FINAL AGENDA

REGISTER BY JULY 30 FOR MAXIMUM SAVINGS

August 3-4, 2021 | EDT

SOLID-STATE BATTERY SUMMIT VIRTUAL

Reducing Costs and Achieving Safe, High Energy Density Batteries with Solid Electrolytes

Solid-state batteries are well positioned to be the breakthrough that will help to propel advanced battery technologies to the next level of global adoption. With significant increases in energy density and vastly improved safety, solid-state batteries show significant promise if their costs can be brought in line with other competing battery chemistries. This unique virtual summit will cover the global solid-state battery ecosystem from multiple angles including advances in chemistry, engineering and safety as well as cost control strategies by manufacturers with an outlook on the forecasted market expansion for China, Japan, Korea, Europe and the United States.

Coverage Will Include:

- Strategies for Lowering Material and Production Costs
- Pack Design Methods
- Cell and Pack Manufacturing Methods
- Manufacturing Scalability
- Considerations of Safety
- Lifetime Durability
- Applications and Market

Featured Speakers:

Frederic Aguesse, PhD
Group Leader, CIC energiGUNE

Josh Buettner-Garrett
CTO, Solid Power

Tim Holme, PhD
Co-Founder & CTO, QuantumScape

Asma Sharafi, PhD
Research Engineer, Automotive Li ion Batteries, Ford Motor Company

Steven Visco, PhD
CEO & CTO, PolyPlus Battery

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Program Agenda

SOLID – STATE BATTERY SUMMIT VIRTUAL

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TUESDAY, AUGUST 3

8:50 am Organizer's Welcome & Opening Remarks
Craig Wohlers, Executive Director, Conferences, Cambridge EnerTech

8:55 Chairperson's Opening Remarks
Jordi Sastre, PhD, Researcher, EMPA - Swiss Federal Laboratories for Materials Science and Technology

KEYNOTE PRESENTATION

9:00 KEYNOTE PRESENTATION: Lithium-metal Solid-State Battery Development at QuantumScape
Tim Holme, PhD, Chief Technology Officer, QuantumScape Battery Corp
QuantumScape is developing a solid-state battery with a lithium-metal anode to enable long-range, faster charging, low-cost EVs. This talk will highlight recent developments in solid-state batteries as well as the challenges in commercializing a new battery technology. QuantumScape was founded in 2010 with a mission to revolutionize energy storage to enable a sustainable future.

APPLICATIONS & MARKET

9:30 Solid State Batteries Developments, Market and Forecast
Michael Sanders, Senior Advisor, Energy, Avicenne Energy
We will explore the many developments, announcements and funding approaches that have led to high interest in solid state batteries. This talk will cover the different groups doing developments in solid state batteries and the current progress toward commercialization. Market forecasts have been developed by end use application will be covered through 2030.

10:00 Solid-State Batteries: The State of Innovation
Youmin Rong, PhD, Principal Analyst, IHS Markit
This presentation will discuss the current state of innovation for solid-state batteries, automakers' timelines for incorporating them into a vehicle, and the role that they could play in the broader electric vehicle market. It will also discuss the leading global development partnership networks centered around solid electrolytes and lithium metal anodes, as well as several companies developing cutting-edge technologies for this market.

10:30 Session Break

11:00 Challenges and Opportunities for Solid-State Players – Can They Be Competitive on the Battery Market within Automotive Applications?
Ines Miller, Senior Consultant, E Mobility, P3 Automotive GmbH
Increasing battery demand and requirements towards high performance cells are pushing lithium-ion technology to its limits. Recent developments in solid-state technology have led to a high level of media attention, and both start-ups and large cell manufacturers are intensively working on the industrialization of their next-generation technology as major challenge. The competitiveness of currently leading players regarding technology, scalability and costs aspects will be evaluated and discussed in the presentation.

OEM PERSPECTIVES ON SOLID-STATE

11:30 Technological Advancements in Solid-State Batteries for Electric Vehicles
Asma Sharafi, PhD, Research Engineer, Automotive Li ion Batteries, Ford Motor Company
This presentation highlights the need for SSBs and discusses the major challenges faced by solid-state battery technology development in gaining wide-scale market adoption and competitiveness. Furthermore, the practices and principles that have been proposed for dealing with core problems related to SSBs as well as future research avenues that will encourage the adoption of SSBs in real application will be discussed.

12:00 pm Solid-State Batteries for All-Electric Future: Opportunities and Challenges
Fan Xu, PhD, Senior Researcher, Energy Storage, General Motors
As the EV industry continues searching for the next-generation battery technology aiming for higher energy density and greater safety, solid-state batteries (SSBs) have received a resurgence of interest across the entire industry as well as the relevant academic fields. This talk will highlight the unique advantages and fundamental challenges of SSBs for foreseeable EV applications on its way to an All-Electric future in GM.

