This presentation will cover the e-Mobility Strategy of MAN Truck & Bus AG, including battery system architecture (multi-battery systems) and cycle life design & test results for HEV, PHEV and BEV applications.

14:40 High Performance Traction Batteries for Electric Buses and Trams

Markus Klohr, Ph.D., Head, Engineering and Propulsion, Bombardier
The presentation will not only present the light and long-life PRIMOVE battery system and its main features. It will highlight different concepts and present our field experience. In addition, this presentation will discuss the application boundaries.

15:00 Battery Solutions for More Power

Arpad W. Imre, Ph.D., Energy Storage Technologist, Powertrain Systems, Bosch Engineering GmbH
The challenging way from requirements to individual battery system solutions. The main performance indicators for off-highway applications and their correlation. This presentation will cover Bosch Engineering GmbH developments for customized mobility solutions.

15:20 Sponsored Presentation (Opportunity Available)

15:40 Refreshment Break with Exhibit & Poster Viewing

16:30 Thermal and Electrochemical Modelling of Li-Ion Cells for HD xEVs

Jen Groot, Ph.D., Energy Storage Systems Specialist, Volvo Trucks Technology
This presentation will cover stratified testing & model development for Li-ion cells as well as thermal models and cooling strategies. In addition, state-of-health prediction using models will be discussed.

16:50 Development of Battery Demand and Production for Specialty Applications

Axel Thielmann, Ph.D., Deputy Head, Competence Center for Emerging Technologies, Fraunhofer ISI
This presentation will cover which technologies, formats, performance parameters, costs for xEV, buses, bikes and forklifts, etc. that are being developed and are being demanded by the market. In addition, a global overview with regional breakdowns by countries and players will be presented.

17:10 Opportunity Charging EV Concept for Urban Transport and Advantage of Toshiba's LTO Technology

Peter Blumrich, Director, Business Battery Development, TOSHIBA Europe GmbH
Urban transport (bus, trolley, tram) is one of the most important aspects of electrification due to local city environment as well as global CO2 emission problems. Opportunity charging EVs are the preferred concept for many municipal governments, but need different battery technology from the ones used for passenger car EVs. This presentation explains the benefits of opportunity charging EV concept for urban transport and advantage of LTO technology Toshiba can offer for this concept.

17:30 Batteries for Industrial Mobility - Securing 8 Years of Lifetime

Sven Bauer, CEO, BMZ, GmbH
This presentation will highlight the importance of using the right cells technology and the right application, including the battery construction, how to handle the heating and the cells inside the battery, the battery management system, passive balancing and communication of BMS, the performance of the battery to reach 8 years lifetime, and the battery qualification. Approval, safety and performance will also be presented.

17:50 Q&A

18:20 Networking Reception with Exhibit & Poster Viewing



19:50 Close of Day

THURSDAY, 2 FEBRUARY

8:00 Registration Open

8:30 Continental Breakfast Roundtable Discussions

Join your colleagues and fellow delegates over breakfast for a focused, informal discussion moderated by a member of our speaking faculty. A small group format allows participants to meet potential collaborators,

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share examples from their own work and discuss ideas with peers. Visit our website to see the full listing of topics and moderators.

9:30 Coffee Break with Exhibit & Poster Viewing

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LIGHT ELECTRIC VEHICLES (LEVs) AND THEIR BATTERY SYSTEMS

10:15 Chairperson's Opening Remarks

Dee Strand, Ph.D., CSO, Wildcat Discovery Technologies

10:20 EnergyBus - The CANopen-Based Communication Protocol for LEVs

Torsten Gedenk, Managing Director, emtas, GmbH

The LEV market is currently characterized by numerous proprietary solutions for the communication between components and with chargers. The EnergyBus e.V. association has dedicated to develop and to promote a standardized solution. The talk points out the need for a standardized charging procedures for LEVs and explains the technical background of the EnergyBus protocol which is based on CAN and CANopen. Additionally, this presentation will cover possible ways to implement EnergyBus into existing batteries, chargers or LEVs.

