

SolidStateBattery

Weekly Intelligence Report

2026-08-02 | 37 articles | 10 countries
troy-technical.jp

This Week's Keyword

Solid-State Battery Race

US/EU accelerate amidst Asian lead

37

articles

Total Articles Analyzed

10

countries

Source Countries/Regions

500

Wh/kg

Max Energy Density Target

140

metric tons

US Electrolyte Capacity '28

All 37 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	China SSB Standard & Prod	Market Overview						China enacts national standard for automotive solid-state batteries, with hundred-ton sulfide electrolyte production and 2027 EV integration targets.
#02	Solid Power DOE Award	Corporate Strategy						Solid Power secures \$50M DOE award to boost sulfide solid electrolyte production to 75 tons by 2026, strengthening US supply chain.
#03	BYD Dual Electrolyte Patent	Research						BYD patents a dual electrolyte cathode using composite solid electrolytes to overcome interfacial resistance in solid-state batteries.
#04	SBU Hybrid Electrolyte	Research						Stony Brook develops hybrid electrolyte for Group II cation batteries, promising safer, cheaper, higher energy density alternatives to Li-ion.
#05	Non-Flammable Li-ion Elec	Research						Chinese researchers develop non-flammable electrolyte for Li-ion batteries, achieving 355 Wh/kg and wide temp range with enhanced safety.
#06	Toyota/Idemitsu SSB Prod	Corporate Strategy						Toyota and Idemitsu accelerate mass production of sulfide solid electrolytes, targeting 2027-2028 commercialization of all-solid-state batteries.
#07	China SSB Classification	Policy						China's new national standard GB/T formally defines and distinguishes 'all-solid-state' from 'semi-solid-state' batteries, effective July 2026.
#08	Max Planck Dendrite Mech	Research						Max Planck researchers uncover how lithium dendrites penetrate rigid ceramic solid electrolytes, a breakthrough for SSB commercialization.
#09	CATL SSB Viability Unprov	Market Overview						Major battery makers like CATL invest heavily in solid-state battery R&D;, but commercial viability remains unproven due to technical hurdles.
#10	Si-Doped Argyrodite SSB	Research						All-solid-state battery with Si-doped argyrodite electrolyte shows stable cycling from -20°C to 60°C, achieving 171.2 mAh g-1.
#11	Hacker News SSB Focus	Analysis						Hacker News discusses corporate focus on all-solid-state batteries, highlighting ideal electrolyte properties yet unrealized.

#	Article Title	Type	Tech Novelty	Market Proximity	Market Impact	Data Reliability	US/EU Relevance	Summary
#12	UW-Madison SSB Fire Risk	Research						UW-Madison study reveals solid-state batteries, while safer, can still ignite in worst-case scenarios, emphasizing rigorous safety design.
#13	Toyota 745-Mile SSB	Corporate Strategy						Toyota's solid-state battery aims for 745-mile range, rapid charging, and extreme temperature performance, potentially revolutionizing EVs.
#14	ZENCAR SSB vs Li-ion	Overview						ZENCAR explains how all-solid-state batteries offer superior safety, energy density, and structural simplification over Li-ion.
#15	BYD Halide/Sulfide Patent	Research						BYD patents a dual-electrolyte cathode combining halide and sulfide materials to improve interfacial stability and extend SSB lifespan.
#16	SSB Electrolyte Review	Research						Review paper compares oxide, sulfide, polymer, and composite solid electrolytes, detailing properties, issues, and improvement strategies.
#17	Factorial/Stellantis Test	New Product						Factorial Energy and Stellantis begin North American testing of FEST solid-state batteries in Dodge Charger Daytona prototype, achieving 375 Wh/kg and 18-min fast charge.
#18	Quinone Electrode Decomp	Research						ACS paper unveils decomposition mechanism of quinone-based electrodes in sulfide SSBs, guiding new organic electrode material design.
#19	Tattu Drone Semi-SSB	New Product						Tattu (Grepow) unveils a semi-solid-state battery for commercial drones, achieving 350Wh/Kg energy density with enhanced safety and cycle life.
#20	Na-Ion Electrolyte Innov	Research						MDPI paper reviews electrolyte and electrode innovations for sodium-ion batteries, highlighting sulfide and halide solid electrolytes.
#21	Gel Electrolytes Na-CO2	Research						OAE paper shows gel electrolytes enhance safety and flexibility in hybrid Na-CO2 batteries by suppressing leakage and dendrite growth.
#22	Car Advisers SSB Potential	Overview						Car Advisers explains how all-solid-state batteries can solve EV challenges in safety, energy density, charging speed, and lifespan.
#23	Sulfide vs Oxide Elec	Comparison						J&K; Scientific compares sulfide and oxide solid electrolytes for all-solid-state batteries, highlighting their properties and applications.
#24	Li-ion Transport Mech	Analysis						Beyond Battery explains lithium-ion transport mechanisms in solid electrolytes, highlighting sulfide's superior conductivity.
#25	UW-Madison Na-Metal SSB	Research						UW-Madison develops a new QSPE and in-situ SEI approach for interfacial stability and dendrite suppression in sodium-metal batteries.
#26	Ming Chi High-V Battery	Research						Ming Chi University advances high-voltage, high-safety battery tech with 5V cathodes, solvent-free DS-SPEs, and LaF3-coated cobalt-free cathodes.
#27	US DOE SSB Scale-Up	Policy						U.S. DOE awards \$11M to three projects for domestic solid-state battery manufacturing scale-up, focusing on continuous processes and R2R.
#28	SK On/Factorial Partner	Corporate Strategy						SK On and Factorial Energy partner to evaluate mass production of solid-state batteries, aiming for 2029 commercialization using existing facilities.

#	Article Title	Type	Tech Novelty	Market Proximity	Market Impact	Data Reliability	US/EU Relevance	Summary
#29	Sila Nanotech Valuation	Corporate Strategy	●●○○○ ○	●●●●● ○	●●●○○ ○	●●●○○ ○	●●●●● ●	Sila Nanotechnologies, a silicon anode developer, reaches \$2.33 billion valuation, having raised \$1.61 billion to scale production.
#30	Sila Nanotech \$300M Fund	Corporate Strategy	●●○○○ ○	●●●●● ○	●●●○○ ○	●●●○○ ○	●●●●● ●	Sila Nanotechnologies raises \$300M to expand its Moses Lake facility for mass production of silicon anode materials, driven by AI/drone demand.
#31	US Gov Battery Investment	Policy	●○○○○ ○	●●●●● ●	●●●●● ●	●●●●● ○	●●●●● ●	U.S. government commits up to \$500M to boost domestic battery production, recycling, and critical mineral processing for national security.
#32	Factorial UAV Partner	Corporate Strategy	●●●○○ ○	●●●○○ ○	●●●○○ ○	●●●○○ ○	●●●●● ●	Factorial Energy partners with Dutch Tulip Tech to expand solid-state batteries into the UAV market, extending drone flight range by over 30%.
#33	ITEN Medical SSB Project	New Product	●●●●● ○	●●○○○ ○	●●●○○ ○	●●●○○ ○	●●●●● ●	French ITEN launches "SOLIMED" project for high-capacity solid-state batteries in implantable medical devices, targeting 600Wh/L and 20-min fast charging.
#34	SK On/Factorial MOU	Corporate Strategy	●●●○○ ○	●●●○○ ○	●●●●● ○	●●●○○ ○	●●●●● ○	SK On and Factorial Energy sign MOU to explore solid-state battery manufacturing using existing facilities, aiming for early mass production.
#35	Factorial/SK On Evaluate	Corporate Strategy	●●●○○ ○	●●●○○ ○	●●●●● ○	●●●○○ ○	●●●●● ○	Factorial Energy and SK On sign MOU to jointly evaluate solid-state battery manufacturing using existing facilities for mobility, aerospace, and data centers.
#36	LGES Dry Electrode Pilot	Corporate Strategy	●●●○○ ○	●●●○○ ○	●●●●● ○	●●●○○ ○	●●●●● ○	LG Energy Solution returns to profit, plans dry electrode pilot line for solid-state batteries in H2 2026 as part of its tech roadmap.
#37	LGES Q2 Profit & SSB Plan	Corporate Strategy	●●●○○ ○	●●●○○ ○	●●●●● ○	●●●○○ ○	●●●●● ○	LG Energy Solution profits from EU EV/US BESS demand, plans dry electrode SSB pilot line in H2 2026 and sodium battery samples by 2027.

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

Three Questions That Demand Your Decision This Week

❶ Is your SSB strategy keeping pace with Asian rivals?

China's national standard (#01) and Toyota/Idemitsu's multi-million-ton pilot facility (#06) signal aggressive commercialization. Are your R&D; and manufacturing scale-up timelines competitive, or are you at risk of losing critical market share by 2027-2028?

❷ Are you investing in fundamental SSB science to overcome core barriers?

