SolidStateBattery

Weekly Intelligence Report

2026-08-09 | 21 articles | 7 countries

troy-technical.jp

This Week's Keyword

Solid-State Race

Global OEMs & nations accelerate ASSB deployment

21	7	900	2026
articles	countries	Wh/L	year
Total Articles Analyzed	Source Countries/Regions	Top Volumetric Density	Earliest GWh Target

All 21 Articles This Week — 5-Axis Evaluation Matrix

How to read columns — Tech Novelty: degree of breakthrough Market Proximity: closeness to commercialization Market Impact: industry-wide effect Data Reliability: quantitative data & peer review US/EU Relevance: direct impact on US/European companies & supply chains

#	Article Title	Type	Tech Novelty	Market Proximity	Market Impact	Data Reliability	US/EU Relevance	Summary
#01	Samsung SDI Mass Prod	Corporate Strategy	●●●●○	●●●●○	●●●●●	●●●●○	●●●●○	Samsung SDI targets H2 2027 mass production of 900 Wh/L sulfide ASSBs, investing $17.77B.
#02	Halide Electrolytes Review	Research	●●●○○	●●○○○	●●●○○	●●●●●	●●●●●	US review highlights halide solid electrolytes for ASSBs: high ionic conductivity, air tolerance, high-voltage compatibility.
#03	GEM Wuxi Pilot Base	Corporate Strategy	●●○○○	●●●○○	●●●○○	●●●○○	●●●●○	China's GEM Wuxi secures environmental approval for 500-ton/year ASSB cathode/electrolyte pilot base.
#04	ASSB Interface Analysis	Analysis	●●○○○	●●○○○	●●○○○	●●●○○	●●●○○	IEST review details ASSB challenges: interfacial resistance, electrolyte types, sulfide air instability.
#05	Honda & QuantumScape	Corporate Strategy	●●●●○	●●●○○	●●●●○	●●●○○	●●●●●	Honda partners with US QuantumScape for R&D; on anode-free Li-metal ASSBs for EVs.
#06	PEC Nanocoating	Research	●●●●○	●●○○○	●●●○○	●●●●●	●●●●●	US researchers develop PEC nanocoating to stabilize sulfide ASSB interfaces, boosting cycling stability.
#07	Li7P3S11 Polymer Electrolyte	Research	●●●○○	●●○○○	●●○○○	●●●●●	●●●●●	German research: $Li_7P_3S_{11}$-modified polymer electrolyte for Li-S ASSBs hits 7.73×10^{-4} S/cm conductivity.
#08	LGES Dry Electrode	Corporate Strategy	●●●○○	●●●○○	●●●●○	●●●○○	●●●●○	LG Energy Solution plans dry electrode pilot line for ASSBs by H2 2026, aiming for cost reduction.
#09	PVDF Interface Reg.	Analysis	●●○○○	●●○○○	●●○○○	●●●○○	●●●○○	Chinese review: multi-scale interface regulation for PVDF-based composite electrolytes boosts ASSB performance.
#10	Halide for Metal Anodes	Research	●●●○○	●●○○○	●●●○○	●●●●●	●●●●●	US review: halide solid electrolytes show promise for metal anodes in ASSBs, despite dendrite challenges.
#11	Dual-Interface NCM811	Research	●●●●○	●●○○○	●●●○○	●●●●●	●●●●●	US research: dual-interface engineering boosts high-voltage ASSBs with NCM811 cathode, improving cycle life.
#12	High-Entropy Sulfides	Research	●●●●○	●●○○○	●●●○○	●●●●●	●●●●●	
#13	CMC Polymer Electrolytes	Research	●●●○○	●●○○○	●●○○○	●●●●●	●●●●●	Swiss review: CMC-based polymer electrolytes achieve 10^5-fold ionic conductivity boost with additives.

#	Article Title	Type	Tech Novelty	Market Proximity	Market Impact	Data Reliability	US/EU Relevance	Summary
#14	Greater Bay A-Sample	Corporate Strategy	●●●●○	●●●●○	●●●●●	●●●○○	●●●●○	Greater Bay Tech ships A-sample ASSBs (260-500 Wh/kg) from mass production line, targeting 2026 GWh scale.
#15	Toyota 1,200km Range	Corporate Strategy	●●●●○	●●●●○	●●●●●	●●●○○	●●●●○	Toyota targets 1,200km range, 10-min fast charge ASSB EVs by 2028, 9 GWh production by 2026.
#16	BYD Test Production	Corporate Strategy	●●●●○	●●●○○	●●●●○	●●●○○	●●●●○	BYD plans 2027 ASSB test production for 1,000km EV range, patents dual-electrolyte cathode for stability.
#17	China Sulphide Road Test	Market Overview	●●●●○	●●●○○	●●●●●	●●●○○	●●●●○	China completes first sulfide ASSB road test; major capacity expansion and investment underway.
#18	ASSBs Surpass Li-Ion	Comparison	●●●●○	●●●○○	●●●●●	●●○○○	●●●●●	ASSBs target 400-500 Wh/kg, 1,200km+ EV range, 1,500-cycle durability, surpassing Li-ion.
#19	GAC Group 400Wh/kg	Corporate Strategy	●●●●○	●●●●○	●●●●●	●●●○○	●●●●○	GAC Group to deploy 400Wh/kg+ ASSBs in Aion EVs by H2 2026; CATL, Toyota also progress.
#20	ASSBs for Aerospace	Market Overview	●●●○○	●●○○○	●●●●○	●●○○○	●●●●●	Aerospace invests in ASSBs for safer, lighter electric aircraft with higher capacity, AI-BMS integration.
#21	ASSBs for Robotics	Market Overview	●●●○○	●●○○○	●●○○○	●●○○○	●●●●●	ASSBs enhance capacity, safety for humanoid robotics; dendrite suppression without high pressure is key.

●●●●○ High ●●●○○ Med-High ●●○○○ Med ●○○○○ Low | Yellow highlight = featured article

Three Questions That Demand Your Decision This Week

❶ Is your EV platform ready for 1,000km+ range by 2028?

Asian OEMs (Toyota, BYD, GAC) and battery makers (Samsung SDI) are targeting 1,000-1,200km range ASSB EVs by 2028, with pilot production starting 2026-2027. Does your product roadmap match this aggressive timeline?

❷ How exposed is your supply chain to Asian ASSB materials?

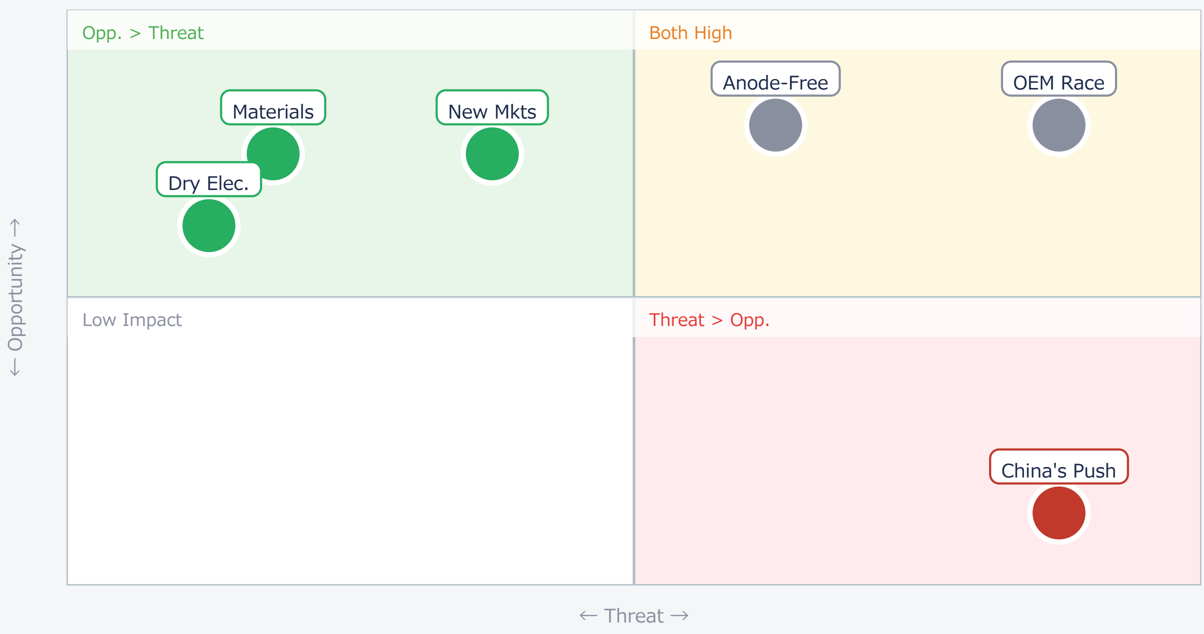
China is rapidly building domestic ASSB material production (e.g., GEM Wuxi, Guoci Materials) and conducting road tests. Are your procurement teams assessing the risk of reliance on non-US/EU suppliers for critical components?

❸ Are you investing enough in next-gen electrolyte IP?

US/EU research is advancing halide, high-entropy sulfide, and interface engineering solutions. Is your R&D; pipeline securing IP in these critical areas to avoid licensing dependencies from Asian competitors?

Opportunities vs. Threats for US/European Companies

Opportunity vs. Threat Matrix for US/European Companies



Item	Quadrant	↑ Opportunity	↓ Threat
● OEM Race	Critical	New EV market	Market share loss
● Anode-Free	Critical	Next-gen IP	Tech obsolescence
● China's Push	Threat	—	Supply chain risk
● Dry Elec.	Opp.	Cost reduction	—
● Materials	Opp.	New materials IP	—
● New Mkts	Opp.	Market expansion	—

Deep Dive ① — Samsung SDI's Aggressive ASSB Roadmap

#01 | 2026/07/31 | Gasgoo | Tech Novelty ●●●●○ Proximity ●●●●○ Market Impact ●●●●● Data Reliability ●●●●○ US/EU Relevance ●●●●○

Samsung SDI plans mass production of sulfide-based all-solid-state batteries (ASSBs) at its Ulsan plant by H2 2027, targeting over 900 Wh/L energy density. This $17.77 billion investment aims to position Samsung as a leader in next-gen EV batteries.

Samples have already been delivered to potential customers, indicating advanced development. The focus on sulfide electrolytes, known for high ionic conductivity, is key to achieving the ambitious energy density targets for extended EV range.

▶ Strategic Analyst's Perspective

Strategic Analyst's Perspective: Samsung SDI's 900 Wh/L target is highly ambitious but plausible given their R&D; history. The H2 2027 mass production timeline is aggressive, suggesting they've overcome significant manufacturing hurdles. Key technical barriers likely include cost-effective scaling of sulfide electrolyte synthesis and robust cell assembly. [Opportunity] for US/EU materials & equipment suppliers to partner with Samsung SDI or other Asian players. [Threat] for US/EU OEMs and battery manufacturers if they fall behind in ASSB commercialization. Next actions: [Strategy] Evaluate competitive timelines and investment levels by Q4 2026. [Business Dev] Identify potential collaboration opportunities with Samsung's supply chain by Q1 2027.

Deep Dive ② — Honda & QuantumScape: Anode-Free ASSB

#05 | 2026/08/01 | Engadget | Tech Novelty ●●●●○ Proximity ●●●○○ Market Impact ●●●●○ Data Reliability ●●●○○ US/EU Relevance ●●●●●

Honda has partnered with US-based QuantumScape for R&D; on anode-free, lithium-metal QSE-5 solid-state battery cells. This collaboration aims to revolutionize EV performance with extended range, faster charging, lower costs, and enhanced safety.

The anode-free design maximizes energy density by eliminating the anode, while the solid electrolyte improves safety. Development will occur at QuantumScape's new Eagle Line facility, signaling a serious push towards commercial viability.

▶ Strategic Analyst's Perspective

Strategic Analyst's Perspective: QuantumScape's anode-free technology is a high-risk, high-reward approach. While promising significant energy density gains, managing lithium metal dendrite growth without an anode remains a formidable technical barrier. The partnership with Honda validates the technology's potential but commercialization is still 2-3 years away. [Opportunity] for US/EU IP holders and materials developers in solid electrolytes and interface engineering. [Threat] for conventional battery manufacturers whose current anode technologies could be disrupted. Next actions: [R&D;] Initiate internal projects on anode-free battery architectures and solid electrolyte compatibility by Q4 2026. [Legal/IP] Monitor QuantumScape's patent filings for potential licensing or competitive threats by Q1 2027.

Deep Dive ③ — Toyota's Ambitious 2028 ASSB EV Target

#15 | 2026/08/05 | Top Speed | Tech Novelty●●●●○ Proximity●●●●○ Market Impact●●●●● Data Reliability●●●○○ US/EU Relevance●●●●○

Toyota is accelerating its plan to launch all-solid-state battery (ASSB) EVs by 2028, targeting a remarkable 1,200km range and 10-80% charge in just 10 minutes. They aim for 9 GWh annual production capacity by 2026.

Supported by Japan's METI, Toyota also emphasizes high durability and plans for a second-generation ASSB with a 1,500km range. These targets directly address major EV adoption barriers: range anxiety and charging time.

> ▶ Strategic Analyst's Perspective
>
> Strategic Analyst's Perspective: Toyota's targets of 1,200km range and 10-minute fast charging by 2028 are extremely aggressive and, while technically feasible in lab conditions, scaling to mass production with high durability remains a significant challenge. The 9 GWh production target by 2026 implies a rapid industrialization. [Opportunity] for US/EU automotive component suppliers to integrate with Toyota's next-gen EV platforms. [Threat] for US/EU automakers who may struggle to match these performance metrics, risking market share. Next actions: [Executive] Conduct a strategic review of EV battery roadmaps against Toyota's targets by Q4 2026. [Procurement] Identify potential raw material and component bottlenecks for ASSB scale-up by Q1 2027.

Other Notable Articles

China Completes First Sulphide All-Solid-State Battery Road Test (Shanghai Metals Market)
Tech Novelty●●●●○ Proximity●●●○○ Market Impact●●●●●

China's first ASSB road test and massive GWh projects signal rapid industrialization, impacting global supply.

All-Solid-State Batteries Poised to Surpass Li-Ion with 400-500Wh/kg Energy Density and 1,200km+ EV Range, 1,500-Cycle Durability (Intelligent Living)
Tech Novelty●●●●○ Proximity●●●○○ Market Impact●●●●●

This overview highlights the transformative performance benchmarks ASSBs are set to achieve, redefining EV expectations.

LG Energy Solution to Establish Dry Electrode Pilot Line for All-Solid-State Batteries in H2 2026 (CNEVPost)
Tech Novelty●●●○○ Proximity●●●○○ Market Impact●●●●○

LGES's dry electrode pilot line could significantly reduce ASSB manufacturing costs and environmental impact.