10:40 New Battery Safety Standard EN 50604 for LEV – Scope, Application, Requirements and Conformity

Stephan Scheuer, Department Manager, Certification Electrical Products, Projects & Innovations, Battery Storage Systems, TÜV Rheinland; President, BATSO e.V.

The new safety requirements for removable Lithium-ion battery systems, to be used as traction batteries for light electrical road vehicles are published for Europe. Safety requirements and the related test procedures will be introduced. The influence to the conformity procedures for the products like E-Bikes or EPAC' and other electrically propelled road vehicles will be discussed.

11:00 LEV Applications in Motorcycle Racing Utilizing Nanophosphate Pouch Cells Outputting 400A & 900A with Output Voltages of 48V & 125V

Purvaj Rajan, Vehicle Development and Test Engineer, Continental; Team Member, EM Racing

This presentation will discuss the development and performance of EV racing motorcycles and the technology utilized to achieve that performance. On our first

bike, the lithium pouch cell from Lonestar EV used was making 900A from 48V from Lonestar EV with BMS from Orion. On the second bike, the battery pack and management system from A123 consisted of the AMP20 model of nanophosphate pouch cells, with a total output current of 400A and output voltage of 125V.

ADVANCED MATERIALS DESIGN AND ENGINEERING

11:20 Low Temperature Limitations of Lithium-Ion Batteries

Dee Strand, Ph.D., CSO, Wildcat Discovery Technologies

In this presentation, we compare properties of the cell (area specific impedance, resistance) vs. properties of the electrolyte (ionic conductivity, Li+ diffusivity) as a function of temperature to determine the temperature at which the bulk electrolyte properties dominate cell performance. We will also highlight the impact of changing solvent on the cell impedance at low temperature. Finally, the use of advanced SEI additives to reduce low temperature impedance while maintaining high temperature stability will be highlighted.

TRANSPORTATION COMPLIANCE AND REGULATION

11:40 Legal Lithium Battery Transport without Dangerous Good Requirements

Hannes Neupert, CEO, ExtraEnergy Services GmbH & Co. KG

This presentation will discuss how the EN 50604 compliance, in combination with the BATSO.org certification, could lead to a exception of removable lithium ion vehicle batteries from the UN 38.3 Dangerous Goods transport rules.

12:00 Q&A

12:20 Networking Lunch

13:05 Dessert Break with Exhibit & Poster Viewing

14:00 Closing Plenary Session

See *Plenary Sessions*.

16:35 Close of Conference

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PRICING AND REGISTRATION INFORMATION

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Supercaps

Raw Materials

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xEV

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All Access Advance Registration Rate Until 20 January	€1999	€1669
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One Tutorial	€459	€459
Two Tutorials	€719	€719
Three Tutorials	€1049	€1049

*Early registration discounts for tutorials are available. See website for current rates.

ONE SYMPOSIUM

One Symposium Advance Registration Rate Until 20 January	€949	€799
One Symposium Late Registration Rate after 20 January	€1049	€879

TWO SYMPOSIA

Two Symposia Advance Registration Rate Until 20 January	€1449	€1219
Two Symposia Late Registration Rate after 20 January	€1549	€1309

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Conference Only Advance Registration Rate Until 20 January	€1449	€1219
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Additional Registration Details

19% VAT will be added to each registration.

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Tutorials TUT1: Li-Ion Battery Design and Simulation TUT2: Effect of Electrode and Cell Production Steps on Lithium-Ion Battery Cell Performance and Costs TUT3: The Rechargeable Battery Market: Value Chain & Main Trends 2016–2026	S3: Lithium Battery Chemistry	T1: Advanced Automotive Battery Technology, Application, & Market T2: EV Technology for Specialty Vehicles
S1: Electrochemical Capacitors	S4: Battery Engineering	
S2: Global Battery Raw Materials	S5: Chemistry & Materials For Lead-Based Batteries	

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