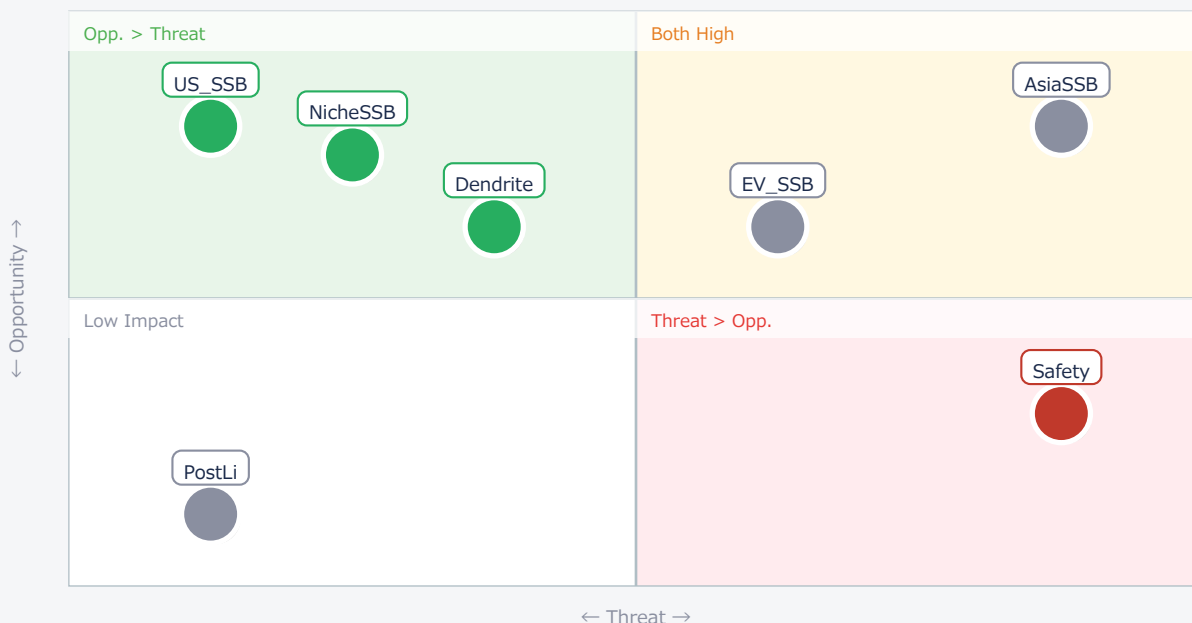
Max Planck's breakthrough on dendrite formation (#08) highlights the need for deep scientific understanding. Is your R&D; team equipped to leverage such insights, or are you only focusing on incremental improvements, risking platform obsolescence?

❸ Have you re-evaluated SSB safety claims for your products?

UW-Madison's study (#12) reveals SSBs still pose fire risks in worst-case scenarios. Does your product development and marketing reflect this reality, and are you investing in advanced BMS and material selection to ensure true safety for consumers?

Opportunities vs. Threats for US/European Companies

Opportunity vs. Threat Matrix for US/European Companies



Item	Quadrant	↑ Opportunity	↓ Threat
● AsiaSSB	Critical	Partnering	Market loss
● US_SSB	Opp.	Domestic growth	Supply chain lock
● EV_SSB	Critical	EV performance	Intense competition
● Dendrite	Opp.	New IP/design	R&D; obsolescence
● Safety	Threat	Safety solutions	Reputational risk
● PostLi	Ref.	Future tech	Long R&D;
● NicheSSB	Opp.	New markets	Niche focus

Deep Dive ① — Factorial & Stellantis Push EV SSB to Market

#17 | 2026/07/29 | Electrek | Tech Novelty ●●●●○ Proximity ●●●●○ Market Impact ●●●●○ Data Reliability ●●●●○ US/EU Relevance ●●●●●

Factorial Energy and Stellantis commenced North American testing of 77Ah FEST solid-state battery cells in a Dodge Charger Daytona prototype, achieving 375 Wh/kg over 600 cycles.

The cells demonstrated stable operation from -30°C to 45°C and ultra-fast charging (15-90% in 18 minutes), marking a significant step towards EV solid-state battery commercialization.

► Strategic Analyst's Perspective

Strategic Analyst's Perspective: The reported 375 Wh/kg and 18-minute fast charge are highly competitive and appear realistic for a prototype stage, aligning with industry roadmaps. Technical barriers remain in scaling manufacturing and ensuring long-term durability under real-world conditions. [Opportunity] for US/EU OEMs and battery manufacturers to integrate advanced SSB technology, gaining a competitive edge in EV range and charging. [Threat] for those without similar partnerships, risking market lag. Next actions: [R&D;] Validate Factorial's claims, [Business Dev] explore strategic partnerships with SSB startups by Q4 2026.

Deep Dive ② — US Boosts Domestic Sulfide Electrolyte Production

#02 | Date unknown | Solid Power | Tech Novelty ●●●●○ Proximity ●●●●○ Market Impact ●●●●○ Data Reliability ●●●●○ US/EU Relevance ●●●●●

Solid Power secured up to \$50 million from the U.S. DOE to expand its sulfide-based solid electrolyte production capacity from 30 to 75 metric tons by 2026, and 140 tons by 2028.

This funding aims to strengthen the U.S. solid-state battery supply chain and accelerate commercialization, building on existing partnerships with BMW and Samsung SDI.

► Strategic Analyst's Perspective

Strategic Analyst's Perspective: The DOE award and production targets are concrete and realistic, reflecting a strategic national investment. Scaling sulfide electrolyte production is a critical bottleneck for SSB commercialization. Technical barriers include maintaining material quality at scale and managing moisture sensitivity. [Opportunity] for US materials & component suppliers to secure domestic contracts and for OEMs to diversify their supply chains away from Asian dominance. [Threat] for US/EU companies reliant on foreign electrolyte supply, potentially facing higher costs or restricted access. Next actions: [Procurement] Identify and qualify Solid Power as a potential supplier, [Strategy] assess long-term supply chain resilience by Q1 2027.

Deep Dive ③ — Max Planck Uncovers Dendrite Formation Mechanism

#08 | 2026/07/28 | CarBuzz | Tech Novelty●●●●● Proximity●○○○○ Market Impact●●●○○ Data Reliability●●●●● US/EU Relevance●●●●●

Researchers at Max Planck Institute for Solid State Research identified how lithium dendrites penetrate rigid ceramic solid electrolytes, causing short circuits.

This fundamental breakthrough provides crucial insight into a major obstacle for all-solid-state batteries, enabling targeted development of robust electrolyte designs for lithium metal anodes.

► Strategic Analyst's Perspective

Strategic Analyst's Perspective: This academic breakthrough is highly reliable and provides fundamental understanding, but commercialization is 5+ years away. The findings are realistic and address a core technical barrier. Remaining technical barriers include translating this understanding into practical, scalable material and interface designs. [Opportunity] for US/EU R&D; teams and IP holders to develop next-generation solid electrolytes and anode protection layers, securing valuable patents. [Threat] for companies relying on existing electrolyte designs that may become obsolete. Next actions: [R&D;] Initiate internal research programs to apply these findings, [Legal/IP] monitor related patent filings by Q4 2026.

Other Notable Articles

Stony Brook University Develops Hybrid Electrolyte for Group II Cation Batteries (Stony Brook University)

Tech Novelty●●●●● Proximity●○○○○ Market Impact●●○○○

US research on post-Li (Mg) batteries offers high novelty, but commercialization is 5+ years away.

China Establishes Clear Distinction Between All-Solid-State and Semi-Solid-State Batteries with New National Standard GB/T (Gasgoo)

Tech Novelty●○○○○ Proximity●●●●● Market Impact●●●●●

China's new standard clarifies SSB definitions, impacting global market transparency and R&D; focus.

All-Solid-State Battery with Si-Doped Argyrodite $\text{Li}_6\text{xSb}_{1-\text{x}}\text{S}_5\text{I}$ Electrolyte Demonstrates Stable Operation from -20°C to 60°C (arXiv)

Tech Novelty●●●●○ Proximity●●○○○ Market Impact●●●○○

New sulfide electrolyte shows stable SSB performance across a wide temperature range, crucial for EV adoption.

Toyota's 745-Mile Solid-State Battery Demonstrates Range and Safety Advantages Over Honda's Technology (Top Speed)

Tech Novelty●●●○○ Proximity●●●○○ Market Impact●●●●●

Toyota's ambitious 745-mile SSB target sets a high bar for EV performance, challenging global automakers.

French ITEN Launches "SOLIMED" Project for High-Capacity Solid-State Batteries in Class III Implantable Medical Devices: Targeting 600Wh/L and 20-Minute Fast Charging (Power Electronics News)

Tech Novelty●●●●○ Proximity●●○○○ Market Impact●●●○○

EU initiative targets high-safety, high-capacity SSBs for implantable medical devices, a high-value niche market.

Recommended Actions This Week

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

■ Immediate (this week)

- [Strategy] Assess competitive landscape, especially China's SSB standardization and production scale-up (#01, #06).
- [R&D;] Review internal SSB safety protocols in light of UW-Madison's fire risk findings (#12).
- [Procurement] Identify potential US domestic suppliers for sulfide electrolytes, leveraging DOE funding (#02, #27).

■ Short-term (1 month)

- [Business Dev] Explore partnerships with US/EU SSB startups (e.g., Factorial Energy, Solid Power) for EV/UAV/medical applications (#17, #28, #32, #33).
- [R&D;] Investigate new material designs for dendrite suppression based on Max Planck's breakthrough (#08).
- [Legal/IP] Monitor BYD's dual-electrolyte patent filings for potential IP implications in SSB interfacial stability (#03, #15).