Dual-Interface Engineering Boosts High-Voltage All-Solid-State Lithium Batteries with NCM811 Cathode and Composite Polymer Electrolyte (ACS Publications)
Tech Novelty●●●●○ Proximity●●○○○ Market Impact●●●○○

US research on dual-interface engineering offers a promising solution for high-voltage cathode stability in ASSBs.

Recommended Actions This Week

Action recommendations based on article evaluation matrix and opportunity/threat analysis.

Immediate (this week)

- [Executive] Review current EV battery technology roadmaps against aggressive Asian ASSB timelines (2026-2028 commercialization).
- [Strategy] Assess competitive landscape for ASSB materials and manufacturing capacity, particularly from China and South Korea.
- [R&D;] Prioritize internal research on interface stabilization techniques and next-gen solid electrolyte materials (halides, HESs).

Short-term (1 month)

- [Procurement] Initiate supply chain risk assessment for critical ASSB raw materials and components, identifying potential dependencies.
- [Business Dev] Explore potential R&D; partnerships with US/EU research institutions or startups focused on advanced ASSB materials and manufacturing.
- [R&D;] Benchmark performance targets (e.g., 900 Wh/L, 10-min charge) against internal capabilities and identify key gaps.

Medium-long term (quarter+)

- [Strategy] Develop a comprehensive ASSB adoption strategy, including potential vehicle integration timelines and market positioning.
- [Legal/IP] Conduct a thorough patent landscape analysis for ASSB technologies, focusing on anode-free and interface engineering solutions.
- [Manufacturing] Investigate dry electrode manufacturing processes for potential cost reduction and scalability in ASSB production.

SolidStateBattery — Selected Articles

Date: 2026-08-09

Articles: 21

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#19 GAC Group to Equip Aion EVs with 400Wh/kg+ All-Solid-State Batteries by H2 2026, CATL & Toyota Also Show Progress

#20 All-Solid-State Batteries Drive Aerospace Innovation: Enhancing Safety, Capacity, and Lightweighting with AI-Enabled BMS

#21 All-Solid-State Batteries Boost Capacity, Safety for Humanoid Robotics; Interfacial Dendrite Suppression Key

#01 Samsung SDI to Commence Mass Production of All-Solid-State Batteries with Over 900 Wh/L Energy Density at Ulsan Plant by H2 2027

Published July 31, 2026 Gasgoo South Korea

OVERVIEW

Samsung SDI announced plans to initiate mass production of all-solid-state batteries at its Ulsan plant in South Korea by the second half of 2027, aiming to be the first domestic battery maker to market the technology. The company is investing 25 trillion won (approx. $17.77 billion USD) through 2040, with 16 trillion won allocated to Ulsan for solid-state battery lines. Focusing on sulfide-based solid electrolytes, Samsung SDI targets an energy density exceeding 900 Wh/L and has already delivered samples to potential customers.

IN DEPTH

Key Findings

Samsung SDI has officially announced its groundbreaking plan to commence mass production of all-solid-state batteries in the second half of 2027 at its Ulsan plant in South Korea. This initiative positions Samsung SDI as the first domestic battery manufacturer to bring this advanced technology to market. The move is a direct response to the escalating demands for enhanced safety, higher capacity, and faster charging in the electric vehicle (EV) sector, marking a significant milestone in the global race for solid-state battery industrialization.

Technical and Manufacturing Details

- **Mass Production Timeline and Hub:** Samsung SDI is targeting the second half of 2027 for the start of mass production of all-solid-state batteries at its Ulsan facility. This aggressive timeline underscores the company's ambition to lead the market in next-generation battery deployment.
- **Substantial Investment:** The company plans a massive investment of 25 trillion won (approximately $17.77 billion USD) across its Ulsan and Cheonan facilities from 2026 to 2040. A significant portion, 16 trillion won (approximately $11.37 billion USD), is specifically allocated to the Ulsan plant for establishing cutting-edge solid-state battery production lines, aiming for technological leadership and scale.
- **Sulfide-Based Solid Electrolytes:** Samsung SDI is concentrating its efforts on sulfide-based solid electrolytes, known for their high ionic conductivity and stability. The company's goal is to achieve a volumetric energy density exceeding 900 Wh/L, a performance metric that would significantly surpass current lithium-ion battery capabilities. Samples have already been dispatched to potential customers, with ongoing optimization based on their feedback.

Background and Industry Context

All-solid-state batteries are garnering immense attention as a transformative technology for EVs, primarily due to their superior safety profile (reduced fire risk compared to liquid electrolyte-based lithium-ion batteries) and their potential for higher energy density. This technology promises to dramatically extend EV range and improve safety. Competitors such as Toyota, Nissan, and BYD are also targeting market entry around 2027-2028, placing Samsung SDI's 2027 mass production goal at the forefront of this intense global competition. This announcement is set against the backdrop of a rapidly expanding EV market and an urgent need for advanced battery technology.

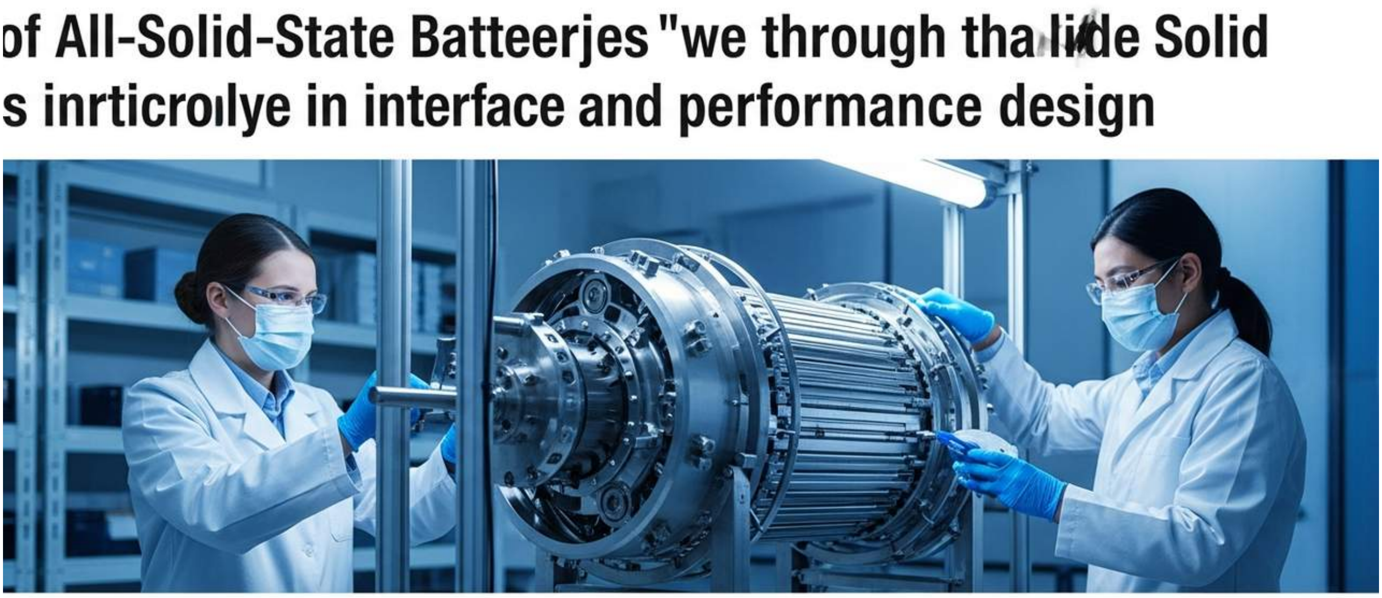
Future Outlook

Samsung SDI's plan for solid-state battery mass production is crucial for bolstering its competitive edge in the EV battery market. The target energy density of over 900 Wh/L is particularly significant, as it is essential for achieving EV ranges exceeding 500 miles (approximately 800 km), offering a substantial benefit to EV users. Key challenges ahead will involve production validation on pilot lines, cost optimization, and establishing a robust supply chain. Researchers, engineers, and investors will be closely watching whether Samsung SDI achieves this ambitious goal and secures a leading position in the burgeoning all-solid-state battery market.

Source: https://autonews.gasgoo.com/articles/ev/samsung-sdi-to-start-mass-production-of-all-solid-state-batteries-in-2027-2083191483950661633

#02 Halide Solid Electrolytes Revolutionize All-Solid-State Batteries Through Interface and Performance Design: A Comprehensive Review

Published August 04, 2026 Bioengineer.org USA



OVERVIEW

A comprehensive review by researchers from the University of Puerto Rico, published in Nano-Micro Letters, highlights halide-based solid electrolytes as a promising solution for all-solid-state battery challenges. These materials exhibit high ionic conductivities (approx. 10^{-4} to 10^{-3} S cm^{-1}), broad electrochemical stability, and improved air tolerance, making them ideal for high-voltage cathodes. The review also discusses bilayer and dual-electrolyte designs leveraging halide catholytes alongside sulfide electrolytes for anode interfaces, and the promising compatibility of fluoride-doped halides with lithium metal.

IN DEPTH

Key Findings

A comprehensive review article by researchers from the University of Puerto Rico, published in Nano-Micro Letters, reveals that halide-based solid electrolytes hold immense promise for overcoming critical hurdles in all-solid-state batteries. These materials combine high ionic conductivity, excellent electrochemical stability, and—crucially—improved air tolerance compared to conventional electrolytes, potentially paving the way for the practical implementation of next-generation high-voltage all-solid-state batteries. The review meticulously analyzes the potential of halide solid electrolytes from the perspective of interface and performance design.

Technical and Research Details

- **Superior Electrochemical Properties:** Halide-based solid electrolytes demonstrate high ionic conductivities, typically ranging from approximately 10^{-4} to 10^{-3} S cm^{-1} at room temperature. This performance surpasses many existing solid electrolytes and is vital for achieving rapid charge and discharge capabilities in batteries. Furthermore, their wide electrochemical stability window enables compatibility with high-voltage cathode materials, contributing to higher energy density batteries.
- **Enhanced Air Tolerance:** While sulfide-based solid electrolytes offer high ionic conductivity, their practical application has been hampered by sensitivity to moisture in the air, complicating manufacturing and handling. Halide electrolytes exhibit superior air tolerance, which simplifies processing and broadens their potential applications.
- **Bilayer and Dual-Electrolyte Designs:** The review emphasizes concepts such as bilayer structures and dual-electrolyte designs, where halide electrolytes are used as catholytes in conjunction with sulfide electrolytes at the anode interface. This approach aims to maximize the advantages of each electrolyte, optimizing the overall performance and stability of the all-solid-state battery. The review also highlights promising results from fluoride-doped halide compositions for compatibility with lithium metal anodes, suggesting potential for dendrite suppression.

- **Compatibility with High-Voltage Cathodes:** Achieving high energy density necessitates cathode materials capable of operating at high voltages. The wide electrochemical stability of halide electrolytes makes them particularly suitable for integration with such high-voltage cathodes, enhancing the design flexibility for high-performance all-solid-state batteries.

Background and Industry Context

The development of all-solid-state batteries is considered indispensable for accelerating the adoption of electric vehicles. Improving safety and energy density are urgent priorities, and the selection and design of solid electrolytes are key to unlocking these advancements. Halide-based solid electrolytes have garnered significant attention recently because they combine the high ionic conductivity of sulfide electrolytes with the stability of oxide electrolytes. This review provides crucial guidance for researchers and engineers in selecting optimal solid electrolyte materials and advancing battery design.

Future Outlook

This review on halide solid electrolytes sets a clear direction for future research and development in materials science and battery engineering. For the practical development of all-solid-state batteries, further improvements in ionic conductivity, reduction of interfacial resistance, and the establishment of cost-effective synthesis processes are critical. Approaches such as bilayer and dual-electrolyte designs, along with enhanced lithium metal anode compatibility through fluoride doping, represent promising avenues for overcoming these challenges, and future research outcomes are highly anticipated. The insights presented in this review will form a fundamental basis for accelerating the commercialization of all-solid-state batteries.

Source: https://bioengineer.org/halide-solid-electrolytes-advance-all-solid-state-batteries-through-interface-and-performance-design/

#03 GEM Wuxi Secures Environmental Approval for 500-Ton/Year All-Solid-State Battery Cathode and Electrolyte Pilot Base

Published August 03, 2026 Asian Metal China

OVERVIEW

GEM (Wuxi) Energy Materials Co. has obtained environmental approval for its high-performance all-solid-state battery cathode and electrolyte materials pilot and industrialization base in Wuxi, Jiangsu Province. With a total investment of RMB 120 million (USD 17.77 million), the project aims for an annual capacity of 500 tons of solid-state battery materials, including 499.9 tons of cathode materials and 0.1 tons of electrolyte. This approval, announced on July 29, 2026, is a significant step in establishing a local supply chain for advanced battery components.

IN DEPTH

Key Findings

GEM (Wuxi) Energy Materials Co. has officially secured environmental regulatory approval for the construction of its high-performance all-solid-state battery cathode and electrolyte materials pilot and industrialization base. This crucial permit marks a pivotal step in establishing a domestic supply chain for key components of all-solid-state batteries, demonstrating China's sustained progress towards the mass production of next-generation battery technology.

Technical and Manufacturing Details

- **Project Overview:** The approved pilot and industrialization base will be located in Wuxi, Jiangsu Province, China, representing a total investment of RMB 120 million (approximately USD 17.77 million). The facility is designed for comprehensive R&D, pilot-scale validation, and eventual mass production of all-solid-state battery materials.
- **Production Capacity:** The planned annual production capacity totals 500 tons of all-solid-state battery materials. This breakdown includes 499.9 tons of high-performance cathode materials and 0.1 tons of solid electrolyte materials. This specific ratio suggests a strategic focus on scaling cathode material production while simultaneously advancing electrolyte material development.
- **Environmental Approval:** The environmental approval was formally granted by the Wuxi Municipal Data Bureau on July 29, 2026. Such regulatory clearance is essential for proceeding with large-scale industrial projects, indicating that GEM is now poised to begin construction and operations in Wuxi.

Background and Industry Context

All-solid-state batteries are anticipated to be a transformative technology for electric vehicles (EVs), promising significant improvements in range, safety, and charging speed. The global development race for this technology is intense. Commercialization necessitates not only high-performance solid electrolytes but also the concurrent development and mass production of compatible, high-capacity cathode materials. GEM's project is viewed as an integral part of China's national strategy to achieve self-sufficiency and technological leadership in core all-solid-state battery materials. Strengthening domestic material supply capabilities is expected to stabilize supply chains, reduce costs, and enhance the overall competitiveness of China's EV and battery industries.