12:30 Session Break

OEM PERSPECTIVES ON SOLID STATE

12:55 Chairperson's Remarks
Steven Visco, PhD, CEO & CTO, PolyPlus Battery

1:00 Solid-State Batteries: Present and Future. Perspectives from an Industry Leader.
Adrian Tylim, Head Business Development North America, Blue Solutions
Blue Solutions has proven to make what most people believe represents the future of advanced battery technology a reality. In this presentation we review, all-solid-state batteries manufacturing, current applications, and the near future technological path necessary to have solid-state batteries become the de facto technology of use.

ELECTROLYTE INTERFACE STABILITY

1:30 Thin-Film Lithium Garnet Electrolytes for Solid-State Batteries
Jordi Sastre, PhD, Researcher, EMPA - Swiss Federal Laboratories for Materials Science and Technology
Lithium garnets have come under the spotlight owing to their high Li-ion conductivity and wide electrochemical stability window, making them promising electrolytes for the development of solid-state lithium batteries. Thin film deposition of solid electrolytes allows the fabrication of better SSBs by reducing the thickness of the electrolyte. Thin film architectures can also be useful model systems to investigate interface charge dynamics and serve as playgrounds for interface engineering.

NAVIGATING THE PATHWAY TO DISCOVERY AND COMMERCIALIZATION

2:00 Solid State Battery Technology Breakthrough, Commercialization, and Highlights of ProLogium
Lisa Hsu, Director, Marketing Department, ProLogium Technology

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As EV demand growing, the industry is seeking the next generation battery and solid state battery is considered the most promising one due to high safety, high energy density and low cost advantages. In this talk, ProLogium will highlight its enabling solid state battery technology progress, competitiveness with peers and the omni solution for commercializing EV application.

2:30 **Solid-State Materials Discovery Platform That Goes from Prediction to Synthesis**
Sam Cross, PhD, Staff Research Engineer, Samsung Research America

3:00 **Session Break and Networking**
Remember those times when you would bump into someone at a conference and strike up a conversation? Here we simulate such an environment where you can easily chat with an attendee or jump into a group discussion. Feel free to grab a coffee and join the conversations.

3:45 **PANEL DISCUSSION: Solid-State Batteries – The Promise vs. Reality**
Moderator: Brian Barnett, PhD, President, Battery Perspectives
All solid-state battery developers have the same goals of increasing energy density with lower costs and higher performance. The question becomes what targets are achievable, cost-effective and scalable. This expert panel will examine the current realities of solid-state battery development and separate that from the promises to break down what is within reach and what isn't.
Panelists:
Tim Holme, PhD, Chief Technology Officer, QuantumScape Battery Corp
Rachid Yazami, PhD, Founding Director, KVI PTE, Ltd. Singapore
Steven Visco, PhD, CEO & CTO, PolyPlus Battery
Paul Albertus, PhD, Associate Director, Maryland Energy Innovation Institute; Assistant Professor, Chemical and Biomolecular Engineering, University of Maryland

4:45 **Close of Day One**

WEDNESDAY, AUGUST 4

8:50 **Organizer's Remarks**
Craig Wohlers, Executive Director, Conferences, Cambridge EnerTech

8:55 am **Chairperson's Remarks**
Josh Buettner-Garrett, CTO, Solid Power, Inc.

KEYNOTE PRESENTATION

9:00 **Progress toward Automotive Qualification for All Solid-State Batteries in Passenger Electric Vehicles**
Josh Buettner-Garrett, CTO, Solid Power
As the company prepares a formal A Sample cell, which will be larger and higher capacity than the company's current 20Ah cell, Solid Power will discuss key cell improvements that have been realized through roll-to-roll process improvements and give an overview of the automotive qualification process as it relates to the company's all solid-state cell design.

CATHODE AND ANODE INTERFACE

9:30 **A Dynamic Stability Design Strategy for Lithium Metal Solid-State Batteries**
Xin Li, PhD, Associate Professor, School of Engineering and Applied Sciences, Harvard University
Solid-state batteries pose new challenges to the battery design due to the unique solid-solid interfaces at battery cathode and anode. However, these interfaces, upon critical understanding and design, also form the new opportunity to achieve battery performances beyond the current commercial liquid electrolyte batteries. We design the lithium metal anode for solid-state batteries based on our unique mechanical constriction principle, making a more stable cycling at high current densities.

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Cambridge EnerTech encourages attendees to gain further exposure by presenting their work in the virtual poster sessions. To ensure your poster presentation is considered, your full submission must be received, and your registration paid in full by **July 9, 2021**.