■ Medium-long term (quarter+)

- [Strategy] Develop a long-term roadmap for post-lithium battery technologies (e.g., Mg, Na-ion) to secure future material supply and cost advantages (#04, #20, #21, #25).
- [R&D;] Evaluate the feasibility of integrating advanced SSB technologies (e.g., Factorial's FEST, Toyota's targets) into future product platforms, targeting 2027-2029 commercialization windows (#13, #17).
- [Executive] Advocate for US/EU standardization efforts to counter China's early moves in SSB definitions and classification (#01, #07).

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SolidStateBattery — Selected Articles

Date: 2026-08-02

Articles: 37

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#17 Factorial Energy and Stellantis Begin North American Testing of FEST Solid-State Battery, Accelerating EV Commercialization

#19 ACS Energy Letters Paper Unveils Decomposition Mechanism of Quinone-Based Electrodes in Sulfide All-Solid-State Batteries

#20 Tattu (Grepow) Unveils Revolutionary Semi-Solid-State Battery for Commercial Drones: Achieving 350Wh/Kg Energy Density

#21 MDPI Paper Details Electrolyte and Electrode Material Innovations and Interfacial Engineering Strategies in Sodium-Ion Batteries

#22 OAE Publishing Inc. Paper: Gel Electrolytes Enhance Safety and Mechanical Flexibility in Hybrid Na-CO₂ Batteries

#23 Car Advisers Explains All-Solid-State Batteries Hold Potential to Solve EV Challenges in Safety, Energy Density, Charging Speed, and Lifespan

#24 J&K Scientific Compares Solid Electrolytes for All-Solid-State Batteries: Analyzing Superiority of Sulfide and Oxide Systems

#25 Beyond Battery Explains Lithium-Ion Transport Mechanisms in Solid Electrolytes: Highlighting Sulfide Conductive Superiority

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#36 Factorial Energy and SK On to Jointly Evaluate Solid-State Battery Manufacturing Using Existing Facilities

#37 LG Energy Solution Returns to Profit in Q2, Prepares Dry Electrode Pilot Line for Solid-State Batteries in H2 2026

#38 European EV Demand and US BESS Drive LG Energy Solution's Q2 Profit Turnaround, Solid-State Battery Pilot Line Forthcoming

#01 China Enacts National Standard for Automotive Solid-State Batteries (GB/T43568-2026), Hundreds of Tons of Sulfide Electrolyte Production Lines Begin Operation

Published July 30, 2026 SMM China



OVERVIEW

In July 2026, China implemented its first national standard for automotive solid-state batteries (GB/T43568-2026), marking a significant milestone in industry standardization. Concurrently, several hundred-ton scale sulfide electrolyte production lines commenced trial operations in Q3, with EV manufacturers procuring electrolytes in ton-level transactions. SVOLT Energy began mass production of hybrid solid-liquid batteries, and Ampace achieved 2 GWh capacity for both cells and packs. CATL and Farasis showcased high-energy-density batteries at 420 Wh/kg and 500 Wh/kg respectively, targeting vehicle integration by 2027.

Key Findings

July 2026 marked a pivotal moment for the solid-state battery (SSB) industry in China, with the official implementation of the nation's first national standard for automotive solid-state batteries, GB/T43568-2026. This standardization effort aims to provide clear guidelines for SSB design, performance, and safety, fostering the healthy development and quality improvement of the domestic industry. Concurrently, the material supply chain witnessed significant advancements, as multiple hundred-ton-level sulfide-based solid electrolyte production lines began trial operations in Q3, exemplified by EV manufacturers procuring electrolytes in one-ton quantities, signaling the onset of 'ton-level transactions' for these critical materials.

Technical / Clinical Details

Chinese battery developers are demonstrating tangible progress in SSB technology. SVOLT Energy has commenced mass production of its hybrid solid-liquid batteries in Q3, representing a pragmatic approach to bridging the gap between conventional lithium-ion and full solid-state solutions. Ampace announced achieving a total capacity of 2 GWh for both cells and packs, indicating substantial manufacturing capability. Furthermore, leading players like CATL and Farasis have reported significant breakthroughs in energy density, reaching 420 Wh/kg and an impressive 500 Wh/kg, respectively. These figures represent a substantial improvement over current lithium-ion technologies and pave the way for vehicle integration, which is projected for 2027. Such high energy densities are crucial for extending EV driving ranges and enhancing overall performance.

Background & Context

China has strategically invested in new energy vehicle (NEV) technologies, including SSBs, to establish global leadership in the automotive sector. The promulgation of a national standard underscores the government's commitment to accelerating technological competitiveness and ensuring the robust growth of its domestic industry. Material suppliers are scaling up production capacities for sulfide-based solid electrolytes, anticipating increasing demand from EV manufacturers. This scale-up is essential for reducing the cost of SSBs and ensuring a stable supply, which are critical for widespread adoption. The mass production of hybrid solid-liquid batteries by companies like SVOLT also highlights a tactical approach to market entry, allowing for incremental advancements while full solid-state technology matures.

Strategic Significance & Outlook

The new Chinese national standard for SSBs is expected to influence international standardization discussions and accelerate global development trends. The establishment of ton-level production capabilities for sulfide electrolytes and the successful integration of high-energy-density batteries into vehicles are poised to be game-changers for the EV market. This will enable significantly longer driving ranges, reduce range anxiety, and potentially lessen reliance on extensive charging infrastructure. The concrete vehicle integration plans for 2027 mark a crucial milestone, transforming SSBs from a 'technology on a slide deck' into a 'tangible product' in the market. As global competition intensifies, China's advancements in SSB technology and standardization will be a key determinant of the future trajectory of the global battery industry and the broader EV landscape.

Source: <https://news.metal.com/en/newscontent/104034082-solid-state-battery-july-2026-policy-standardization-+-hundred-ton-level-production-lines-+-semi-solid-batteries>

Collected: July 31, 2026 | Automated Research System (Gemini API)

#02 Solid Power Secures Up to \$50 Million DOE Award, Boosting Sulfide Solid Electrolyte Production Capacity to 75 Metric Tons

Published Date unknown Solid Power USA



OVERVIEW

Solid Power, a leader in solid-state battery technology, has been selected for an award negotiation of up to \$50 million by the U.S. Department of Energy (DOE). This funding will significantly expand continuous production capacity for sulfide-based solid electrolyte materials, crucial for advanced solid-state batteries. Currently capable of producing 30 metric tons annually, Solid Power plans to scale its production to 75 metric tons by 2026 and 140 metric tons by 2028 through this multi-year capital expenditure project, reinforcing the U.S. solid-state battery supply chain and accelerating commercialization.

Key Findings

Solid Power, a frontrunner in solid-state battery (SSB) technology development, has been selected for an award negotiation of up to \$50 million by the U.S. Department of Energy (DOE). This substantial funding is earmarked for significantly expanding the continuous production capacity of sulfide-based solid electrolyte materials, which are integral to advanced SSBs. Through this multi-year capital expenditure project, Solid Power plans to dramatically increase its annual production capacity from the current 30 metric tons to 75 metric tons by 2026, and further to 140 metric tons by 2028. This move represents a critical step in building out the domestic SSB supply chain in the U.S. and accelerating the commercialization of this transformative technology.

Technical / Clinical Details

Solid Power's strategic focus is on sulfide-based solid electrolytes, which are considered crucial for achieving high-energy-density and fast-charging SSBs due to their high ionic conductivity and relatively good mechanical properties. Substantially increasing the continuous production capacity for sulfide electrolytes directly contributes to reducing manufacturing costs and stabilizing supply, thereby addressing a significant bottleneck for the large-scale commercialization of SSBs. The DOE funding will be invested in optimizing and scaling up this manufacturing process, aiming for more efficient and higher-quality electrolyte material production. Solid Power has already forged partnerships with leading automakers and battery manufacturers such as BMW and Samsung SDI, with its technology integrated into their vehicle application evaluation pathways. Furthermore, the company reported its Q1 2026 revenues and grant income, indicating steady progress in its line installation agreement with SK On.

Background & Context

As the global transition to electric vehicles (EVs) accelerates, there is growing anticipation for SSBs to overcome the limitations of conventional liquid lithium-ion batteries in terms of safety, energy density, and charging speed. The U.S. government has prioritized the development of clean energy technologies and the strengthening of domestic manufacturing capabilities as pillars of its national strategy, and the DOE's support for Solid Power is a direct component of this initiative. This investment is considered a vital measure for the U.S. to maintain international competitiveness in next-generation battery technology and ensure future energy supply stability. While sulfide-based electrolytes are promising in terms of performance, they have presented challenges in manufacturing complexity and moisture sensitivity, making their mass production a significant industry-wide hurdle.