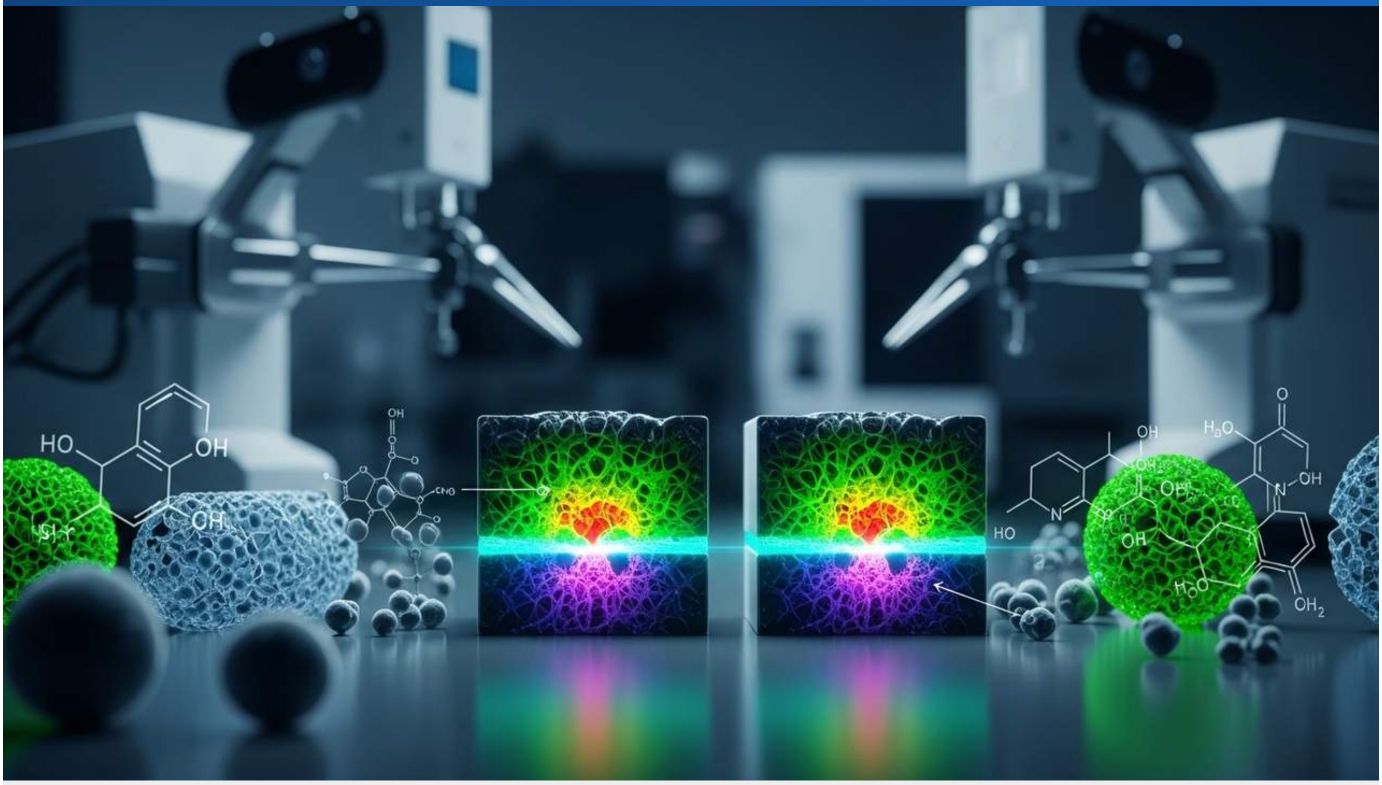
Future Outlook

The environmental approval for GEM Wuxi's pilot base signifies concrete progress toward the commercial production of all-solid-state battery materials. Moving forward, the construction of the facility, installation of equipment, and pilot production of materials will commence in earnest. The stable supply of both cathode and solid electrolyte materials will be critical to achieving cost reductions and enabling mass production of all-solid-state batteries. This project represents a vital step for China's battery industry in securing leadership in next-generation technologies, with global battery manufacturers and EV producers closely monitoring its progress, material performance, and supply status.

Source: https://www.asianmetal.com/news/2354237/GEM-Wuxi-obtains-environmental-approval-for-battery-cathode-pilot-base

#04 Comprehensive Analysis of All-Solid-State Batteries: Detailing Interface Resistance and Solid Electrolyte Advancements

Published July 30, 2026 IEST Instrument China



OVERVIEW

A review by IEST Instrument comprehensively analyzes the status and challenges of all-solid-state batteries (ASSBs), focusing on solid electrolytes. It categorizes polymer, inorganic (oxide, sulfide), and organic/inorganic composite electrolytes, highlighting high interfacial resistance from poor solid-solid contact as a primary issue. While sulfide electrolytes like Li6PS5Cl achieve 4.96×10^{-3} S/cm ionic conductivity, they suffer from air instability. The review details strategies like in-situ solid electrolyte growth and hot/cold pressing to mitigate these interfacial challenges.

IN DEPTH

Key Findings

A recent review published by IEST Instrument offers a detailed and systematic analysis of the current state of all-solid-state batteries (ASSBs) and the significant challenges they face. The review specifically zeroes in on advancements in solid electrolytes and, critically, the high resistance caused by poor solid-solid contact at electrode interfaces—a major impediment to ASSB performance. By presenting diverse strategies to overcome these challenges, the review provides crucial insights for researchers and engineers striving for the practical implementation of all-solid-state batteries.

Technical and Research Details

- **Types and Properties of Solid Electrolytes:** The review categorizes and details the advantages and disadvantages of three main types of solid electrolytes currently under research and development:
    - **Polymer Solid Electrolytes:** Offer flexibility and excellent electrode contact but generally exhibit lower ionic conductivity.
    - **Inorganic Solid Electrolytes:** Broadly divided into oxide-based (e.g., garnet, NASICON) and sulfide-based (e.g., argyrodite, LiPON). Oxide types possess high chemical stability but lower ionic conductivity, whereas sulfide types show high ionic conductivity (e.g., Li6PS5Cl reaching 4.96×10^{-3} S/cm) but are sensitive to atmospheric moisture (air instability).
    - **Organic/Inorganic Composite Solid Electrolytes:** These aim to combine the strengths of both polymer and inorganic materials, seeking to achieve both flexibility and high ionic conductivity.

- **Interfacial Resistance Challenges and Solutions:** The most significant technical obstacle for all-solid-state batteries is the high resistance originating from poor solid-solid contact at the electrode-solid electrolyte interface. This interfacial resistance severely degrades the battery's power density and cycle life. The review outlines the following strategies to address this issue:
    - **In-situ Growth Method:** Growing the solid electrolyte directly within the battery cell to enhance adhesion with the electrodes.
    - **Hot/Cold Pressing:** Physically compressing the electrodes and solid electrolyte to maximize contact area and reduce resistance.
    - **Interfacial Layer Introduction:** Inserting a thin, functional layer (buffer layer) between the electrode and solid electrolyte to improve chemical and mechanical stability.

Background and Industry Context

All-solid-state batteries are envisioned as the "ultimate battery" to overcome the limitations of existing lithium-ion batteries—namely, safety concerns (leakage, fire), energy density, and charging speed. They are expected to have wide applications in electric vehicles (EVs), portable electronic devices, and stationary energy storage systems. However, high interfacial resistance and challenges in solid electrolyte stability and manufacturability have been major barriers to their commercialization. This review focuses on these fundamental issues, comprehensively summarizing the latest solutions being pursued by researchers worldwide, thereby indicating the direction of technological development across the industry.

Future Outlook

This review clearly delineates the roadmap for R&D necessary for further advancements in all-solid-state battery technology. Developing solid electrolytes that combine high ionic conductivity, excellent electrochemical and chemical stability, and facile manufacturing processes remains a top priority. Furthermore, research into interfacial engineering is crucial to establish fundamental solutions for interfacial resistance. The insights presented in this review will form the basis for accelerating the commercialization of all-solid-state batteries and contribute to the realization of a sustainable energy society. Continued technological innovation is highly anticipated.

Source: https://iestbattery.com/news/research-status-of-all-solid-state-batteries/

#05 Honda and QuantumScape Partner on All-Solid-State Battery R&D, Leveraging Anode-Free Li-Metal Tech to Revolutionize EV Performance

Published August 01, 2026 Engadget Japan

OVERVIEW

Honda has partnered with U.S. battery developer QuantumScape for R&D of all-solid-state batteries and associated manufacturing techniques. This collaboration underscores Honda's prioritization of solid-state technology within its EV strategy, aiming to leverage QuantumScape's anode-free, lithium-metal QSE-5 solid-state battery cells for extended range, faster charging, lower costs, and enhanced safety. The project will utilize QuantumScape's newly opened Eagle Line facility.

IN DEPTH

Key Findings

Honda has announced a strategic partnership with QuantumScape, an innovative U.S.-based battery development firm, for the research and development of all-solid-state batteries and related manufacturing technologies. This collaboration distinctly highlights the critical importance of solid-state battery technology in Honda's electric vehicle (EV) development roadmap, holding the potential to fundamentally improve EV performance, cost-efficiency, and safety. By building upon QuantumScape's anode-free, lithium-metal technology, the alliance aims to accelerate the realization of next-generation EVs.

Technical and Partnership Details

- **Focus of Collaboration:** Honda and QuantumScape will primarily concentrate on evaluating and refining QuantumScape's proprietary anode-free, lithium-metal QSE-5 solid-state battery cells. This technology is expected to deliver high energy density and rapid charging capabilities, effectively breaking through the limitations of conventional liquid-electrolyte lithium-ion batteries.
- **Advantages of QSE-5 Technology:** QSE-5 cells achieve dramatically higher energy density by eliminating the anode (negative electrode), thereby making more space available for lithium ion storage. Furthermore, the use of a solid electrolyte significantly reduces the fire risk associated with liquid electrolytes, enhancing safety. These advancements are anticipated to contribute to substantially extended driving ranges, reduced charging times, and overall lower vehicle costs.
- **Development Infrastructure:** Research and development efforts will be conducted at QuantumScape's recently inaugurated state-of-the-art Eagle Line facility. This facility is equipped with advanced capabilities for efficient prototyping and performance validation of all-solid-state batteries.

Background and Industry Context

In the intensely competitive electric vehicle market, advancements in battery technology stand as one of the most crucial differentiators for automakers. All-solid-state batteries are heralded as the "dream battery" capable of overcoming the inherent limitations of existing lithium-ion batteries, with major Japanese manufacturers like Toyota and Nissan also targeting commercialization in the late 2020s. Honda's partnership with QuantumScape signals a clear strategy to lead this race not only through in-house development but also by integrating cutting-edge external technologies. QuantumScape, notably, has also secured investment from Volkswagen (VW), underscoring the international recognition of its technology.

Future Outlook

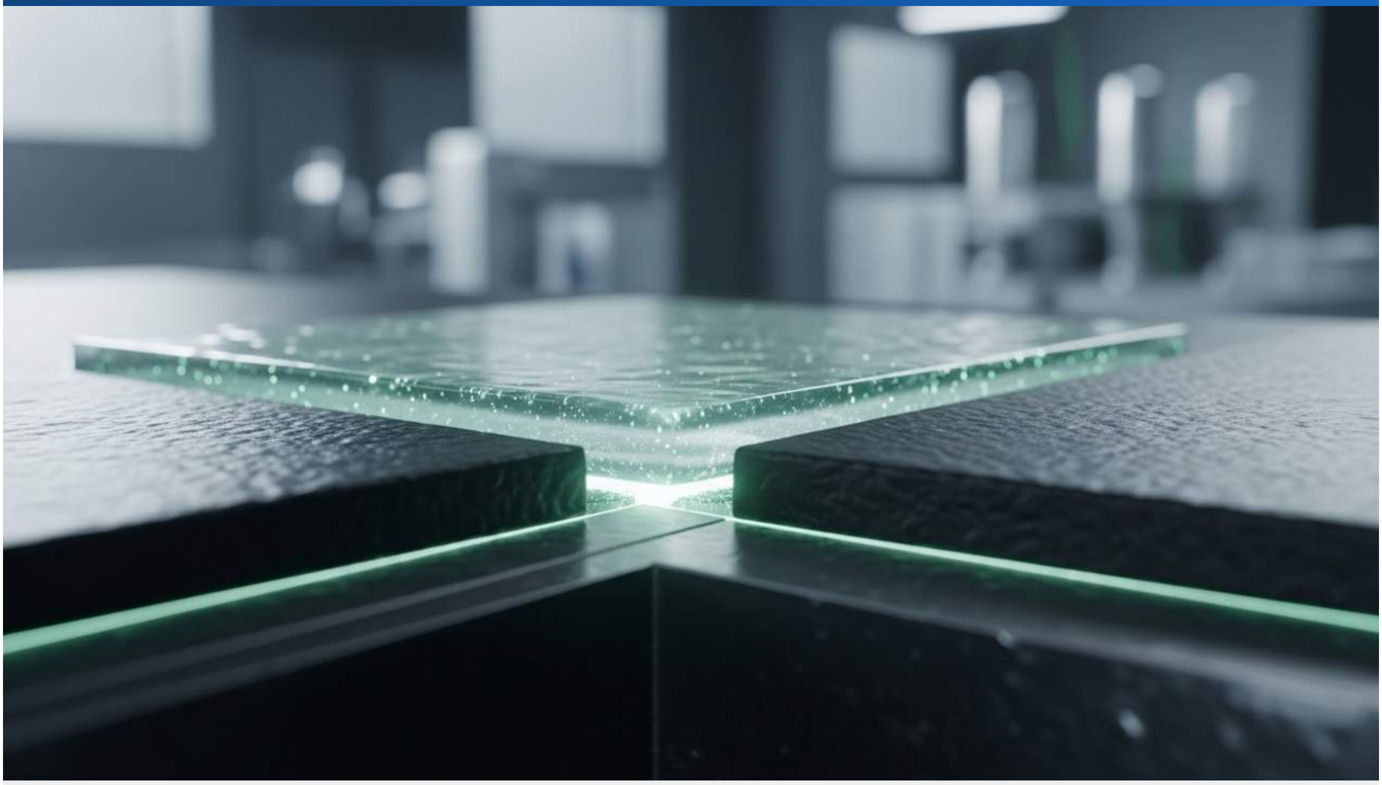
The joint development between Honda and QuantumScape could have a profound impact on the EV market. If anode-free, lithium-metal all-solid-state batteries become practical, consumers can expect EVs that offer greater peace of mind, extended range, and faster charging. Future milestones include the performance validation of prototype cells, optimization of production processes, and ultimate vehicle integration testing. Researchers, engineers, and investors will closely monitor the tangible technological and business outcomes of this partnership, eagerly anticipating when and in what form all-solid-state battery technology will become a commercial reality for electric vehicles.