A limited number of oral poster presentation slots are available. *Poster presentations will be pre-recorded oral presentations played in real-time and integrated into the conference agenda. Not all submissions will be selected.*

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10:00 High Energy Silicon Anodes for Thiophosphate-Based All-Solid-State-Batteries

Felix Hippauf, PhD, Battery Scientist, Center for Battery Research, Fraunhofer Institute for Material & Beam Technology

Scalable concepts for high energy anodes are presented. We investigated different silicon anodes for solid state batteries. Columnar structures achieve high energy densities and stable cycling at moderate stack pressure. To reduce the necessary stack pressure and increase loading, we furthermore investigated silicon-carbon void structures with silicon contents of up to 37 wt%. The carbon matrix enables enhanced performance and lifetime without the need for prelithiation.

10:30 Session Break and Networking

Remember those times when you would bump into someone at a conference and strike up a conversation? Here we simulate such an environment where you can easily chat with an attendee or jump into a group discussion. Feel free to grab a coffee and join the conversations.

11:00 Concentrating on the Cathode – The Cornerstone of Solid-State

Richard Clark, Global Lead, Energy Storage, Morgan Advanced Materials

Solid-State Battery research is primarily focused on development and utilization of a solid lithium-ion conductive electrolyte and elimination of a non-lithium anode. However, not only will the cathode survive the transition to solid-state, new options open up for its material and structure. For large-format thin-film batteries this is the last frontier, but for all other types of solid-state batteries cathode considerations may provide the differentiation needed for commercial success.

POLYMER-BASED BATTERIES

11:30 Improving Polymer-Based Solid-State Batteries

Michel Armand, PhD, Group Co-Leader, Solid Electrolyte, CIC energiGUNE

We will show the preparation of of comb polymers with pendent PEO segment, separated by a flexible tether show the highest conductivity today without a plasticizer. In a second part, we study new solutes able to increase the T+ of the electrolyte.

HIGH RESOLUTION PRODUCTION ANALYSIS FOR MANUFACTURING

12:00 pm Assessing Lithium-Ion Battery Cells with 3D X-Ray Inspection

Herminso Villarraga Gomez, Product Manager, X-ray Quality Solutions, ZEISS Industrial Quality Solutions

New energy battery manufacturers face challenges when trying to non-destructively map the battery electrodes microstructure in 3D, its heterogeneities, and their effect on battery aging and performance. This presentation introduces workflows that combine high-resolution X-ray microscopy and computed tomography to generate detailed internal views of 3D microstructure in rechargeable batteries without destroying them. These workflows can speed up development time, increase cost-effectiveness, and simplify failure analysis and quality inspection of new energy battery cells deliverables.

12:30 Session Break

POSTER PRESENTATIONS

1:15 Chairperson's Remarks

Richard Clark, Global Lead, Energy Storage, Morgan Advanced Materials

1:20 Poster Presentation Session

Selected poster presentations will be pre-recorded oral presentations. Poster presenters will be available to answer any audience questions in the chat while their poster presentation is being broadcast.

1:20 Stabilization of the Cathode-Electrolyte Interface for 5 V-Class All-Solid-State Batteries

Zhe Li, PhD, Sr Researcher, Science Lab, General Motors

A 5 V-class spinel cathode is targeted to combine with a high-ionic-conductivity sulfide solid electrolyte for developing high-performance all-solid-state batteries. Aiming to passivate and stabilize the cathode-electrolyte interface, three oxide materials are rationally applied to decorate the surface of pristine cathode particles with various amounts through a wet-chemistry approach.

1:25 Rapid Rate Capability Determination of All-Solid-State Batteries via Chronoamperometry

Silian Yanev, Graduate Student, Fraunhofer IKTS, Julius Maximilians Univ

Rate capability determination is an essential part of battery cell development and characterization. Chronoamperometry is presented as a rapid alternative to the standard rate capability test, while also not being limited to discrete C-rates. The rate performance of three different cathode active materials in an all-solid-state battery is characterized by chronoamperometry and an excellent agreement with the standard rate performance test is demonstrated.

1:30 The Origin of Mixed Conductivity in Lithium Lanthanum Titanate (LLTO)

Kyeongjae Cho, PhD, Prof, Material Science & Engineering, Univ of Texas Dallas

Lithium lanthanum titanium oxide (LLTO) has long been considered a promising candidate for use as solid electrolyte in all-solid-state batteries. However, recent experimental reports indicate LLTO shows electronic as well as ionic conductivity. We use density functional theory to investigate the electronic structure of LLTO and elucidate the conditions under which mixed conductivity occurs. Results indicate that spontaneous Li insertion shifts the band edges, resulting in mixed conductivity.

1:35 Scalable Production of Solid-State Batteries Based on Sulfide Solid Electrolytes

Peter Michalowski, Research Assoc, Technical Univ of Braunschweig

Currently, there are many challenges for upscaling synthesis processes of sulfide solid electrolytes (SE) as well as the production of solid-state batteries (SSBs). Thus, our work focuses on gaining a deeper understanding of process-product relations and to evaluate and establish new process strategies for the production of SE as well as SSBs. The presentation gives an overview of the whole process chain and discusses results as well as future challenges.