Strategic Significance & Outlook

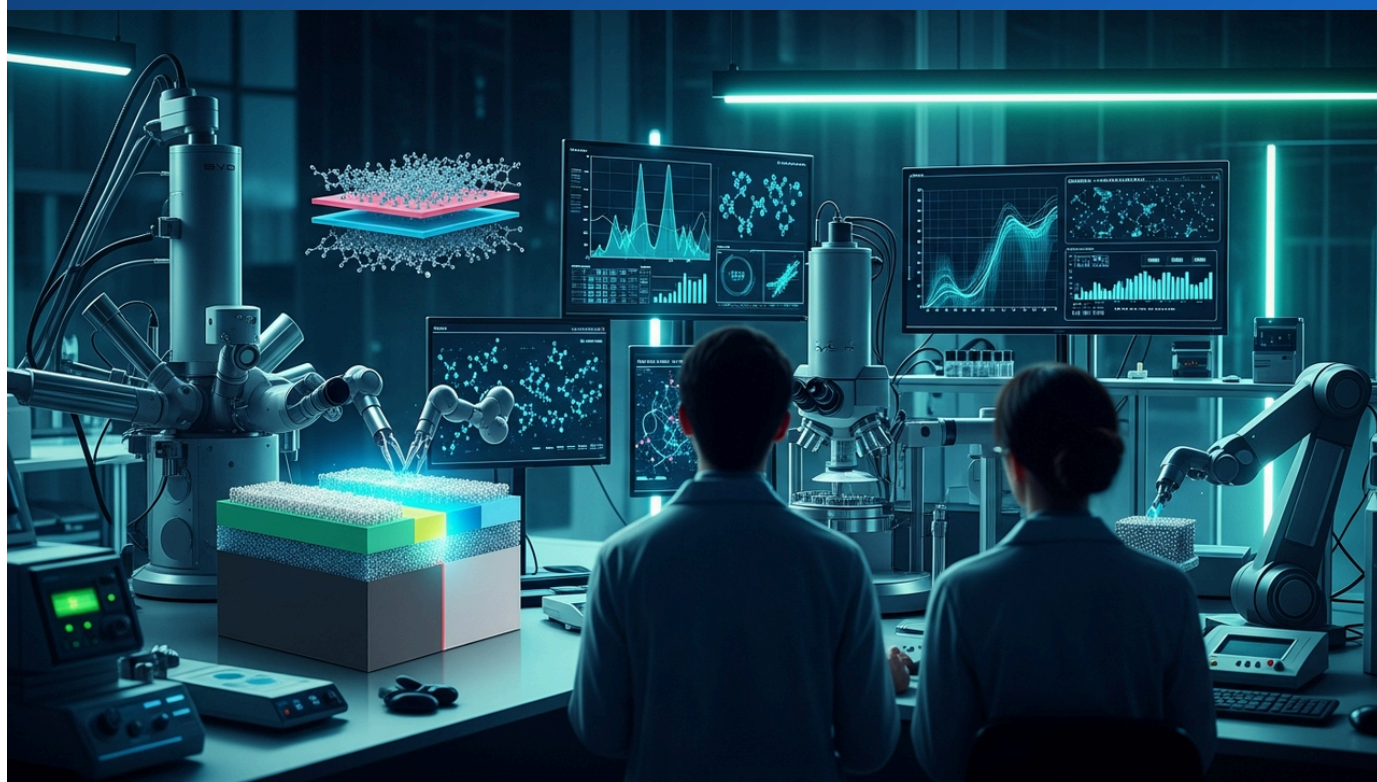
The expansion of Solid Power's sulfide solid electrolyte production capacity signifies a major advancement towards the commercialization of SSBs. Production scales of 75 and 140 metric tons will enable supply to initial EV markets, providing a foundation for further cost reduction and technological refinement. This will encourage more automakers to consider adopting SSBs, thereby intensifying market competition. Moreover, the DOE's support enhances the domestic technology development ecosystem and contributes to job creation. As Solid Power's technology is integrated into vehicles and gains further validation, SSBs are expected to become widely adopted as an innovative solution not only in the EV industry but also across other energy storage sectors.

Source: <https://www.rolltoroll.org/industry-news-post?recordId=recFhU86nRwLg3IMk>

Collected: July 31, 2026 | Automated Research System (Gemini API)

#03 BYD Files Patent for Dual Electrolyte Cathode Approach in Solid-State Batteries to Overcome Interfacial Challenges

Published July 29, 2026 Car News China China



OVERVIEW

BYD has filed a new patent for a dual electrolyte cathode approach to tackle interfacial resistance, a critical challenge in solid-state batteries (SSBs). This patent details the use of a composite solid electrolyte membrane combining inorganic solid electrolyte particles with a polymer electrolyte fiber network. This follows another patent application in May 2026 for a composite solid electrolyte membrane including sulfide electrolyte components. These technologies hold potential to enhance SSB stability and performance, accelerating commercialization.

Key Findings

BYD, the Chinese automotive and battery giant, has filed a new patent application detailing an innovative dual electrolyte cathode approach designed to overcome interfacial challenges—a primary impediment to solid-state battery (SSB) performance. This patented technology involves a composite solid electrolyte membrane that integrates inorganic solid electrolyte particles with a polymer electrolyte fiber network. This filing follows a separate patent application in May 2026 concerning another composite solid electrolyte membrane containing sulfide electrolyte components, indicating BYD's multifaceted strategy in this critical area. These developments promise to significantly enhance the long-term stability and energy efficiency of SSBs, potentially accelerating their widespread adoption in the electric vehicle market.

Technical / Clinical Details

In solid-state batteries, high interfacial resistance between the solid electrolyte and electrodes is a major obstacle, hindering ion conduction and thereby reducing battery power output and charging speed. BYD's dual electrolyte cathode approach aims to mitigate this interfacial problem by introducing distinct solid electrolyte layers on the cathode side. Inorganic solid electrolytes typically offer high ionic conductivity but often suffer from imperfect physical contact with electrodes due to their rigidity. Conversely, polymer electrolytes are flexible and can improve adhesion to electrodes. BYD's innovation combines the strengths of both, developing a composite solid electrolyte membrane that achieves both high conductivity and excellent interfacial contact. Specifically, by including sulfide electrolyte components, high ionic conductivity is ensured, while the polymer network enhances electrode adhesion, aiming to reduce interfacial resistance and improve battery cycle stability. This approach also has potential implications for suppressing dendrite formation, a common challenge with lithium metal anodes in SSBs.

Background & Context

Solid-state batteries are highly anticipated as a next-generation technology for electric vehicles (EVs) and energy storage systems (ESS) due to their superior safety, energy density, and lifespan compared to conventional lithium-ion batteries. However, high resistance, particularly at the solid-solid interface, has been a significant barrier to their commercialization. Research institutions and companies worldwide are tackling this issue, and BYD's latest patent application signifies that a leading Chinese automaker and battery manufacturer is proposing its own unique solution to this fundamental challenge. BYD leverages its vertical integration in battery and EV technology, and advancements in such core technologies are expected to further strengthen its competitive position.

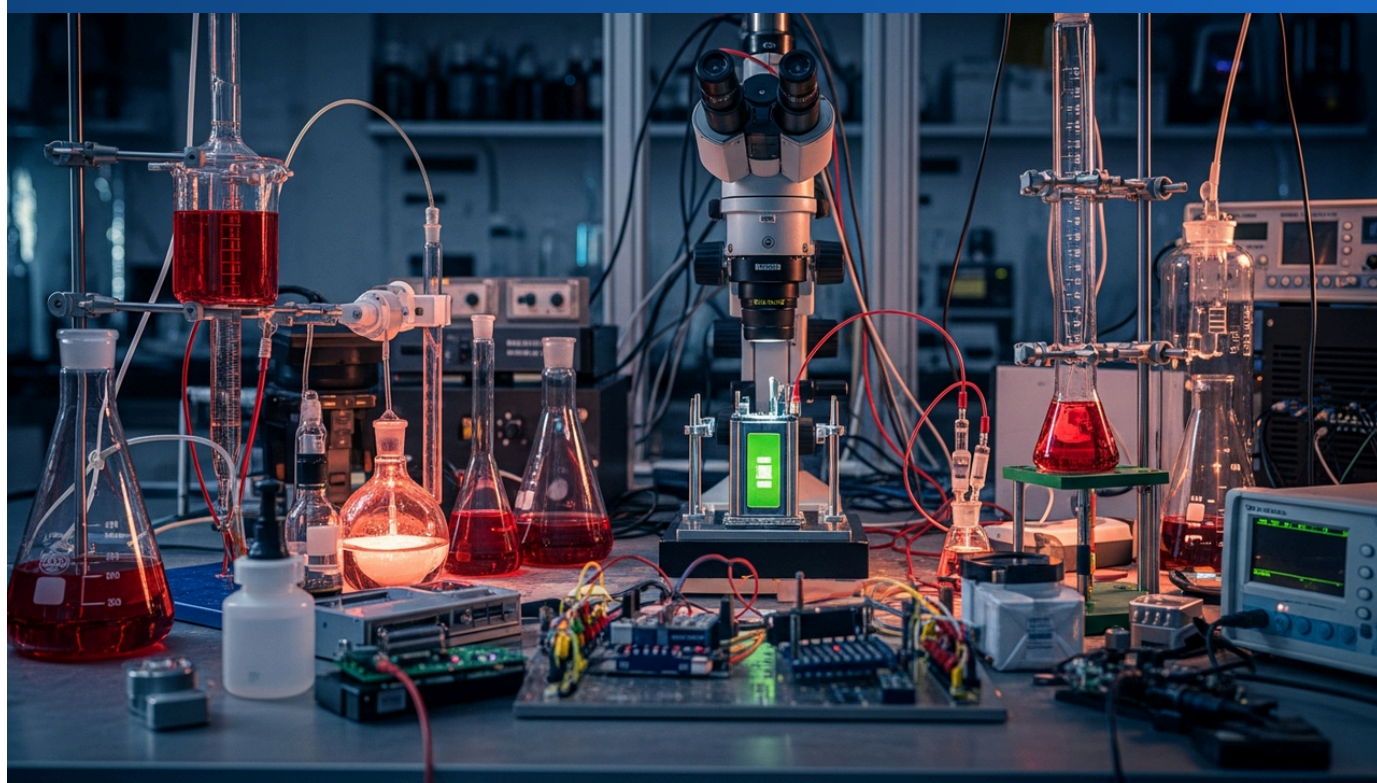
Strategic Significance & Outlook

BYD's dual electrolyte cathode approach offers a promising solution to the interfacial issues in solid-state batteries, potentially accelerating SSB performance improvements and mass production. If commercialized, this technology could lead to even longer EV driving ranges, shorter charging times, and enhanced safety, thereby accelerating consumer adoption of EVs. BYD's patent highlights that the fusion of materials science and electrode interface engineering is crucial for the practical implementation of solid-state batteries. Moving forward, validation of the scalability and cost-effectiveness of this technology will be key factors determining its market entry timeline. BYD's innovation is poised to set new directions in the global solid-state battery development race.