Source: https://www.engadget.com/2225030/honda-solid-state-battery-technology-new-partner-quantumscape/

Collected: August 07, 2026 | Automated Research System (Gemini API)

#06 Polyelectrolyte Complex Nanocoating Dramatically Enhances Interfacial Stability in Sulfide All-Solid-State Batteries

Published August 04, 2026 EurekAlert! / ACS Publications USA



OVERVIEW

Researchers have developed a novel polyelectrolyte complex (PEC) nanocoating, a dynamic ion gel, to simultaneously stabilize both cathode and anode interfaces in sulfide-based solid-state batteries (SSBs). This scalable coating enhances viscoelasticity and ionic conductivity, adapting to solid-solid interfaces while maintaining efficient ion transport. SSBs utilizing PEC-coated silicon anodes and $LiNiO_2$ cathodes showed improved cycling stability by suppressing interfacial side reactions, offering a breakthrough solution to the instability of sulfide-based electrolytes.

IN DEPTH

Key Findings

Researchers have developed an innovative polyelectrolyte complex (PEC) nanocoating that fundamentally addresses the critical challenge of interfacial instability in sulfide-based all-solid-state batteries (SSBs). This dynamic ion gel is capable of simultaneously stabilizing both cathode and anode interfaces, dramatically enhancing the cycling performance and lifespan of SSBs. This scalable coating technology represents a significant advancement towards the practical implementation of all-solid-state batteries.

Technical and Research Details

- **Polyelectrolyte Complex (PEC):** The PEC is a dynamic ion gel formed through complex coacervation (liquid-liquid phase separation) between oppositely charged polyelectrolytes. This property endows the PEC with high viscoelasticity, allowing it to flexibly adapt to the volume changes of electrodes. Crucially, it also maintains high ionic conductivity, ensuring efficient lithium ion transport without compromising interface protection.
- **Interfacial Stabilization Mechanism:** While sulfide-based solid electrolytes offer high ionic conductivity, they are prone to chemical and electrochemical side reactions at interfaces with electrode materials (especially lithium metal and high-voltage cathodes). These reactions have been a primary cause of capacity degradation and reduced lifespan. The PEC nanocoating mitigates these undesirable side reactions by forming a physically and chemically stable barrier layer between the electrode and the solid electrolyte.
- **Performance Demonstration:** All-solid-state batteries employing PEC-coated silicon (Si) anodes and $LiNiO_2$ cathodes exhibited significantly suppressed interfacial side reactions during cycling, leading to substantial improvements in cycling stability. This is particularly beneficial for resolving challenges associated with sulfide-based SSBs utilizing high-capacity Si anodes.
- **Scalability:** The nanocoating technology is reported to be easily integrated into existing battery manufacturing processes and is scalable. This is a critical factor for translating laboratory-scale achievements into industrial-scale production.

Background and Industry Context

All-solid-state batteries, particularly sulfide-based ones, are highly promising battery technologies for electric vehicles (EVs) and next-generation electronic devices due to their high ionic conductivity. However, the lack of chemical and mechanical stability at the electrode-solid electrolyte interface has been the biggest barrier to their practical implementation for many years. Conventional solutions often focused on single interfaces or required complex manufacturing processes. In contrast, the PEC nanocoating is groundbreaking because it addresses both interfaces and is scalable. This breakthrough has the potential to significantly improve the reliability and lifespan of all-solid-state batteries, accelerating their commercialization.

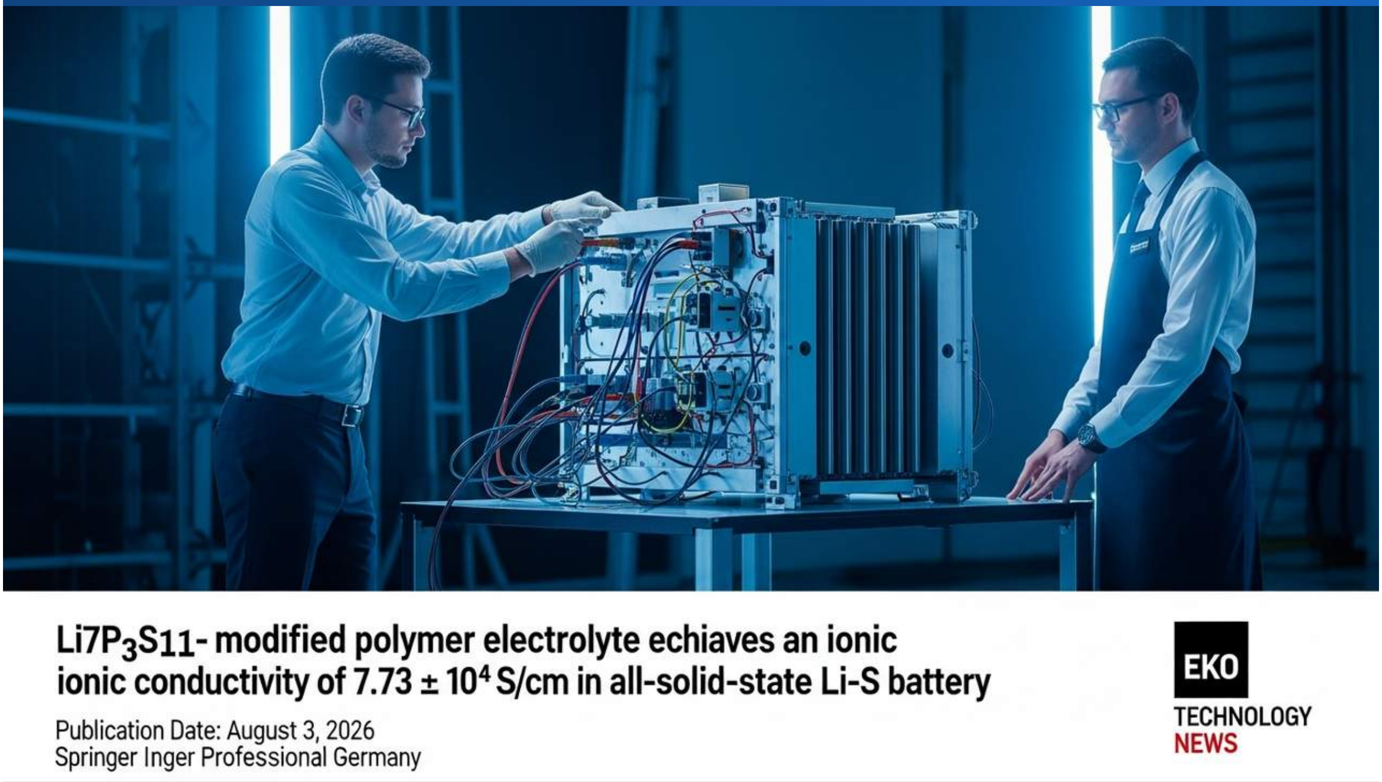
Future Outlook

The advent of PEC nanocoating technology could be a game-changer in the development of sulfide-based all-solid-state batteries. Future research will likely focus on further optimizing this technology, evaluating its long-term reliability, and exploring its applicability to different electrode materials and battery systems. If this technology can be mass-produced cost-effectively and integrated into actual EVs and electronic devices, it is expected to redefine battery performance standards and strongly promote the adoption of sustainable energy storage solutions. Researchers, engineers, and investors will closely follow the further advancements of this promising technology.

Source: https://pubs.acs.org/ancac3/article/doi/10.1021/acsnano.6c05725/5242109/Stabilizing-Solid-State-Battery-Interfaces-with-a?searchresult=1

#07 Li7P3S11-Modified Polymer Electrolyte Achieves 7.73×10^{-4} S/cm Ionic Conductivity in All-Solid-State Li-S Batteries

Published August 03, 2026 Springer Professional Germany



OVERVIEW

This research details the development of a Li7P3S11-modified PAN/PVDF-HFP composite polymer electrolyte for all-solid-state lithium–sulfur (Li–S) batteries. The composite achieves a room-temperature ionic conductivity of 7.73×10^{-4} S/cm and an electrochemical stability window of approximately 4.8 V, while supporting prolonged lithium plating/stripping. Integrating sulfide-based Li7P3S11 fillers with polymer matrices enhances ionic conductivity, mechanical stability, and interfacial compatibility, offering a promising pathway for advancing solid-state Li–S battery technology.

IN DEPTH

Key Findings

A novel Li7P3S11-modified PAN/PVDF-HFP composite polymer electrolyte has been developed, significantly enhancing the performance of all-solid-state lithium–sulfur (Li–S) batteries. This innovative composite electrolyte simultaneously achieves a high ionic conductivity of 7.73×10^{-4} S/cm at room temperature and a wide electrochemical stability window of approximately 4.8 V, enabling stable and prolonged operation of lithium electrodes. This achievement represents a crucial breakthrough towards the practical implementation of next-generation all-solid-state Li-S batteries.

Technical and Research Details

- **Composite Polymer Electrolyte Composition:** The developed electrolyte is based on a polymer blend of polyacrylonitrile (PAN) and polyvinylidene fluoride-hexafluoropropylene (PVDF-HFP), into which Li7P3S11, a sulfide-based solid electrolyte with high ionic conductivity, is incorporated as a filler. The introduction of Li7P3S11 significantly boosts the composite's ionic conductivity by reducing the crystallinity of the polymer matrix and improving lithium ion transport pathways.
- **Superior Electrochemical Performance:**
    - **Room-Temperature Ionic Conductivity:** The composite electrolyte achieved an excellent ionic conductivity of 7.73×10^{-4} S/cm at room temperature. This value surpasses many existing polymer electrolytes and is essential for the fast charge/discharge capabilities of all-solid-state batteries.
    - **Electrochemical Stability Window:** With a wide electrochemical stability window of approximately 4.8 V, the electrolyte enables high-voltage operation of Li-S batteries, facilitating high energy density.
    - **Lithium Plating/Stripping Stability:** The developed electrolyte supports prolonged and stable lithium plating and stripping on the lithium metal electrode. This is critically important for suppressing lithium dendrite formation and extending the battery's cycle life.

- **Multifunctional Filler Effects:** The integration of the Li7P3S11 filler not only enhances ionic conductivity but also contributes to improved mechanical stability of the composite electrolyte and better interfacial compatibility with electrodes. These benefits are expected to reduce interfacial resistance and enhance the reliability of all-solid-state Li-S batteries.

Background and Industry Context

Lithium–sulfur (Li-S) batteries have garnered significant attention as a next-generation high-energy-density battery alternative to conventional lithium-ion batteries, owing to the high theoretical capacity (1675 mAh g^{-1}) and low cost of sulfur cathodes. However, challenges such as the polysulfide shuttle effect of sulfur cathodes and lithium dendrite formation on lithium metal anodes have hindered their commercialization. All-solid-state Li-S batteries, by replacing liquid electrolytes with solid ones, hold the potential to overcome these issues, offering both safety and high performance. This research demonstrates a vital pathway toward the practical application of Li-S batteries through the hybridization of sulfide-based solid electrolytes with polymer electrolytes.

Future Outlook

The Li7P3S11-modified PAN/PVDF-HFP composite polymer electrolyte developed in this study is a strong candidate material for realizing all-solid-state Li-S batteries. Future work will focus on evaluating the long-term cycling stability and high-rate performance of actual Li-S battery cells incorporating this composite electrolyte. Furthermore, scaling up manufacturing processes and cost optimization will be key for commercialization. This achievement holds the potential to expand the role of all-solid-state Li-S batteries in applications demanding high energy density and safety, such as electric vehicles and large-scale energy storage systems, with significant anticipation for future research progress.

Source: https://www.springerprofessional.de/en/li7p3s11-modified-pan-pvdf-hfp-composite-polymer-electrolyte-for/53062122

#08 LG Energy Solution to Establish Dry Electrode Pilot Line for All-Solid-State Batteries in H2 2026

Published July 31, 2026 CNEVPost South Korea

OVERVIEW

LG Energy Solution announced plans to establish a pilot line for all-solid-state batteries using a dry electrode process in the second half of 2026, accelerating product development and preparation for mass production. This move signals the company's commitment to advancing next-generation battery technologies and gaining a competitive edge. While specific details on location or capacity remain undisclosed, this initiative aligns with LGES's broader strategy, including plans to deliver sodium-ion battery samples to clients in 2027.

IN DEPTH

Key Findings

LG Energy Solution has announced its intention to establish a pilot line for all-solid-state batteries utilizing a dry electrode process in the second half of 2026. This significant strategic decision aims to accelerate the development of next-generation battery technology and fortify preparations for eventual mass production. The dry electrode technology holds the potential to reduce manufacturing costs and environmental impact, representing a substantial step forward for the practical implementation of all-solid-state batteries.

Technical and Manufacturing Details

- **Dry Electrode Process:** The dry electrode process, unlike conventional wet processes (which use solvents), eliminates the need for a drying stage in electrode manufacturing. This is expected to significantly reduce energy consumption, shorten manufacturing times, and substantially lower production costs. Moreover, it diminishes environmental impact, contributing to more sustainable battery manufacturing practices.
- **Purpose of Pilot Line Establishment:** Through this pilot line, LG Energy Solution aims to validate the integration of the dry electrode process with all-solid-state battery technology, optimizing product performance, reliability, and manufacturing efficiency. This will allow the company to identify technical challenges for mass production and accumulate crucial data and know-how to establish solutions.
- **Future Plans:** Specific details regarding the pilot line's location, production capacity, or operational commencement date have not yet been disclosed. However, this initiative is central to LG Energy Solution's strategy to catch up with and potentially lead competitors in all-solid-state battery technology. The company also plans to deliver sodium-ion battery samples to clients in 2027, indicating diversified investments in multiple next-generation technologies.

Background and Industry Context

With the rapid expansion of the electric vehicle (EV) market, battery performance, cost, and manufacturing efficiency have become paramount concerns for both automakers and battery manufacturers. All-solid-state batteries are globally recognized as a technology that can overcome the safety and energy density limitations of liquid-electrolyte lithium-ion batteries, leading to intense development competition worldwide. Dry electrode technology, which companies like Tesla have already partially applied to reduce manufacturing costs, is considered an effective approach to address the high cost challenge associated with all-solid-state batteries.