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1:40 High-Energy Solid-State Batteries by the Use of Nanostructured Si-C Anode Materials

Stephanie Poetke, PhD, Fraunhofer Institute for Material & Beam Technology (IWS), Technische Universität Dresden (TUD)

Silicon-carbon void structures (Si-C) are evaluated as anode material for all-solid-state batteries (ASSBs). The enhanced performance of the Si-C electrodes compared to bare silicon nanoparticles in half-cells indicate the effective compensation of the volume changes of silicon through the carbon matrix. Solid-state full cells comprising the Si-C void anodes show higher initial discharge capacities than the liquid electrolyte full cells. The balancing of full cells is also studied.

1:45 Influencing the Microstructure of Composite Solid Polymer and Ceramic Electrode-Particles

Jessica Gerstenberg, Technical Univ of Braunschweig

All-Solid-State Electrodes promise increased energy densities, fast charging properties and higher safety compared to traditional liquid-based systems. In this study, an additive manufacturing process is intended to produce 3D-structured and graded composite cathodes from composite particles in order to promote ionic and electric conductivity.

1:50 Thermal Modeling of Liquid Electrolyte in Solid-State Batteries

Alex Bates, Energy Storage Safety & Reliability, Sandia Natl Labs

To overcome interfacial resistance in solid-state batteries, a small amount of liquid electrolyte is often utilized; however, this raises the question of safety impact. That question is explored through thermal modeling. A sample of key findings include: a small enough amount of liquid electrolyte has a nearly negligible effect on heat release and, as energy density improves, heat release due to solid electrolyte failure becomes more consequential.

1:55 Developments in Robust Early Detection of Thermal Runaway

Brian Engle, Mgr Bus Dev, ASTG, Amphenol

Amphenol has developed a family of multiphysics sensors that can monitor the airspace within a battery enclosure to detect the onset of cell thermal runaway from lithium ion cells with various electrochemistries including LFP, NMC, and NCA. The fast response sensor platforms utilize a combination of thermal conductivity and Non dispersive infrared spectroscopy for primary detection, with auxiliary measurements of temperature, relative humidity, and air pressure.

NEW APPROACHES TO SOLID-STATE BATTERY DESIGN

2:00 Addressing Challenges of Solid-State Batteries Using High Throughput

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

Successful demonstration of all solid-state batteries requires combining multiple components, each of which must meet certain performance metrics. This presentation will show several examples of the power of high throughput methodologies to optimize component properties, address interfacial challenges, and investigate material combinations.

2:30 Session Break

3:00 Development of Ultra-Thin Conductive Glass for Next-Generation Batteries

Steven Visco, PhD, CEO & CTO, PolyPlus Battery

PolyPlus Battery Company is developing next generation lithium metal batteries based on the use of continuous sheets of high conductivity sulfide glass separators. The use of lithium metal as an anode will lead to the highest possible energy density for lithium based chemistries. The approach is inherently scalable and is expected to reach cost parity with polymeric separators with high volume manufacturing.

3:30 Improving Solid-State Battery Performance Through Physics, Not Chemistry

Moshiel Biton, PhD, CEO, Addionics

In this presentation, we will highlight how a new 3D electrode design can solve the multiple challenges that still exist with today's solid-state batteries: namely the energy-power tradeoff and cost. He can also discuss new approaches to scaling battery manufacturing and how AI can be used to accelerate the adoption of this new electrode design in the battery market.

MANUFACTURING PROCESS INTEGRATION AND SCALABILITY

4:00 Micro to Giga Scale: Different Materials, Processes and Challenges

Denis Pasero, PhD, Manager, Product Commercialization, Ilika Technologies Ltd.

This presentation will compare and contrast the various challenges and choices of chemistries, processes and engineering solutions necessary for the development of mWh level micro batteries to the full commercialization of SSB modules at GWh level.

SOLID-STATE BATTERY SAFETY

4:30 Safety and Qualification Testing Considerations for Solid-State Batteries

Keith Beers, PhD, Principal Engineer, Polymer Science & Materials Chemistry, Exponent

There is a gap between the academic testing of cutting-edge battery technologies and the safety testing often performed on commercial Li-ion batteries. In this presentation we will discuss what types of tests are typically performed industrially, what their limitations are, and potential considerations as these are applied to solid state cells.

5:00 Close of Conference

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Poster Submission - Discount ($50 Off*): Poster materials are due by July 9, 2021. Once your registration has been fully processed, we will send an email containing a unique link and instructions for submitting your abstract and other materials. If you do not receive your link within 5 business days, please contact jring@cambridgeenertech.com. *Submissions received by the poster deadline will be considered for an Oral Poster Presentation. Not all submissions will be selected.*

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