Source: <https://carnewschina.com/2026/07/29/byds-new-solid-state-battery-patent-reveals-a-dual-electrolyte-cathode-approach-to-interface-challenges/>

#04 Stony Brook University Develops Hybrid Electrolyte for Group II Cation Batteries: Achieving Environmental Reduction and High Energy Density

Published Date unknown Stony Brook University USA



OVERVIEW

Researchers at Stony Brook University have developed a novel hybrid electrolyte system for Group II cation-based batteries, offering enhanced safety and reduced environmental impact compared to lithium-ion batteries. This system enables the use of abundant, low-cost materials, minimizing environmental footprint. Magnesium, 12-23 times cheaper than lithium, theoretically allows magnesium-based batteries to achieve 3.4 times the energy density of lithium-ion and 8.5 times that of lead-acid batteries.

Key Findings

A research team at Stony Brook University has developed an innovative hybrid electrolyte system for Group II cation-based batteries, poised as a promising alternative to lithium-ion batteries (LIBs). This new electrolyte system offers inherent safety advantages and a lower environmental footprint compared to LIBs. A crucial aspect of this technology is its ability to utilize abundant, low-cost materials, thereby minimizing environmental impact. Specifically, magnesium, which is 12-23 times cheaper than lithium, theoretically enables magnesium-based batteries to achieve energy densities 3.4 times greater than LIBs and an astonishing 8.5 times higher than lead-acid batteries, indicating a significant leap in battery performance and sustainability.

Technical / Clinical Details

Group II cation-based batteries, particularly magnesium (Mg) ion batteries, theoretically hold the potential to dramatically increase volumetric energy density compared to monovalent lithium ions (Li^+), as multivalent Mg^{2+} ions transfer two electrons. However, the movement of Mg^{2+} is typically slower than Li^+ , and ensuring the stability of the electrolyte and electrode interface has been a significant technical challenge. Stony Brook University's hybrid electrolyte system overcomes these hurdles by combining the advantages of organic liquid electrolytes and solid-state electrolytes. For example, it integrates highly ion-conductive organic solvents with solid components that promote stable Mg^{2+} migration at the electrode interface, enabling efficient Mg^{2+} transport and enhancing electrolyte stability. This is also expected to contribute to suppressing dendrite formation from Mg metal anodes, thereby improving battery safety and cycle life. The adoption of this system also brings economic benefits by substantially reducing material costs compared to existing battery technologies.

Background & Context

The global energy storage market is rapidly expanding, driven by the increasing demand for electric vehicles (EVs), the integration of renewable energy sources, and the proliferation of portable electronic devices. While current mainstream lithium-ion batteries offer high performance, they face challenges such as the uneven distribution of lithium resources, environmental impact associated with mining, and safety concerns (thermal runaway risk). To address these issues, research and development into next-generation batteries (post-lithium batteries) utilizing abundant alternative elements are progressing worldwide. Group II cation-based batteries (e.g., magnesium, calcium, zinc) are considered particularly promising candidates due to their high energy density potential and abundant resources, making Stony Brook University's research a significant step forward in this field.

Strategic Significance & Outlook

The hybrid electrolyte system developed by Stony Brook University holds significant potential to advance the practical implementation of magnesium-ion batteries. If commercialized, this technology could lead to safer, cheaper, and more environmentally friendly high-performance batteries, with applications expected across a wide range of sectors, including electric vehicles, stationary energy storage, drones, and medical devices. Future research will focus on further developing the long-term stability, cycle life, and scalability for mass production of this electrolyte system. The widespread adoption of magnesium-based batteries, with fewer resource constraints, is anticipated to enhance the resilience of global energy supply chains and contribute significantly to the realization of a sustainable society.

Source: <https://www.stonybrook.edu/commcms/technologies/innovations/tech-details.php?caseid=8632>

#05 South China University of Technology Develops Non-Flammable Electrolyte: Boosting Li-ion Battery Energy Density and Safety to 355 W/kg

Published July 24, 2026 EurekAlert! China



OVERVIEW

Scientists from South China University of Technology, Xi'an University of Technology, and Guangzhou Tinci Materials Technology have collaboratively developed a non-flammable electrolyte that simultaneously enhances the energy density, cycle life, and safety of lithium-ion batteries (LIBs). Prototype tests achieved a specific energy capacity of 355 W/kg, with no ignition or thermal runaway even when punctured by a metal nail. Operating over a wide temperature range of -30 to +60°C, this new electrolyte shows immense promise for electric vehicles (EVs) and stationary energy storage systems.

Key Findings

A research team from South China University of Technology, Xi'an University of Technology, and Guangzhou Tinci Materials Technology has jointly developed a groundbreaking non-flammable electrolyte that dramatically enhances the performance and safety of lithium-ion batteries (LIBs). This novel electrolyte not only boosts the battery's energy density and cycle life but also significantly reduces the risk of ignition and thermal runaway. In prototype battery tests, a high specific energy capacity of 355 W/kg was achieved. Furthermore, during a rigorous safety test involving intentional puncturing with a metal nail, the battery demonstrated no ignition or thermal runaway. This technology functions stably across a wide temperature range from -30°C to +60°C, making it highly promising for diverse environmental applications.

Technical / Clinical Details

Existing lithium-ion batteries, which utilize flammable organic solvent-based liquid electrolytes, inherently carry risks of thermal runaway and ignition under conditions of overcharging, external impact, or high temperatures. The newly developed non-flammable electrolyte fundamentally eliminates the flammability of the electrolyte solution itself through an optimal combination of flame-retardant solvents and additives. The specific energy capacity of 355 W/kg is comparable to or exceeds that of current high-performance LIBs, significantly contributing to extended driving ranges for electric vehicles (EVs). Moreover, the wide operating temperature range (-30°C to +60°C) means that EVs and stationary energy storage systems (ESS) can operate reliably across diverse climatic conditions worldwide, from cold regions to hot environments. The metal nail penetration test is one of the most stringent safety assessments simulating internal short circuits; passing this test clearly demonstrates the high safety level of this electrolyte.

Background & Context

With the expansion of the electric vehicle market and the accelerated integration of renewable energy, the demand for high-performance and safe battery storage technologies is exploding. Battery safety, in particular, is key to consumer confidence and market adoption. Concerns about the safety of conventional LIBs have been a long-standing challenge for the entire industry. China is the world's largest EV market and is at the forefront of battery technology development. The development of a non-flammable electrolyte like this one holds critical significance for China to push the boundaries of battery safety and performance, further strengthening its competitiveness in the global market.