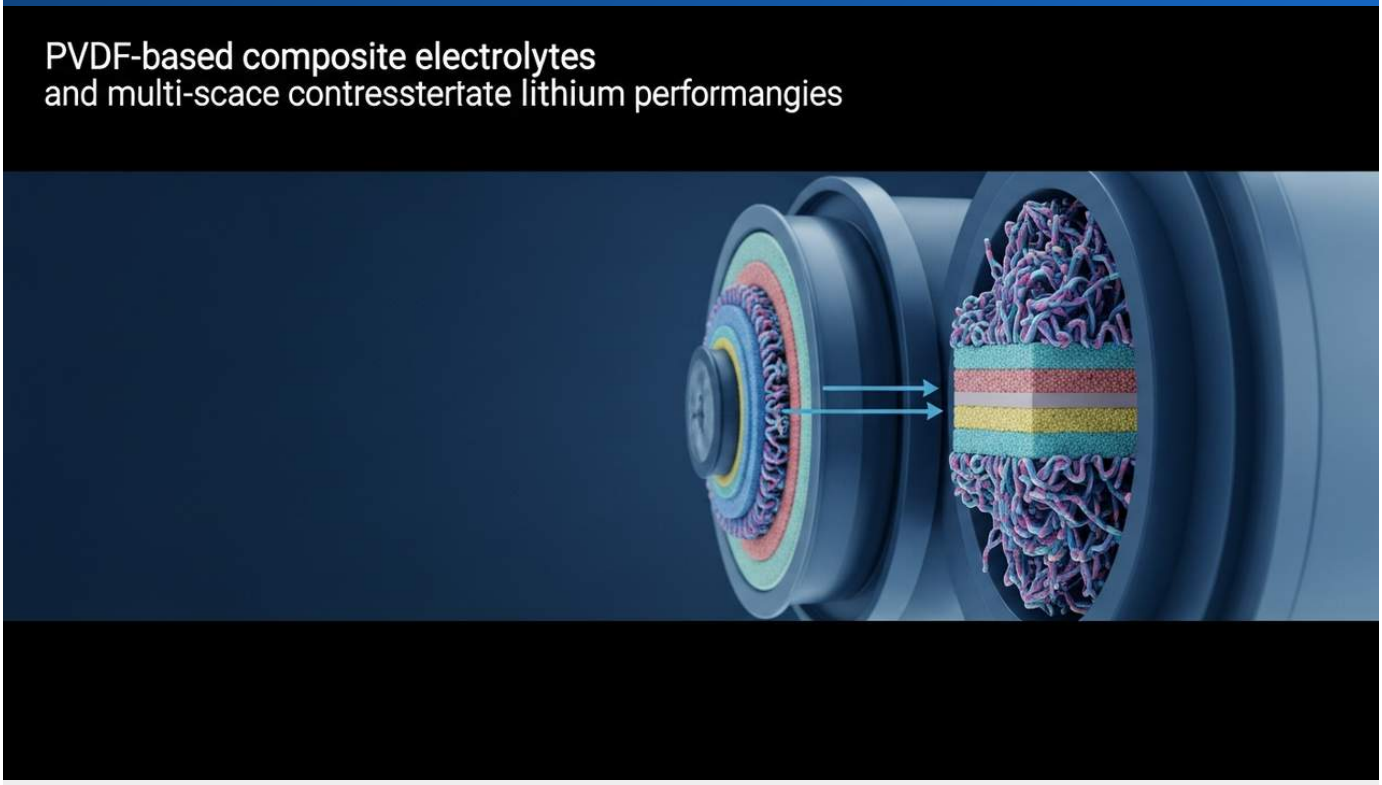
Future Outlook

LG Energy Solution's establishment of a dry electrode pilot line clearly demonstrates its commitment to the mass production of all-solid-state batteries. The insights gained from this pilot line will be crucial for innovating all-solid-state battery manufacturing processes and enhancing cost competitiveness. Future focus will be on the technical maturity of the dry electrode process, the performance validation results of the all-solid-state batteries, and the announcement of a concrete roadmap for mass production. Researchers, engineers, and investors will be keenly interested in how this pilot line impacts the competitive landscape of the all-solid-state battery market and whether LG Energy Solution can establish leadership in next-generation battery technology.

Source: https://news.metal.com/en/newscontent/104036774-solid-state-battery-lg-energy-solution-turned-profitable-in-q2-h2-to-launch-all-solid-state-dry-electrode-pilot-line2

#09 Multi-Scale Interface Regulation Strategies for PVDF-Based Composite Electrolytes Enhance All-Solid-State Lithium Battery Performance

Published August 06, 2026   OAE Publishing   China



OVERVIEW

This review comprehensively examines multi-scale interface regulation strategies for PVDF-based composite electrolytes to enhance performance in all-solid-state lithium batteries. It discusses approaches like organic polymer modification, inorganic filler incorporation, liquid additive modification, and structural design to improve ionic conductivity, mechanical strength, and interfacial compatibility. The article highlights that incorporating inorganic ceramic fillers (e.g., garnets, sulfides) into a polymer matrix combines high ionic conductivity with flexibility and interfacial compatibility, overcoming limitations of single-component electrolytes.

IN DEPTH

Key Findings

A recent review article published by OAE Publishing focuses on multi-scale interface regulation strategies for polyvinylidene fluoride (PVDF)-based composite electrolytes to significantly improve the performance of all-solid-state lithium batteries. This study systematically analyzes four main approaches—organic polymer modification, inorganic filler incorporation, liquid additive modification, and structural design—detailing how these methods enhance ionic conductivity, mechanical strength, and interfacial compatibility with electrodes. This comprehensive analysis offers crucial guidance for the design and development of next-generation all-solid-state batteries.

Technical and Research Details

- **Advantages of PVDF-Based Composite Electrolytes:** PVDF is extensively studied as a foundational material for polymer electrolytes due to its excellent mechanical strength, electrochemical stability, and ease of processing. However, its ionic conductivity alone is often insufficient. Hybridization strategies aim to overcome this limitation, leveraging PVDF's benefits while achieving both high ionic conductivity and high stability.

- **Multi-Scale Interface Regulation Strategies:** The review discusses four main strategies in detail:
    - **Organic Polymer Modification:** Blending or grafting PVDF with other polymers enhances the segmental motion of polymer chains, thereby facilitating lithium ion transport.
    - **Inorganic Filler Incorporation:** Dispersing inorganic ceramic fillers such as garnet-type oxides (LLZO), NASICON-type materials (LLZTO), or sulfides (LPS) into the PVDF matrix. These fillers can create lithium ion conduction pathways, reduce polymer crystallinity, or lower interfacial impedance with electrodes. Incorporating inorganic fillers significantly improves ionic conductivity while maintaining the electrolyte's mechanical stability.
    - **Liquid Additive Modification:** Introducing small amounts of liquid additives, such as ionic liquids or plasticizers, enhances the flexibility of the polymer matrix and improves ionic conductivity.
    - **Structural Design:** Morphological designs, including porous structures, layered structures, or nanofiber networks, are employed to optimize interfacial contact and ion transport efficiency within the electrolyte.
- **Overcoming Single-Component Electrolyte Limitations:** Composite solid electrolytes, by embedding inorganic ceramic fillers into a polymer matrix, can combine the advantages of both inorganic solid electrolytes (high ionic conductivity) and polymer electrolytes (flexibility and interfacial compatibility). This enables a performance balance that is difficult to achieve with single-component electrolytes.

Background and Industry Context

All-solid-state lithium batteries are considered the most promising candidates for electric vehicles (EVs) and next-generation electronic devices, offering advantages over conventional liquid-electrolyte lithium-ion batteries in terms of safety, energy density, and lifespan. However, the ionic conductivity of solid electrolytes, poor interfacial contact with electrodes, mechanical properties, and manufacturing costs have been major hurdles to their practical implementation. This review on PVDF-based composite electrolytes presents multi-faceted solutions to these challenges, emphasizing the importance of interface regulation, thereby providing fundamental insights to accelerate the commercialization of all-solid-state batteries.

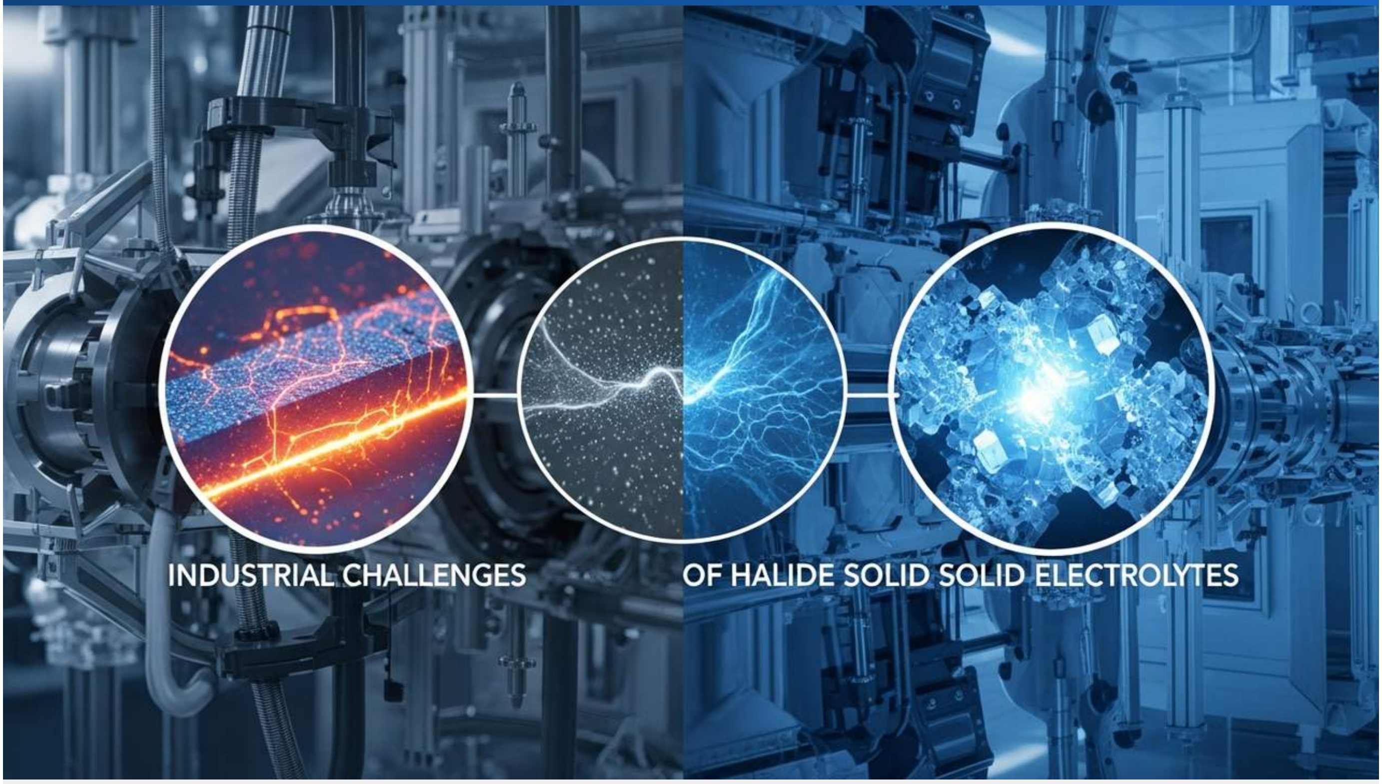
Future Outlook

This review on multi-scale interface regulation for PVDF-based composite electrolytes clearly outlines directions for future research and development. In particular, breakthroughs are needed to further improve the chemical and mechanical stability of interfaces and ensure long-term compatibility with high-voltage cathodes and lithium metal anodes. The development of cost-effective, large-scale manufacturing techniques for these composite electrolytes will also be a critical challenge for commercialization. The insights from this review are expected to help all-solid-state batteries maximize their potential in a wide range of applications and shape the future of sustainable energy storage technologies.

Source: https://www.oaepublish.com/articles/energymater.2026.80

#10 Industrial Challenges of Metal Battery Anodes and Potential of Halide Solid Electrolytes: A Critical Review

Published August 07, 2026 PMC USA



OVERVIEW

This critical review, from an industrial perspective, examines the challenges and progress in metal battery anodes, particularly lithium metal anodes for all-solid-state batteries. Halide solid electrolytes such as Li3YCl6 and Li3YBr6, discovered in 2018, have garnered significant interest due to high room-temperature ionic conductivities (0.51 and 1.7 mS/cm, respectively) and compatibility with oxide cathodes. However, issues like uncontrolled lithium dendrite growth, low Coulombic efficiency, and unstable interfaces between lithium metal and electrolytes continue to impede practical implementation.

IN DEPTH

Key Findings

One of the most significant bottlenecks for the realization of all-solid-state batteries is the lithium metal anode, which, while key to achieving high energy density, faces severe challenges such as dendrite growth and interfacial instability. This review critically examines the industrial challenges of metal battery anodes and the progress of halide solid electrolytes as a promising solution. Notably, halide solid electrolytes like Li3YCl6 and Li3YBr6, discovered in 2018, have attracted considerable attention due to their excellent ionic conductivities at room temperature (0.51 mS/cm and 1.7 mS/cm, respectively) and good compatibility with oxide cathodes.

Technical and Research Details

- **Challenges of Lithium Metal Anodes:** Lithium metal is considered an ideal material for maximizing battery energy density due to its extremely high theoretical capacity (3860 mAh g^{-1}) and low potential (-3.04 V vs. SHE) compared to graphite, currently used as an anode in lithium-ion batteries. However, the uncontrolled growth of lithium dendrites during charge-discharge cycles poses a major problem, leading to safety risks from internal short circuits, reduced Coulombic efficiency, and shortened cycle life. Additionally, the instability of the interface between lithium metal and the electrolyte is a primary cause of performance degradation.
- **Advancements in Halide Solid Electrolytes:**
  - **High Ionic Conductivity:** Halide solid electrolytes, such as Li3YCl6 and Li3YBr6, discovered in 2018, have achieved impressive lithium ion conductivities of 0.51 mS/cm and 1.7 mS/cm, respectively, at room temperature. These values are comparable to some liquid electrolytes and are crucial for the fast charge-discharge capabilities of all-solid-state batteries.
  - **Compatibility with Oxide Cathodes:** These halide solid electrolytes have been shown to exhibit good chemical and electrochemical compatibility with high-voltage oxide cathode materials (e.g., NMC, LCO). This represents a significant advantage in the design of high-energy-density all-solid-state batteries.
  - **Improved Air Tolerance:** Compared to sulfide-based solid electrolytes, halide systems are considered to have relatively higher air tolerance, which could simplify manufacturing and handling processes.

- **Remaining Challenges:** Despite the advances in halide solid electrolytes, fundamental suppression of lithium dendrite growth, further improvement in Coulombic efficiency, and the establishment of stable interfaces between lithium metal and electrolytes remain the biggest challenges for practical implementation.

Background and Industry Context

With the expansion of the electric vehicle (EV) market, improving battery energy density and safety has become an urgent priority. The combination of lithium metal anodes and all-solid-state electrolytes is anticipated as the "ultimate battery" to simultaneously solve these challenges, but the instability of lithium metal anodes has hindered its practical application. The discovery of halide solid electrolytes holds the potential to significantly change this landscape and is considered a crucial factor in accelerating the transition from liquid to solid electrolytes. This review provides valuable information for researchers, engineers, and investors to understand the current status and future potential of this field.