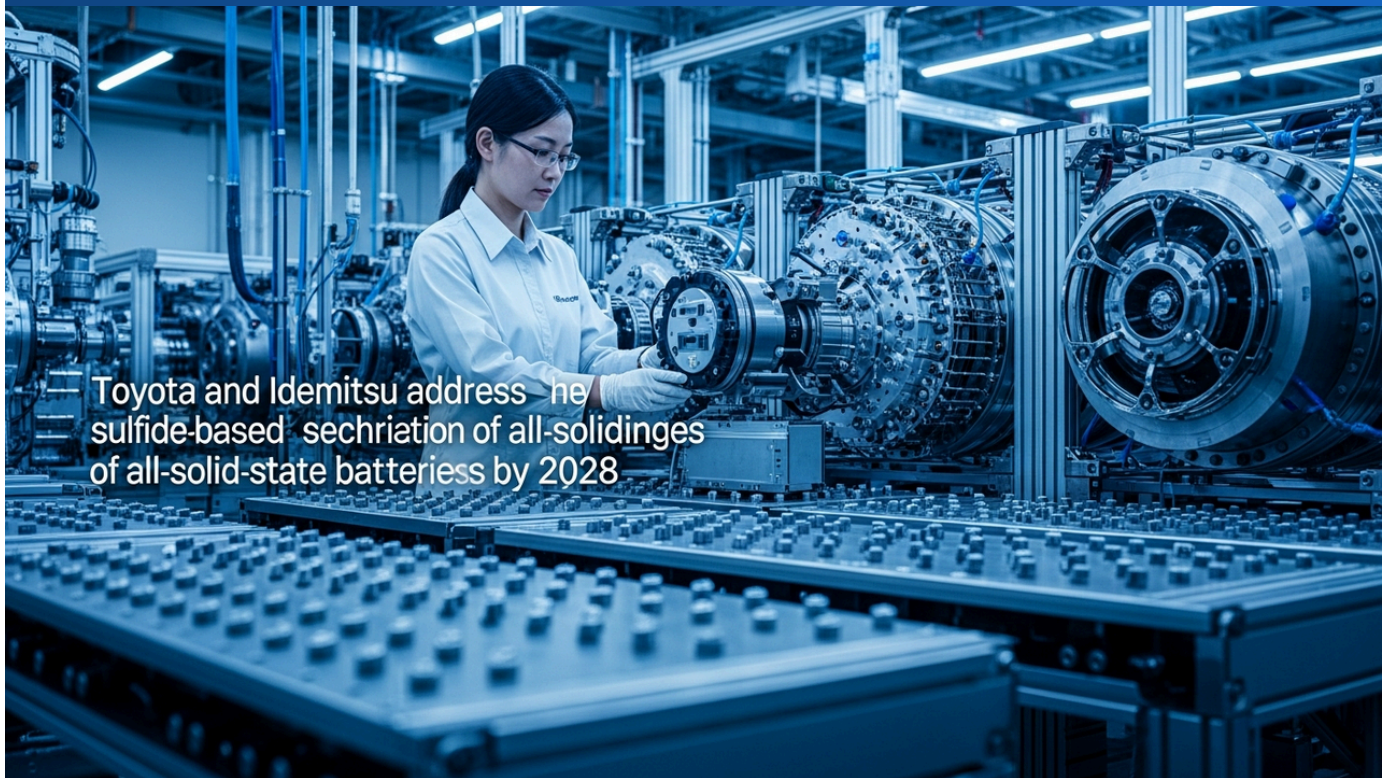
Strategic Significance & Outlook

The development of this non-flammable electrolyte is poised to redefine safety standards for lithium-ion batteries and will significantly impact the EV and stationary energy storage markets. Its energy density of 355 W/kg and operating temperature range of -30°C to +60°C enable it to replace existing battery systems, promoting the widespread adoption of safer, higher-performance products. Future efforts will focus on further validating the manufacturability, cost-effectiveness, and long-term reliability of this technology. If widely adopted, non-flammable electrolytes are expected to accelerate EV penetration, contribute to grid stabilization, and ultimately play a major role in achieving a safer and more sustainable energy society. This innovation sets a new benchmark for battery technology safety and performance.

Source: <https://globalenergyprize.org/en/2026/07/24/new-non-flammable-electrolyte-boosts-energy-density-and-safety-of-lithium-ion-batteries/>

#06 Toyota and Idemitsu Accelerate Mass Production of Sulfide-Based Solid Electrolytes for 2027-2028 All-Solid-State Battery Commercialization

Published July 26, 2026 Wevolver USA



Toyota and Idemitsu address the sulfide-based solid electrolyte commercialization of all-solid-state batteries by 2028

OVERVIEW

Toyota and Idemitsu are aggressively developing mass production technology for sulfide-based solid electrolytes, targeting commercialization of all-solid-state batteries by 2027-2028. Idemitsu is currently constructing a multi-million-ton scale pilot facility for solid electrolytes, a critical step towards overcoming manufacturing bottlenecks and realizing high-energy-density, safe batteries. This initiative addresses key technical challenges such as dendrite formation and interface resistance, positioning the companies to potentially lead the next-generation battery market.

Key Findings

Toyota and Idemitsu are making significant strides in scaling up the mass production technology for sulfide-based solid electrolytes, a crucial component for all-solid-state batteries in electric vehicles (EVs). Their ambitious timeline targets commercial availability between 2027 and 2028, with Idemitsu already establishing a multi-million-ton scale pilot facility for solid electrolyte production. This development directly tackles one of the most formidable barriers to all-solid-state battery widespread adoption: manufacturing scalability and cost efficiency.

Technical / Clinical Details

All-solid-state batteries promise substantial improvements over conventional lithium-ion batteries, including higher energy density and enhanced safety. However, their practical implementation has been hindered by several technical challenges: lithium dendrite formation, high interfacial resistance between solid electrolytes and electrodes, poor contact between cathode and electrolyte, volume changes in lithium metal anodes, the need for sustained stacking pressure, and the intricate manufacturing of thin-film solid electrolytes. Sulfide-based solid electrolytes, favored by Toyota and Idemitsu, are particularly promising due to their high ionic conductivity and inherent flexibility, which can mitigate these issues. Their current advancements aim to engineer stable, high-performance solid-state batteries that can be produced at scale.

Background & Context

The global race to develop and commercialize all-solid-state batteries is intensifying, with major automotive and battery manufacturers investing heavily. Samsung SDI, for instance, initiated a pilot line in 2022, shipped samples in 2023, and aims for mass production by 2027. All-solid-state batteries are considered a potential game-changer for the EV market, promising extended driving ranges, faster charging times, and crucially, significantly improved safety profiles by eliminating flammable liquid electrolytes. The successful commercialization of this technology could accelerate EV adoption and fundamentally transform the automotive industry.

Strategic Significance & Outlook

The establishment of mass production capabilities by Toyota and Idemitsu is poised to significantly accelerate the adoption of all-solid-state batteries. Moving forward, the focus will be on refining manufacturing processes to reduce costs and ensure consistent quality, paving the way for applications not only in EVs but also in consumer electronics and grid-scale energy storage. Despite remaining technical hurdles, Japan's proactive efforts in building a robust production infrastructure could grant it a leading position in the global battery supply chain, influencing future energy solutions worldwide.

Source: <https://www.wevolver.com/article/solid-state-batteries-vs-lithium-ion-batteries>

Collected: July 31, 2026 | Automated Research System (Gemini API)

#07 China Establishes Clear Distinction Between All-Solid-State and Semi-Solid-State Batteries with New National Standard GB/T

Published July 31, 2026 Gasgoo China



OVERVIEW

China's National Standard GB/T 'Solid-State Batteries for Electric Vehicles Part 1: Terminology and Classification,' effective July 1, 2026, formally defines and distinguishes between 'all-solid-state' and 'semi-solid-state' batteries. This standard clarifies that true all-solid-state batteries, completely free of liquid electrolytes, remain in research and pilot production stages. The move aims to prevent marketing confusion and foster transparent technological development, although current all-solid-state cells are significantly more expensive than mainstream lithium iron phosphate batteries.

Key Findings

On July 1, 2026, China officially implemented the national standard GB/T 'Solid-State Batteries for Electric Vehicles Part 1: Terminology and Classification,' which establishes a clear distinction between 'all-solid-state' and 'semi-solid-state' batteries. This new standard is designed to prevent market confusion and provide precise benchmarks for technological development. Its enactment is a significant step towards accurately assessing the maturity of solid-state battery technology and influencing future development and deployment strategies.

Technical / Clinical Details

The new standard defines 'all-solid-state batteries' as those entirely devoid of liquid electrolytes, while 'semi-solid-state batteries' are categorized as those containing a minimal amount of liquid or gel electrolyte. This clarification provides a more precise direction for R&D efforts aimed at achieving fully solid-state electrolyte systems. Currently, genuine all-solid-state batteries are still largely confined to laboratories and pilot lines, without large-scale commercial production. This is primarily due to challenges such as high interfacial resistance of solid electrolytes, dendrite formation issues, and elevated manufacturing costs. Notably, the cost of current all-solid-state battery cells is substantially higher than that of mainstream lithium iron phosphate (LFP) batteries, posing a significant barrier to widespread adoption.

Background & Context

All-solid-state batteries have garnered immense public enthusiasm as a technology promising to resolve critical electric vehicle (EV) concerns, including 'fire anxiety,' 'range limitations,' and 'slow charging.' However, a gap exists between these high expectations and the current technological readiness, exacerbated by the broad and sometimes imprecise use of the term 'all-solid-state' in marketing. The new Chinese national standard aims to establish stricter technical definitions, enabling researchers, engineers, and investors to more accurately understand the market landscape and foster healthy technological competition.