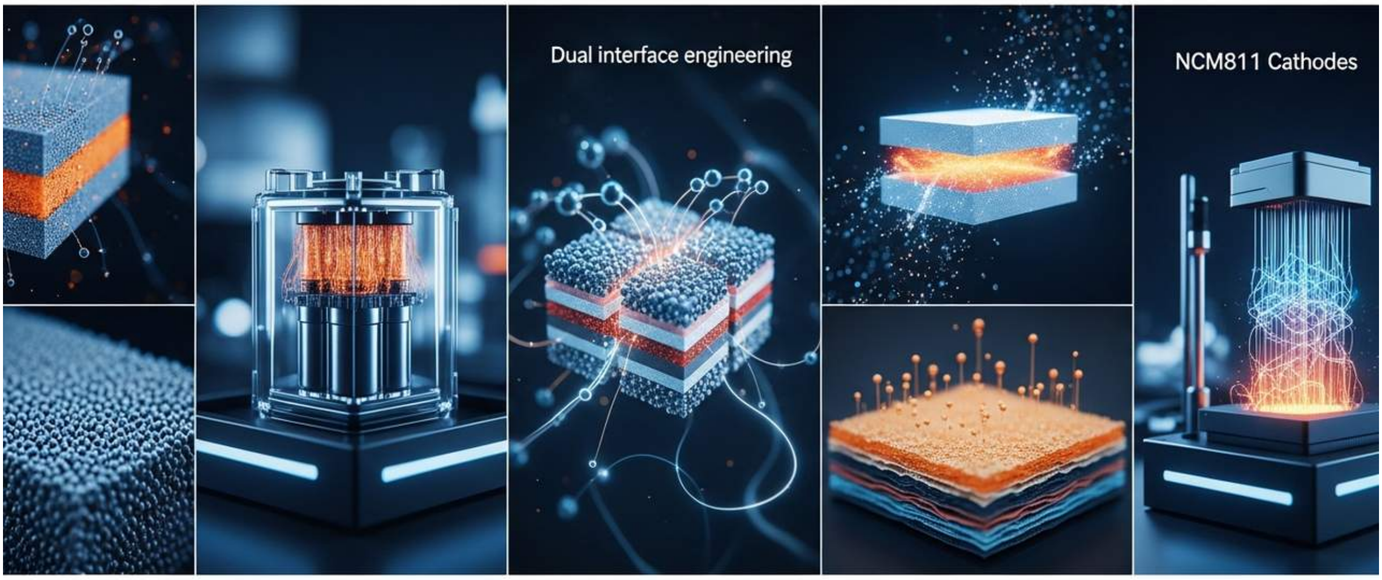
Future Outlook

Halide solid electrolytes show a promising path towards the commercialization of all-solid-state lithium metal batteries, but further research is needed for complete dendrite suppression and long-term interfacial stability. Specifically, interfacial engineering, electrolyte composition optimization, and scalable manufacturing processes will be key research areas. If efforts to address the challenges highlighted in this review succeed, halide solid electrolytes are expected to redefine the performance of next-generation all-solid-state batteries and significantly contribute to the widespread adoption of electric vehicles and the realization of a sustainable energy society.

Source: https://pmc.ncbi.nlm.nih.gov/articles/PMC13423496/

#11 Dual-Interface Engineering Boosts High-Voltage All-Solid-State Lithium Batteries with NCM811 Cathode and Composite Polymer Electrolyte

Published August 04, 2026 ACS Publications USA



OVERVIEW

This research proposes a synergistic dual-interface engineering strategy for high-voltage all-solid-state lithium batteries, combining surface-modified cathodes with an optimized composite polymer electrolyte. A uniform Li_3PO_4 coating on NCM811 cathodes, applied via atomic layer deposition, effectively suppresses high-voltage phase transitions and mitigates electrolyte oxidation. The in-situ polymerized PEGDME-based composite polymer electrolyte, incorporating 7.5 wt% LLZTO, achieves an ionic conductivity of 3.47×10^{-4} S cm^{-1} and a Li^+ transference number of 0.665 at 60 °C. The integrated battery delivers 152.0 mAh g^{-1} at 0.5C and retains 77.88% capacity after 170 cycles, enhancing compatibility between high-voltage cathodes and polymer electrolytes.

IN DEPTH

Key Findings

An innovative dual-interface engineering strategy has been developed to dramatically enhance the performance and stability of high-voltage all-solid-state lithium batteries. This synergistic approach, which combines surface-modified cathodes with an optimized composite polymer electrolyte, has successfully improved the interfacial compatibility between high-voltage cathodes and solid electrolytes, leading to increased battery energy density and cycle life. This represents a significant breakthrough towards the practical implementation of all-solid-state batteries.

Technical and Research Details

- **Dual-Interface Engineering Strategy:** The core of this research lies in simultaneously optimizing two crucial interfaces within the battery system: the cathode/electrolyte interface and the electrolyte/anode interface. This strategy aims to overcome the limitations of individual materials and maximize the performance of the entire system.
- **Cathode Modification (Li3PO4 Coating):** A uniform thin film of Li3PO4 (lithium phosphate) was coated onto the surface of the NCM811 high-voltage cathode material using atomic layer deposition (ALD) technology. This Li3PO4 layer effectively:
    - **Suppresses High-Voltage Phase Transitions:** Prevents NCM811 cathode from exhibiting structural instability under high voltage conditions, thereby inhibiting material degradation.
    - **Mitigates Electrolyte Oxidation:** Suppresses undesirable electrolyte decomposition reactions at the cathode surface, enhancing interface stability.
- **Development of Composite Polymer Electrolyte (CPE):** An in-situ polymerized PEGDME (polyethylene glycol dimethyl ether)-based composite polymer electrolyte was fabricated, incorporating 7.5 wt% of the garnet-type solid electrolyte LLZTO (lithium lanthanum zirconia oxide) filler. This CPE exhibited the following properties:
    - **High Ionic Conductivity:** Achieved an excellent ionic conductivity of 3.47 × 10–4 S cm–1 at 60 °C.
    - **High Li+ Transference Number:** Demonstrated a high lithium ion transference number of 0.665, indicating efficient transport of lithium ions.

- **Battery Performance:** All-solid-state batteries applying this dual-interface engineering strategy delivered a high discharge capacity of 152.0 mAh g–1 at a 0.5C rate and maintained 77.88% of their capacity after 170 cycles. This represents a significant improvement compared to conventional polymer electrolyte-based batteries using high-voltage cathodes.

Background and Industry Context

All-solid-state lithium batteries hold immense potential as next-generation energy storage technology for improving the safety and energy density of electric vehicles (EVs) and portable electronic devices. However, interfacial instability (side reactions, poor contact) between high-voltage cathodes and solid electrolytes has been a major barrier to their practical implementation. Specifically, cathode material degradation and electrolyte oxidation under high voltage conditions adversely affect battery lifespan and performance. This research's dual-interface engineering offers a comprehensive and effective solution to these challenges, which is crucial for accelerating the commercialization of all-solid-state batteries.

Future Outlook

The dual-interface engineering strategy developed in this study provides a promising pathway for enhancing the performance of high-voltage all-solid-state lithium batteries. Future efforts will focus on further optimizing this technology, exploring its applicability to different electrode materials and electrolyte systems, and developing cost-effective manufacturing processes. Particularly, validation of long-term cycling stability and performance evaluation under more extreme conditions are essential for practical implementation. This achievement is expected to accelerate the realization of next-generation batteries that combine high energy density and safety, contributing to a sustainable society. Researchers, engineers, and investors will closely monitor further advancements of this groundbreaking approach.

Source: https://pubs.acs.org/aaemcq/article/doi/10.1021/acsaem.6c01474/5242061/In-Situ-Polymerized-Composite-Polymer-Electrolyte?searchresult=1

#12 High-Entropy Sulfides Overcome Key Challenges for All-Solid-State Batteries: Addressing Air/Moisture Sensitivity and Interfacial Instability

Published August 04, 2026 Nano Letters (ACS Publications) USA

OVERVIEW

A review in Nano Letters systematically analyzes the role of High-Entropy Sulfides (HESs) in electrochemical energy storage, particularly for solid-state electrolytes. HESs hold significant potential by integrating the high ionic conductivity of sulfide materials with the structural tunability of high-entropy design. The review highlights breakthroughs in ionic conductivity, cycle life, and rate capability, noting how HES strategies aim to overcome practical limitations such as air/moisture sensitivity and interface instability inherent in traditional sulfide solid-state electrolytes.

IN DEPTH

Key Findings

A recent review article published in Nano Letters systematically elucidates the innovative potential of High-Entropy Sulfides (HESs) in electrochemical energy storage, especially in the realm of solid electrolytes for all-solid-state batteries. HESs integrate the intrinsic high ionic conductivity of sulfide materials with the extensive structural tunability offered by high-entropy design. This fusion provides a promising avenue to overcome critical challenges associated with conventional sulfide solid electrolytes, such as their susceptibility to air/moisture sensitivity and interfacial instability.

Technical and Research Details

- **Concept of High-Entropy Sulfides (HESs):** HESs apply the concept of high-entropy alloys—where four or more cationic elements occupy crystal lattice sites in near-equimolar ratios—to sulfide materials. This multi-component mixing increases the configurational disorder (entropy) within the crystal structure, leading to unique physicochemical properties such, as lattice distortion, a cocktail effect, and sluggish diffusion kinetics.
- **Advantages of HESs as All-Solid-State Electrolytes:**
  - **High Ionic Conductivity:** While traditional sulfide-based solid electrolytes are known for excellent lithium ion conductivity (e.g., Li_6PS_5Cl at several mS/cm), HESs hold the potential to further optimize ion transport pathways.
  - **Enhanced Stability:** The high-entropy effect can improve crystal structural stability, potentially reducing sensitivity to atmospheric moisture and oxygen. This has been a major practical barrier for sulfide electrolytes.
  - **Improved Interfacial Compatibility:** By tuning the composition and structure of HESs, it may be possible to suppress parasitic side reactions at the interface with electrode materials, thereby reducing interfacial resistance.
- **Key Breakthroughs and Challenges:** The review highlights breakthroughs achieved by HESs in ionic conductivity, cycle life, and rate capability. Concurrently, it points out challenges such as optimizing high-entropy design, complex synthesis processes, and detailed evaluation of long-term stability.

Background and Industry Context

All-solid-state batteries are anticipated as the ultimate battery technology to enhance the range, safety, and charging speed of electric vehicles (EVs). Sulfide-based solid electrolytes are considered closest to practical application due to their high ionic conductivity, but their sensitivity to air/moisture and interfacial instability with electrodes have been major hurdles. Research into HESs seeks to resolve these challenges through a novel materials science approach, making it highly significant for accelerating the commercialization of all-solid-state batteries. This review systematically synthesizes advancements in this cutting-edge field, offering new perspectives for researchers and engineers.

Future Outlook

This review on high-entropy sulfides opens new frontiers in the development of high-performance solid electrolytes for all-solid-state batteries. Future research will likely explore the HES compositional space to discover optimal materials that balance ionic conductivity and stability. Furthermore, simplifying synthesis processes and establishing scalable manufacturing techniques will be critical for practical implementation. If HESs can overcome the limitations of conventional sulfide solid electrolytes and enable high-energy-density, high-safety, and long-life all-solid-state batteries, they are expected to bring innovation across various sectors, including the EV industry, and significantly contribute to the realization of a sustainable energy society.

Source: https://pubs.acs.org/nalefd/article/doi/10.1021/acs.nanolett.6c02489/5242060/High-Entropy-Sulfides-in-Electrochemical-Energy

#13 Carboxymethyl Cellulose-Based Solid Polymer Electrolytes Achieve 10^5-Fold Ionic Conductivity Boost with Functional Additives

Published August 05, 2026 MDPI Switzerland

OVERVIEW

This systematic review evaluates recent advances in carboxymethyl cellulose (CMC)-based solid polymer electrolytes (SPEs) for sustainable battery applications. It focuses on how lithium salts and functional additives like plasticizers, ionic liquids, and nanofillers enhance physicochemical and electrochemical properties. Findings indicate that ionic conductivity can be significantly improved from ~10^{-7} to 10^{-2} S cm^{-1} through synergistic modifications that reduce crystallinity and promote segmental mobility. Electrochemical stability is enhanced up to ~3.85 V with ionic liquid incorporation, while mechanical properties show a trade-off between flexibility and tensile strength.

IN DEPTH

Key Findings

A systematic review published in MDPI assesses the latest groundbreaking advancements in carboxymethyl cellulose (CMC)-based solid polymer electrolytes (SPEs) for sustainable battery applications. Through an optimized combination of lithium salts and functional additives, CMC-based SPEs have achieved an astonishing 100,000-fold improvement in ionic conductivity, escalating from ~10^{-7} S cm^{-1} to ~10^{-2} S cm^{-1} within just a few years. This clearly demonstrates CMC's potential as a low-environmental-impact, next-generation battery material while simultaneously boosting battery performance and safety.

Technical and Research Details

- **Intrinsic Properties of CMC-Based SPEs:** Carboxymethyl cellulose (CMC), derived from biomass, is recognized as a sustainable solid electrolyte material due to its eco-friendliness, low cost, and good mechanical strength. However, early challenges included low ionic conductivity owing to its high crystallinity and limited segmental motion of polymer chains.

- **Performance Enhancement through Functional Additives:** The review meticulously analyzes strategies for integrating lithium salts and various functional additives to improve the physicochemical and electrochemical properties of CMC-based SPEs:
  - **Lithium Salt Optimization:** Optimizing the concentration and type of lithium salts (e.g., $LiClO_4$, LiTFSI) increases the supply of charge carriers, thereby boosting ionic conductivity.
  - **Plasticizer Incorporation:** Adding plasticizers like polyethylene glycol (PEG) reduces CMC crystallinity, promotes segmental motion of polymer chains, and facilitates ion transport.
  - **Ionic Liquid (ILs) Integration:** Ionic liquids are non-volatile and possess high ionic conductivity, simultaneously improving both the ionic conductivity and electrochemical stability of SPEs. Integration of ILs has shown electrochemical stability enhancement up to 3.85 V.
  - **Nanofiller Hybridization:** Incorporating inorganic nanofillers such as SiO_2, Al_2O_3, and TiO_2 modifies the morphology of the polymer matrix, increasing ion transport pathways and enhancing mechanical strength.
- **Dramatic Improvement in Ionic Conductivity:** Through these synergistic modifications, the room-temperature ionic conductivity of CMC-based SPEs has remarkably improved from initial values of $\sim 10^{-7}$ S cm^{-1} to high values of $\sim 10^{-2}$ S cm^{-1} reported in recent research. This approaches levels suitable for practical battery applications.
- **Mechanical Property Trade-offs:** A trade-off is observed between flexibility and tensile strength among mechanical properties, where improving one often sacrifices the other. For practical application, optimizing this balance according to specific use cases is necessary.