Strategic Significance & Outlook

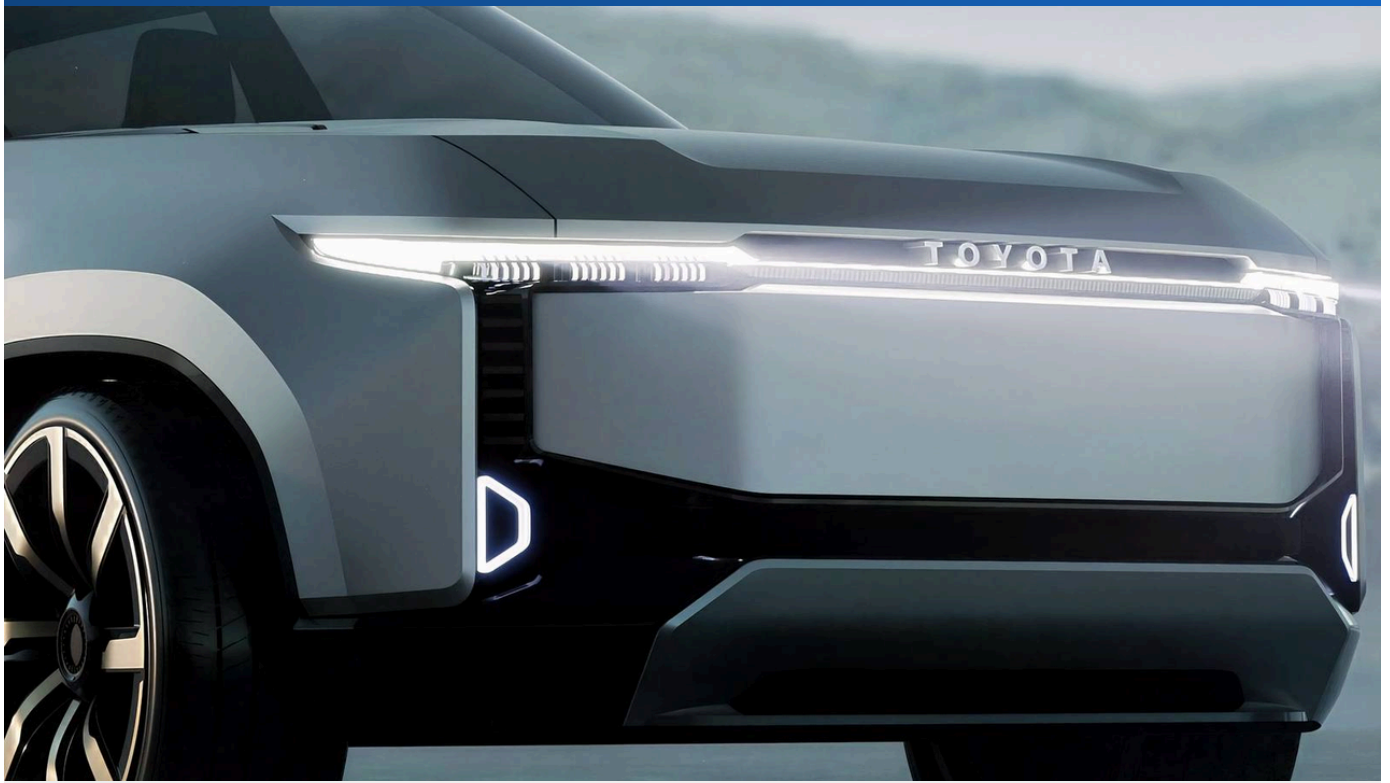
The introduction of this new standard will require Chinese battery manufacturers to adhere to more rigorous product development and disclosure practices. This is expected to stimulate advancements in semi-solid-state battery technologies while accelerating R&D investments towards the ultimate commercialization of true all-solid-state batteries. Globally, similar standardization efforts could enhance transparency and trustworthiness in solid-state battery advancements. Cost reduction and performance improvement will remain key focal points, and the commercialization of full all-solid-state batteries is still anticipated to be several years away.

Source: <https://autonews.gasgoo.com/articles/ev/all-solid-state-batteries-time-for-a-reality-check-2083020862696427521>

Collected: July 31, 2026 | Automated Research System (Gemini API)

#08 Max Planck Researchers Uncover Dendrite Formation Mechanism in Solid-State Batteries, Paving Way for Commercialization

Published July 28, 2026 CarBuzz Germany



OVERVIEW

Researchers at the Max Planck Institute for Solid State Research have identified for the first time how lithium dendrites penetrate rigid ceramic solid electrolytes, causing short circuits. This breakthrough addresses a major obstacle to the commercialization of all-solid-state batteries, which promise higher energy density and improved safety. Understanding this mechanism is crucial for developing robust electrolyte designs that enable the use of lithium metal anodes, theoretically enhancing energy storage within a smaller footprint.

Key Findings

Researchers at the Max Planck Institute for Solid State Research have made a groundbreaking discovery regarding the mechanism of lithium dendrite formation, a primary hurdle to the practical implementation of all-solid-state batteries. They successfully elucidated, for the first time in detail, how lithium dendrites penetrate rigid ceramic solid electrolytes and ultimately cause battery short circuits. This breakthrough is poised to significantly accelerate the commercialization of all-solid-state batteries by enabling the development of new battery designs and materials that effectively suppress dendrite growth.

Technical / Clinical Details

Historically, all-solid-state batteries utilizing lithium metal anodes have been plagued by the growth of tree-like lithium structures (dendrites) during charge-discharge cycles. These dendrites can fracture the solid electrolyte, leading to internal short circuits. The Max Planck Institute's research suggests that this phenomenon is not merely due to cracks in the electrolyte but also involves a mechanism where dendrites 'tunnel' through the microstructure of the solid electrolyte itself. This deeper understanding allows for more targeted approaches to physically or chemically impede dendrite growth. Theoretically, solid electrolytes enable the use of lithium metal anodes, which can store significantly more energy in the same volume compared to conventional liquid-electrolyte lithium-ion batteries. This promises substantial extensions in electric vehicle range and reductions in charging times.

Background & Context

All-solid-state batteries are considered the 'holy grail' of energy storage, offering dramatically improved safety (reduced fire risk) and higher energy density compared to current lithium-ion technologies. The electric vehicle (EV) sector, in particular, has a critical demand for extended range and faster charging, making all-solid-state batteries an ultimate solution. The dendrite problem has long been the most significant technical barrier. This discovery from the Max Planck Institute provides fundamental insight into this decades-old challenge, potentially marking a breakthrough towards practical application. New electric crossover vehicles are anticipated by 2026, offering over 300 miles (approximately 480 km) of range, fast-charging capabilities, and multi-year battery warranties, a timeline that will be significantly influenced by advancements in solid-state battery technology.

Strategic Significance & Outlook

Clarifying the dendrite formation mechanism provides direct guidance for developing more stable solid electrolytes and designing anode protective layers that effectively suppress dendrite growth. This will enhance the cycle life and safety of all-solid-state batteries, potentially establishing a strong competitive advantage in the EV market. An intensified patent race for new materials and structures based on these research findings is expected, with high-performance, reliable all-solid-state batteries potentially entering the market within a few years. This progress will accelerate electric vehicle adoption and contribute significantly to realizing a sustainable mobility society globally.

Source: <https://carbuzz.com/solid-state-battery-breakthrough-making-current-electric-vehicles-obsolete/>

#09 CATL and Other Major Battery Makers Deploy Thousands in Solid-State Battery R&D, Yet Commercial Viability Remains Unproven

Published July 30, 2026 Construction Physics USA



OVERVIEW

Major battery manufacturers, including CATL, BYD, LG, and Samsung, are investing heavily in all-solid-state battery development, with CATL dedicating over 1,000 researchers to the field. Despite the potential benefits of lighter weight, enhanced safety, and dendrite suppression, CATL's chairman cautions that the commercial viability of all-solid-state batteries is not yet established. This highlights the persistent technical complexities and high manufacturing costs that remain significant barriers to widespread adoption.

Key Findings

Leading global battery manufacturers such as CATL, BYD, LG, and Samsung are allocating substantial resources to the development of all-solid-state batteries. CATL alone reports having over 1,000 researchers dedicated to this domain as of 2024, underscoring the high expectations for the potential advantages of all-solid-state technology, including weight reduction, enhanced safety, and mitigation of dendrite formation. However, the chairman of CATL has issued a cautionary note, stating that the commercial viability of all-solid-state batteries is not yet established, emphasizing the significant technical hurdles and cost challenges that persist.

Technical / Clinical Details

All-solid-state batteries aim to fundamentally improve safety and significantly increase energy density by replacing the flammable liquid electrolytes in traditional lithium-ion batteries with solid-state alternatives, such as ceramics, polymers, or composite materials. The elimination of liquid electrolytes drastically reduces the risk of thermal runaway and fire, while enabling the use of lithium metal anodes, which promise higher capacity in a more compact design. Nevertheless, key obstacles to commercialization remain, including high interfacial resistance between solid electrolytes and electrodes, persistent dendrite formation issues, and the high costs associated with complex manufacturing processes. Major players are intensively focusing on innovations in materials science, interface engineering, and manufacturing techniques to overcome these challenges.

Background & Context

The rapid growth of the electric vehicle (EV) market positions battery technology evolution as a decisive factor shaping the future of mobility. Current lithium-ion batteries are approaching their performance limits, with demands for further improvements in range, charging speed, and safety. All-solid-state batteries are widely considered the most promising 'next-generation battery' to meet these requirements, attracting significant attention and investment from governments, automakers, and venture capitalists worldwide. Asian giants like CATL and BYD from China, and LG and Samsung from South Korea, are leading this intense development race, reflecting a fierce competition for technological supremacy.