Background and Industry Context

With increasing demand for sustainable energy storage solutions, the development of eco-friendly, safe, and high-performance battery materials is urgent. CMC-based solid polymer electrolytes offer a promising alternative to conventional liquid electrolytes, addressing issues of safety (leakage, fire) and environmental impact. This review highlights research efforts to leverage CMC's natural advantages while pushing its electrochemical performance to its limits through advanced materials engineering techniques. This represents a significant contribution toward realizing next-generation batteries that balance cost-efficiency and environmental performance.Future Outlook

This review on CMC-based SPEs outlines future directions for R&D in sustainable solid electrolyte materials. Key challenges will include further increasing ionic conductivity, ensuring long-term interfacial stability with high-voltage cathodes and lithium metal anodes, and developing cost-effective, large-scale manufacturing processes. If CMC-based SPEs can fully realize their potential and be commercialized as high-performance, low-environmental-impact all-solid-state batteries, they are expected to accelerate the widespread adoption of sustainable energy storage solutions in various fields, including electric vehicles, wearable devices, and stationary energy storage systems. Researchers, engineers, and investors are closely watching further developments in this green battery technology.

Source: https://www.mdpi.com/2073-4360/18/15/1925

#14 Greater Bay Technology Ships All-Solid-State A-Sample Battery Cells from Mass Production Line, Targeting 2026 GWh-Scale Manufacturing

Published August 03, 2026 Intelligent Living USA

OVERVIEW

Greater Bay Technology announced the shipment of its first all-solid-state A-sample battery cells from a mass-production-designed line. The company aims for gigawatt-hour (GWh) scale manufacturing by 2026, propelling all-solid-state EVs into full market validation. These cells report a nominal energy density of 260–500 Wh/kg and charging capabilities of 2C–3C, marking a significant step toward practical, high-performance next-generation battery technology.

IN DEPTH

Key Findings

Greater Bay Technology has announced the successful shipment of its all-solid-state A-sample battery cells from a production line designed for mass manufacturing. This achievement represents a critical milestone in the transition of all-solid-state batteries from research and development to large-scale production and eventual commercial market introduction. The company aims to establish gigawatt-hour (GWh) scale manufacturing capacity by 2026, which would enable all-solid-state electric vehicles (EVs) to enter a comprehensive real-world market validation phase.

Technical Details

The A-sample battery cells boast a nominal energy density ranging from 260 to 500 Wh/kg, a performance level comparable to or exceeding that of many high-performance conventional lithium-ion batteries. Furthermore, the cells demonstrate impressive charging capabilities of 2C to 3C, indicating that they can be charged rapidly. This fast-charging characteristic is a crucial factor for enhancing user convenience and addressing one of the primary challenges faced by current EV owners. The successful production of A-samples from a mass production line signifies the maturity of the design and the reproducibility of the manufacturing process, laying a solid technical foundation for future large-scale output.

Background & Context

All-solid-state batteries are widely regarded as the next-generation battery technology, promising to mitigate the risks of leakage and fire associated with liquid electrolytes, while delivering higher energy density and longer lifespans. Automakers and battery developers worldwide are intensely competing to commercialize this technology. Greater Bay Technology's announcement highlights China's strong position at the forefront of all-solid-state battery development, with a clear focus on future market deployment. This technological advancement is expected to further accelerate the expansion of the EV market and promote the adoption of safer and higher-performing vehicles.

Strategic Significance & Outlook

If Greater Bay Technology achieves GWh-scale manufacturing by 2026, it could become one of the first companies to supply all-solid-state batteries to the EV market at scale. This development is anticipated to lead to a significant increase in EV driving range and a reduction in the burden on charging infrastructure, thereby contributing substantially to the broader adoption of electric vehicles. Beyond the automotive industry, the success of this technology could also have a profound impact on sectors such as drones and other forms of electric mobility.

Source: https://www.intelligentliving.co/us-solid-state-batteries-2026-greater-bay/

Collected: August 07, 2026 | Automated Research System (Gemini API)

#15 Toyota Targets 1,200km Range, 10-Minute Fast Charging All-Solid-State EVs by 2028, Aiming for 9GWh Production in 2026

Published August 05, 2026   Top Speed   Japan

OVERVIEW

Toyota is accelerating its plan to launch all-solid-state battery (ASSB) electric vehicles (EVs) by 2028, targeting a remarkable 745-mile (approx. 1,200km) range and 10-80% charge in just 10 minutes. Supported by Japan's Ministry of Economy, Trade and Industry, Toyota aims for an annual production capacity of 9 gigawatt-hours (GWh) by 2026. The company also emphasizes high durability and plans for a second-generation ASSB with a 1,500km range.

IN DEPTH

Key Findings

Toyota Motor Corporation is rapidly advancing its development of all-solid-state battery (ASSB) electric vehicles (EVs), with a clear goal of bringing them to market by 2028. These next-generation EVs are projected to offer an impressive driving range of up to 745 miles (approximately 1,200 km) on a single charge and revolutionary fast-charging capabilities, allowing for a 10% to 80% charge in just 10 minutes. Crucially, the batteries are also designed for high stability and durability, maintaining performance over repeated charge-discharge cycles.

Technical Details

Toyota's ASSBs aim to achieve significant improvements in safety and energy density by replacing traditional liquid electrolytes with solid-state materials. The ambitious targets of a 1,200 km range and a 10-minute fast charge for 80% capacity directly address two of the biggest barriers to EV adoption: range anxiety and charging time. These advancements promise to dramatically enhance the convenience and practicality of EVs for consumers. Furthermore, Toyota has set an even more ambitious target for its second-generation ASSBs, aiming for a driving range of 1,500 km, indicating a continuous commitment to pushing battery technology boundaries. The company's plan to achieve an annual production capacity of 9 gigawatt-hours (GWh) by 2026, with support from Japan's Ministry of Economy, Trade and Industry (METI), signifies a concrete roadmap for large-scale commercial production, moving beyond purely research-level efforts.

Background & Context

As global automakers intensify their focus on ASSB development, Toyota has consistently been a leader in this research field for many years. The support from METI underscores the strategic importance that the entire Japanese automotive industry places on this technology. ASSBs are expected to not only dramatically improve EV performance but also to significantly reduce the risk of battery fires, thereby bolstering consumer confidence. This technology will contribute to the performance enhancement of electrified vehicles across the board, including hybrid models.

Strategic Significance & Outlook

If Toyota successfully introduces ASSB EVs to the market by 2028, it will profoundly alter the competitive landscape of the global EV market. The realization of ultra-long range and ultra-fast charging will make EVs an increasingly attractive option for consumers who have been hesitant to switch from gasoline-powered vehicles, potentially accelerating the expansion of the EV market even further. Additionally, improved battery stability and durability are expected to have a positive impact on maintaining EV residual values in the used car market, a critical factor for wider adoption.

Source: https://www.topspeed.com/toyotas-future-745-mile-solid-state-battery/

#16 BYD to Begin All-Solid-State Battery Test Production in 2027, Files Six Patents for Interfacial Stabilization via Dual-Electrolyte Cathode

Published August 06, 2026 Car News China China

OVERVIEW

BYD plans to initiate small-scale test production of all-solid-state batteries in 2027, aiming for over 1,000km EV range through vehicle road tests. The company has filed six new solid-state battery patents, specifically focusing on interfacial stability between solid electrolytes and electrodes, featuring a 'dual-electrolyte cathode' combining halide and sulfide materials. BYD's Chief Scientist highlights solid-solid interface stability as a primary commercialization barrier, and these patents represent a comprehensive approach spanning material chemistry, manufacturing, and quality control.

IN DEPTH

Key Findings

BYD has announced plans to commence small-scale test production of all-solid-state batteries (ASSBs) in 2027, including road tests in camouflaged vehicles. This initiative aims to significantly extend the range of electric vehicles (EVs) beyond 1,000 km. Concurrently, to address the critical challenge of interfacial stability between solid electrolytes and electrodes—a major hurdle for ASSB commercialization—BYD has filed six new patents, notably featuring a 'dual-electrolyte cathode' design that combines halide and sulfide materials.

Technical Details

The patents filed by BYD (e.g., a series of patents including CN202510126712.6) describe a dual-electrolyte cathode approach that integrates halide and sulfide materials with the cathode active material. This design aims to enhance lithium ion transmission efficiency while maintaining interfacial stability during repeated charge-discharge cycles. By combining fast but potentially unstable conductors with slower, more stable conductors, the dual-electrolyte system seeks to enable smooth and efficient energy transfer. As pointed out by BYD Group's Chief Scientist, the instability of solid-solid interfaces has been a major cause of performance degradation and safety concerns, acting as a significant barrier to commercialization. These patents propose comprehensive solutions addressing this challenge across material chemistry, manufacturing processes, and quality control. Specific designs are incorporated to suppress the growth of lithium metal dendrites, ensuring reliable long-term operation.

Background & Context

All-solid-state batteries are globally recognized as the next-generation EV battery technology, primarily due to their lower risk of fire and potential for higher energy density compared to conventional lithium-ion batteries with liquid electrolytes. However, high interfacial resistance and mechanical property mismatches between solid electrolytes and electrodes have posed significant obstacles to mass production. Leveraging its unique vertically integrated production system and R&D capabilities, BYD is focusing on overcoming these complex technical barriers. The numerous patent applications underscore the company's deep technical expertise and strong commercialization intent in this field.

Strategic Significance & Outlook

BYD's plan to initiate small-scale test production and road tests of solid-state batteries in 2027 holds the potential to bring groundbreaking performance enhancements to its EV lineup. A driving range exceeding 1,000 km would significantly alleviate consumer anxiety about EVs, thereby promoting further expansion of the EV market. If the dual-electrolyte cathode technology proves successful, it could also improve the cost-effectiveness and manufacturing scalability of ASSBs, potentially redefining technical standards across the entire EV industry.

Source: https://carnewschina.com/2026/08/06/byd-files-six-solid-state-battery-patents-eyes-2027-production-with-dual-electrolyte-cathode-cells/

Collected: August 07, 2026 | Automated Research System (Gemini API)

#17 China Completes First Sulphide All-Solid-State Battery Road Test, Accelerating 30 GWh-Class Projects in Inner Mongolia

Published Published August 06, 2026 Shanghai Metals Market China

OVERVIEW

China has achieved a significant milestone in next-generation battery technology with Zhongke Yuanben completing the nation's first road test of a sulphide all-solid-state battery-powered vehicle. This technical validation is rapidly accompanied by industrial expansion, including Guoci Materials constructing sulphide electrolyte production and Tuoyi Guneng launching a massive 30 GWh project in Inner Mongolia, alongside substantial capital influx into the sector. Such integrated developments, including international partnerships like Factorial and SK On, signal a rapid global movement towards ASSB commercialization leveraging existing production capabilities.

IN DEPTH

Background

All-solid-state batteries (ASSBs) are widely regarded as a pivotal next-generation technology, promising superior safety, enhanced energy density, and extended lifespan compared to conventional lithium-ion batteries that rely on liquid electrolytes. Their potential in the electric vehicle (EV) sector is particularly transformative, prompting China to aggressively pursue ASSB research, development, and industrialization as a national strategic imperative. Sulfide-based electrolytes, a leading material candidate due to their high ionic conductivity, have historically faced challenges related to air stability and interface compatibility. The recent successful road test, however, marks a significant breakthrough in addressing these complexities, underscoring China's accelerated trajectory towards global leadership in ASSB innovation.

Key Findings

China's Zhongke Yuanben (中科院本) has achieved a major milestone by successfully completing the nation's first road test of a vehicle powered exclusively by a sulfide-based all-solid-state battery (ASSB). This groundbreaking accomplishment conclusively demonstrates the practical viability of ASSB technology in real-world driving environments, marking the completion of a critical validation phase essential for commercialization. The rigorous road test validated the robust performance and inherent safety attributes of sulfide ASSBs under diverse public road conditions.

Technical Details

Concurrent with the successful road test, the Chinese ASSB industry is experiencing multifaceted advancements across its value chain. Guoci Materials (国瓷材料) is actively establishing a mass production line for sulfide electrolytes, a critical component for ASSBs, thereby bolstering the foundational material supply infrastructure. Further amplifying capacity, Tuoyi Guneng (拓遠谷能) has unveiled plans for a substantial 30 Gigawatt-hour (GWh) all-solid-state battery project in Inner Mongolia, representing a significant investment of 6 billion RMB (approximately 1.2 billion USD). This initiative aims to address anticipated large-scale demand for EV batteries. On the financial front, WELION New Energy (衛藍新能源) has completed a pre-IPO funding round, securing a valuation of 20 billion RMB (approximately 4 billion USD), underscoring robust investor confidence in the sector. Internationally, Factorial Energy has forged a strategic partnership with South Korea's SK On, with plans to repurpose existing lithium-ion battery production lines to accelerate solid-state battery industrialization, potentially yielding significant reductions in manufacturing costs and development timelines.

Strategic Significance & Outlook

Zhongke Yuanben's successful road test critically enhances the commercial viability and public trust in ASSB technology. The concurrent establishment of mass production capabilities by Guoci Materials and Tuoyi Guneng's substantial project announcement will rapidly integrate the supply chain, from raw materials to finished products, thereby fostering a robust and self-sustaining ASSB ecosystem within China. The significant capital infusion into WELION New Energy is expected to catalyze further technological innovation and market penetration. Furthermore, the Factorial-SK On partnership offers a compelling model for rapid industrialization by leveraging existing manufacturing infrastructure, potentially reshaping global battery production strategies. Collectively, these advancements strongly suggest that ASSBs are on the cusp of substantial integration into the electric vehicle market within the foreseeable future.

Source: https://news.metal.com/en/newscontent/104046556-chinas-first-sulphide-all-solid-state-real-vehicle-road-test-completed-30-gwh-class-projects-intensively-implemented-smm

#18 All-Solid-State Batteries Poised to Surpass Li-Ion with 400-500Wh/kg Energy Density and 1,200km+ EV Range, 1,500-Cycle Durability

Published August 03, 2026　Intelligent Living　International

OVERVIEW

All-solid-state batteries (ASSBs) aim for a commercial energy density of 400–500 Wh/kg, with laboratory results exceeding 600 Wh/kg, significantly outperforming current lithium-ion batteries (250–300 Wh/kg). This leap could extend EV ranges to over 1,000–1,200 km, doubling current capabilities. Furthermore, ASSBs demonstrate superior durability, retaining 90–95% capacity after 1,000–1,500 cycles, compared to 500–1,000 cycles for lithium-ion, promising a revolution in the EV market.

IN DEPTH

Key Findings

All-solid-state batteries (ASSBs) are projected to demonstrate significant advantages over current lithium-ion batteries in both energy density and durability. Specifically, they aim for a commercial energy density of 400–500 Wh/kg, with laboratory prototypes exceeding 600 Wh/kg. This dramatically surpasses the approximately 250–300 Wh/kg typically achieved by contemporary lithium-ion cells. This substantial increase in energy density has the potential to extend electric vehicle (EV) driving ranges to over 1,000–1,200 km, representing a dramatic leap forward.

Technical Details

In terms of energy density, ASSBs achieve higher gravimetric (Wh/kg) and volumetric (Wh/L) efficiencies by replacing liquid electrolytes with solid counterparts, which allows for denser packing of active materials within the cell and contributes to overall lighter and more compact battery packs. An EV range exceeding 1,000–1,200 km would effectively eliminate 'range anxiety,' a major barrier to EV adoption, by offering performance comparable to or even superior to gasoline-powered vehicles for long-distance travel.

ASSBs also exhibit superior durability. While conventional lithium-ion batteries typically begin to show performance degradation after 500–1,000 cycles, ASSBs are reported to maintain 90–95% of their capacity after 1,000–1,500 cycles. This enhanced longevity is attributed to the solid electrolyte's ability to suppress lithium dendrite growth and minimize undesirable side reactions at the electrode-electrolyte interface. Extended lifespan is crucial for reducing the frequency of battery replacements and lowering the total cost of ownership (TCO) for EVs.

Background & Context

As the electric vehicle market expands, improving battery performance remains the paramount challenge for the entire industry. ASSBs, often referred to as the 'holy grail' of battery technology, are capable of meeting high standards across safety, energy density, charging speed, and durability. Consequently, automakers and battery suppliers worldwide are making massive investments in their development. Current lithium-ion batteries face limitations in safety (thermal runaway risk), energy density, and charging speed, for which ASSBs are anticipated to provide a fundamental solution.

Strategic Significance & Outlook

The successful mass production and commercialization of ASSBs at the targeted performance levels will undoubtedly revolutionize the EV market. The dramatic increase in driving range and superior durability will significantly enhance the appeal of EVs, accelerating consumer transition away from internal combustion engine vehicles. Furthermore, the inherent safety of ASSBs will enable broader applications in aerospace, robotics, and stationary energy storage, holding the potential to redefine the future of energy storage across multiple critical sectors.

Source: https://www.intelligentliving.co/solid-state-battery-vs-lithium-ion/

Collected: August 07, 2026 | Automated Research System (Gemini API)

#19 GAC Group to Equip Aion EVs with 400Wh/kg+ All-Solid-State Batteries by H2 2026, CATL & Toyota Also Show Progress

Published July 30, 2026 Intelligent Living International

OVERVIEW

GAC Group reconfirmed plans to integrate all-solid-state batteries with over 400 Wh/kg cell energy density into its Aion brand production vehicles by the second half of 2026, accelerating its entry into the next-generation EV market. Concurrently, CATL continues testing its condensed batteries in aircraft and premium EVs, pursuing higher performance. Toyota has also begun raw material input at its Japanese all-solid-state pilot line, aiming for integration into small-scale vehicles by 2027, with major manufacturers updating roadmaps and achieving concrete results in ASSB development and commercialization.

IN DEPTH

Key Findings

Several leading automotive and battery manufacturers have updated their all-solid-state battery (ASSB) roadmaps and announced significant progress since July 2026. A notable highlight is GAC Group's reaffirmation to integrate ASSBs with a cell energy density exceeding 400 Wh/kg into its Aion brand production vehicles by the second half of 2026. This marks a crucial indication that ASSBs are transitioning from limited testing phases to deployment in mass-produced vehicles.

Technical Details

The integration of ASSBs with an energy density exceeding 400 Wh/kg by GAC Group is set to dramatically enhance the range and performance of electric vehicles. This level of energy density surpasses that of current high-performance lithium-ion batteries (typically 250–300 Wh/kg), potentially transforming the EV user experience. Meanwhile, CATL, the world's largest battery manufacturer, continues testing its condensed batteries in aviation and premium EV sectors, targeting applications that demand exceptionally high energy density and safety. Toyota is also steadily advancing its development, having initiated raw material input at its Japanese all-solid-state pilot line and aiming to integrate these next-generation batteries into small-scale vehicles by 2027. These developments showcase diverse strategies and paces adopted by companies in their pursuit of ASSB commercialization.

Background & Context

All-solid-state batteries are garnering immense anticipation from the automotive, aviation, and electronics industries as a technology capable of overcoming the safety issues (thermal runaway risk) and energy density limitations inherent in conventional lithium-ion batteries that use liquid electrolytes. The updated roadmaps and tangible progress announced by these companies strongly suggest that ASSBs, once considered a distant future technology, are now on the verge of practical implementation. GAC's explicit commitment to integrate these batteries into production vehicles by a specific timeline is particularly significant, as it is expected to intensify market competition.

Strategic Significance & Outlook

GAC Group's deployment of ASSBs in its Aion brand vehicles has the potential to accelerate the widespread adoption of all-solid-state batteries in the EV market. CATL's continued testing in the aviation and premium EV sectors will pave the way for new high-performance battery applications and bolster technological credibility. Toyota's plans will serve as a crucial indicator of Japan's technological role in the global market. These advancements by major players collectively indicate that ASSB technology is poised to profoundly transform our lives and mobility in the near future.

Source: https://www.ebak-battery.com/lithium-battery-industry-watch-july-2026-solid-state-progress-lithium-price-stabilization-and-eu-compliance-tightening/

Collected: August 07, 2026 | Automated Research System (Gemini API)

#20 All-Solid-State Batteries Drive Aerospace Innovation: Enhancing Safety, Capacity, and Lightweighting with AI-Enabled BMS

Published August 06, 2026 MarketsandMarkets International

OVERVIEW

Aerospace manufacturers are accelerating investments in all-solid-state batteries (ASSBs) due to their promise of enhanced safety, faster charging, higher energy capacity, and reduced thermal runaway risk. ASSB technology is expected to deliver significantly higher energy density, improved safety, extended lifespan, and overall aircraft weight reduction compared to current batteries. These advancements, combined with AI-enabled battery management systems, advanced thermal management, lightweight composites, and predictive maintenance, are transforming the aerospace industry and enhancing the feasibility of electric aircraft.

IN DEPTH

Key Findings

The aerospace industry is significantly increasing its investment in all-solid-state batteries (ASSBs), recognizing their potential to fundamentally improve safety, energy capacity, charging speed, and mitigate thermal runaway risks. This technology is positioned as a core component for dramatically enhancing aircraft performance and operational safety.

Technical Details

ASSBs achieve superior safety by eliminating the flammable liquid electrolytes found in traditional lithium-ion batteries. This enhanced safety is paramount for aircraft applications, directly impacting the protection of passengers and cargo. Furthermore, ASSBs enable higher energy density, which translates to extended flight ranges for aircraft and the capability to carry increased payloads. They also contribute to overall weight reduction, as the battery system itself becomes lighter, leading to improved fuel efficiency (or power efficiency for electric aircraft) of the entire aircraft. The extended lifespan of ASSBs also contributes to reduced maintenance costs over time.

These battery technology innovations are not evolving in isolation; their effectiveness is maximized when integrated with other advanced technologies. Specifically, AI-enabled Battery Management Systems (BMS) offer real-time, optimal control of battery states, boosting both performance and safety. Advanced thermal management systems ensure stable battery operation under the demanding conditions of aerospace environments, while lightweight composite materials contribute to overall airframe weight reduction. Moreover, predictive maintenance technologies allow for early detection of battery anomalies and enable proactive, planned maintenance, thereby enhancing operational reliability.

Background & Context

The aerospace industry faces dual challenges of reducing environmental impact and improving operational efficiency, with electrification being a primary solution. However, aircraft batteries demand extremely high levels of safety, reliability, and energy density. Conventional battery technologies have struggled to meet these stringent requirements, but the advent of ASSBs has made the realization of next-generation air mobility, such as electric aircraft and eVTOLs (electric Vertical Take-Off and Landing aircraft), increasingly feasible. Governments and private enterprises worldwide are investing heavily in research and development in this sector.

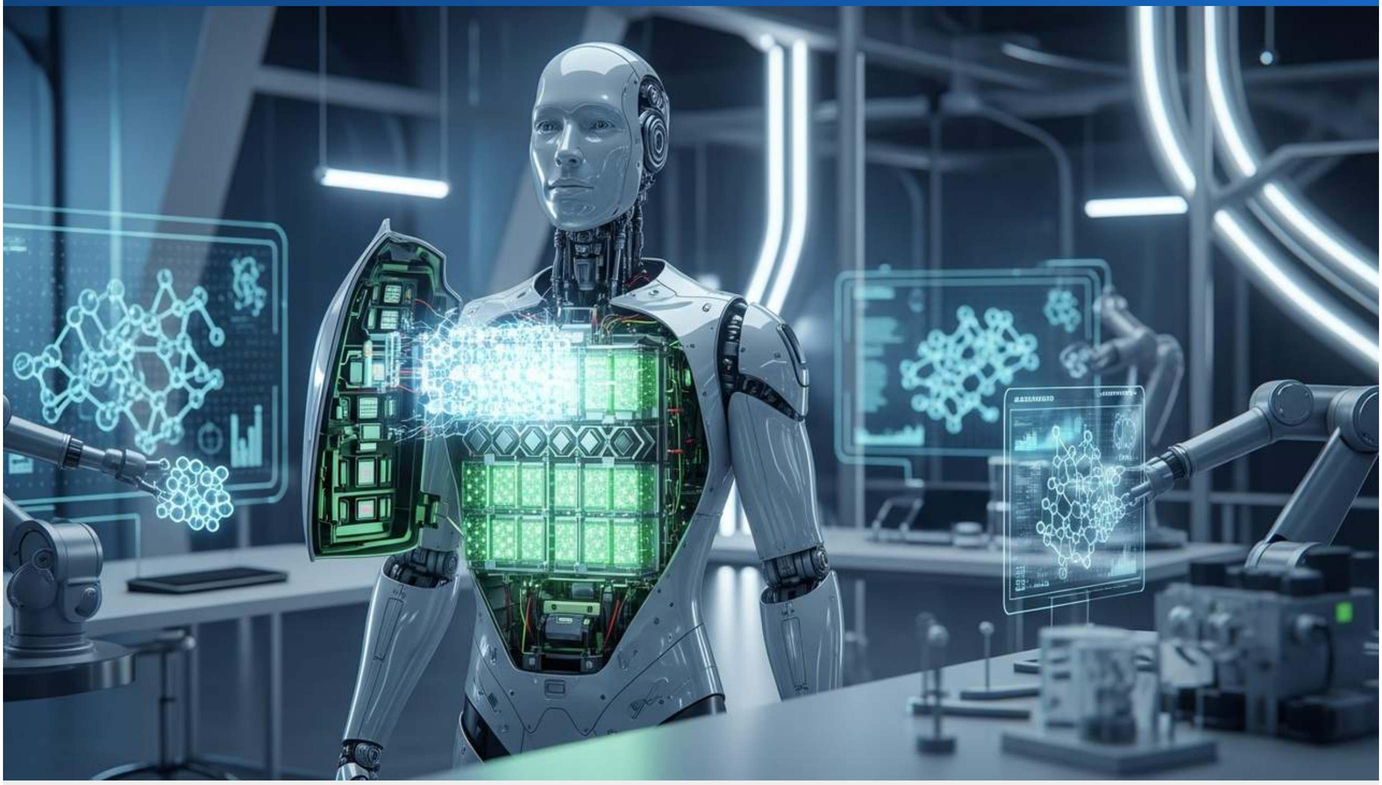
Strategic Significance & Outlook

The evolution of ASSBs and related technologies is poised to bring about a radical transformation in the aerospace industry. The widespread adoption of electric aircraft will contribute to significant reductions in greenhouse gas emissions and enable the creation of quieter, more efficient air transport systems. In the future, eVTOLs and smaller electric aircraft are expected to play a major role in urban air mobility and regional air services, with ASSBs serving as their pivotal power source. This technological innovation will profoundly impact aircraft design, operations, and entire business models, serving as a key to unlocking a new era of aviation.

Source: https://www.marketsandmarkets.com/blog/AD/future-of-aircraft-battery-technology-innovation

#21 All-Solid-State Batteries Boost Capacity, Safety for Humanoid Robotics; Interfacial Dendrite Suppression Key

Published August 06, 2026 PMC International



OVERVIEW

All-solid-state batteries (ASSBs) are poised to significantly enhance capacity and safety for next-generation applications like humanoid robotics by replacing polymer separators and organic liquid electrolytes with solid electrolytes. This technology maximizes active material utilization while reducing battery weight and volume. However, dendrite growth suppression remains a key challenge, with ongoing research focused on innovative interfacial designs and reducing the reliance on high external pressures, which are currently common but impractical solutions.

IN DEPTH

Key Findings

For next-generation applications, including humanoid robotics, all-solid-state batteries (ASSBs) offer the potential to overcome limitations of traditional battery technologies by significantly improving both capacity and safety. This is achieved by replacing conventional polymer separators and organic liquid electrolytes with solid-state electrolytes, thereby maximizing active material within the cell and consequently reducing the overall battery weight and volume.

Technical Details

One of the primary advantages of ASSBs is their ability to physically suppress the growth of dendrites, which are tree-like metallic structures. Dendrite growth is a major cause of internal short circuits and safety hazards in lithium-ion batteries, posing a severe problem, especially for high-energy-density batteries employing lithium metal anodes. Currently, common solutions to suppress dendrite growth include optimizing the interface design between the anode and the solid electrolyte or applying high external pressure to the battery cell. However, these approaches face practical challenges related to manufacturing costs, design complexity, and long-term reliability. Consequently, intensive research and development are underway to discover more innovative interfacial stabilization techniques and new solid electrolyte materials that can effectively suppress dendrite growth while relaxing the stringent requirements like high-pressure application.

Background & Context

Humanoid robots demand extended operating times, high power output, and safe operation, making high-performance batteries indispensable. Conventional liquid electrolyte lithium-ion batteries have imposed limitations on robot design and operation due to their inherent limits in energy density and safety. ASSBs, with their reduced risk of fire, higher energy density, and extended lifespan, possess the potential to dramatically enhance robot autonomy, mobility, and safety. This technology will be key to accelerating the adoption of robots in diverse application areas, including manufacturing, healthcare, and services.

Strategic Significance & Outlook

Establishing practical solutions for dendrite growth suppression is critical for the commercialization of ASSBs for humanoid robots. If optimized interface designs and advancements in material science lead to ASSBs that perform stably without requiring high external pressure, robot batteries will become smaller, lighter, and even safer, enabling them to perform more complex and prolonged tasks. This progress is expected to have broad implications not only for humanoid robots but also for other mobile applications such as drones, wearable devices, and medical equipment, ushering in a new era of advanced mobile power solutions.

Source: https://pmc.ncbi.nlm.nih.gov/articles/PMC13418515/

Collected: August 07, 2026 | Automated Research System (Gemini API)