Strategic Significance & Outlook

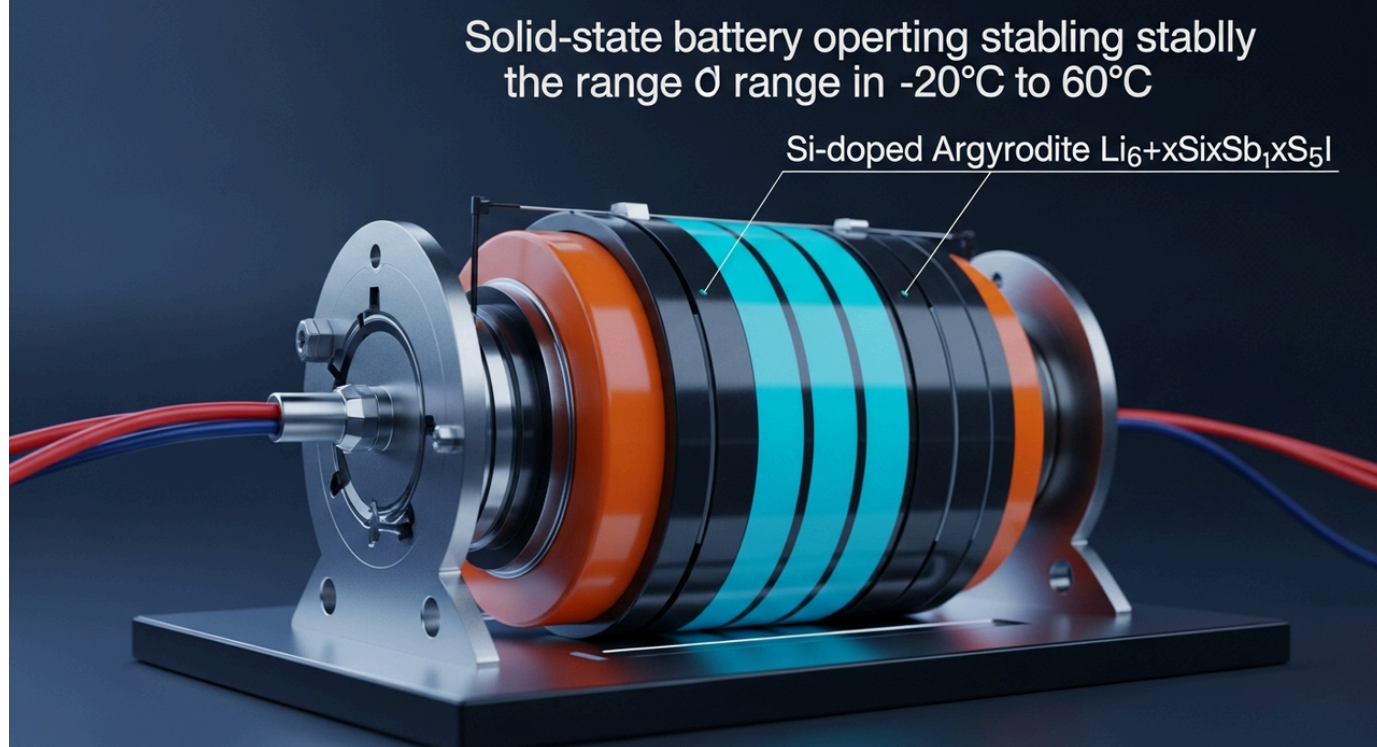
The statements from CATL's chairman suggest that the commercialization of all-solid-state batteries will still require time, necessitating significant technical breakthroughs and cost reductions. Nevertheless, the massive investment and talent allocation by leading global corporations indicate that research and development will continue to progress rapidly. Going forward, success will hinge not only on material discovery but also on establishing efficient manufacturing processes and robust supply chains. The transition from pilot to large-scale production, and the ability to optimize the balance between performance, safety, and cost, will be the ultimate test for all-solid-state batteries to truly dominate the market.

Source: <https://www.construction-physics.com/p/why-is-everyone-trying-to-build-a>

Collected: July 31, 2026 | Automated Research System (Gemini API)

#10 All-Solid-State Battery with Si-Doped Argyrodite $\text{Li}_{6+x}\text{S}_i\text{Sb}_{1-x}\text{S}_5\text{I}$ Electrolyte Demonstrates Stable Operation from -20°C to 60°C

Published July 23, 2026 arXiv Unknown



OVERVIEW

Researchers have developed an all-solid-state battery combining a Si-doped antimony argyrodite $\text{Li}_{6+x}\text{S}_i\text{Sb}_{1-x}\text{S}_5\text{I}$ electrolyte with an LiNbO_3 -coated $\text{LiNi}_{0.7}\text{Co}_{0.1}\text{Mn}_{0.2}\text{O}_2$ cathode, demonstrating stable cycling performance across a wide temperature range from -20°C to 60°C . The battery achieved an initial discharge capacity of 171.2 mAh g^{-1} and maintained 84.2% capacity retention after 200 cycles, highlighting its potential for durable, high-performance next-generation all-solid-state batteries in extreme conditions. This work represents a significant advance in overcoming interfacial stability and ionic conductivity challenges in sulfide solid-state electrolytes.

Key Findings

Stable operation of all-solid-state batteries across a broad temperature range is a critical factor for their practical implementation. This research demonstrates that an all-solid-state battery, fabricated by combining a Si-doped antimony argyrodite $\text{Li}_6\text{+xSi}_x\text{Sb}_{1-x}\text{S}_5\text{I}$ electrolyte with an LiNbO_3 -coated $\text{LiNi}_{0.7}\text{Co}_{0.1}\text{Mn}_{0.2}\text{O}_2$ (NCM) cathode, maintains stable cycling performance within a remarkably wide temperature range, specifically from -20°C to 60°C . Achieving an initial discharge capacity of 171.2 mAh g^{-1} and an impressive 84.2% capacity retention after 200 cycles, this breakthrough paves the way for reliable, high-performance next-generation all-solid-state batteries capable of operating under harsh thermal conditions.

Technical / Clinical Details

This innovative all-solid-state battery utilizes the sulfide-based solid electrolyte $\text{Li}_6\text{+xSi}_x\text{Sb}_{1-x}\text{S}_5\text{I}$ to achieve both high ionic conductivity and superior interfacial stability. This argyrodite-type electrolyte is characterized by its ability to facilitate rapid lithium ion transport, particularly exhibiting high ionic conductivity at room temperature. Furthermore, the cathode material, $\text{LiNi}_{0.7}\text{Co}_{0.1}\text{Mn}_{0.2}\text{O}_2$, is coated with LiNbO_3 (lithium niobate) to reduce interfacial resistance and suppress detrimental side reactions between the electrolyte and electrode. This strategic modification significantly enhances stability during charge-discharge cycles across the extended temperature range. Specifically, the battery delivered an initial discharge capacity of 171.2 mAh g^{-1} and maintained a high capacity retention of 84.2% after 200 cycles. Its ability to sustain stable performance even at low temperatures (-20°C) is a crucial advancement for electric vehicles (EVs) and other applications operating in extreme climates.

Background & Context

All-solid-state batteries are garnering significant attention as a next-generation battery technology due to their potential for higher energy density and improved safety compared to existing lithium-ion batteries. However, sulfide-based solid electrolytes, in particular, have long struggled with challenges such as air stability and performance degradation due to interfacial side reactions with lithium metal anodes. Poor performance in low-temperature environments has also been a major barrier. The stable operation across a wide temperature range demonstrated in this study presents a concrete material design and interfacial engineering strategy to overcome these issues, marking a significant step towards the practical application of all-solid-state batteries. This expands the potential regions and applications where all-solid-state batteries can be utilized.

Strategic Significance & Outlook

The all-solid-state battery developed in this research, utilizing the $\text{Li}_{6+x}\text{S}_x\text{Sb}_{1-x}\text{S}_5\text{I}$ electrolyte, exhibits a clear advantage over existing technologies in terms of wide-temperature stability. Future challenges will include further extending cycle life, adapting to higher voltages, and simplifying manufacturing processes while reducing costs. This achievement is expected to find applications in sectors demanding highly reliable batteries under various thermal conditions, such as electric vehicles (EVs), aerospace, and stationary energy storage systems. Notably, it could be a pivotal technology for accelerating EV adoption in regions with extremely cold or hot climates.

Source: <https://arxiv.org/html/2607.19664v1>

#11 Hacker News Analyzes Corporate Focus on All-Solid-State Batteries: High Energy Density and Safety as Key Drivers

Published July 30, 2026 Hacker News USA



OVERVIEW

A Hacker News discussion analyzes why numerous companies are concentrating on all-solid-state battery development, citing their potential for higher energy density, enhanced safety, and eventual lower costs compared to liquid-electrolyte lithium-ion batteries. Ideal solid electrolytes are characterized as polymer or single-ion conductive, capable of suppressing dendrites, exhibiting room-temperature ionic conduction activation energy below 10 kJ/mol, and no phase transitions from -40°C to 80°C . However, such an ideal battery remains unrealized at present.

Key Findings

A discussion on Hacker News has analyzed why a significant number of companies worldwide are intensely investing in the development of all-solid-state batteries. The primary drivers are the technology's potential for substantially higher energy density, superior safety, and the long-term prospect of reduced costs compared to conventional liquid-electrolyte lithium-ion batteries. This technology promises radical improvements in electric vehicle (EV) range and safety, making it a leading candidate for the next generation of energy storage.

Technical / Clinical Details

The core principle of all-solid-state batteries involves replacing flammable liquid electrolytes with solid materials. This change dramatically reduces the risk of thermal runaway and fire, while simultaneously enabling the use of lithium metal anodes, which can achieve energy storage capacities far exceeding those of current liquid-based batteries. However, effectively suppressing dendrite formation remains a paramount challenge. The discussion points out that ideal solid electrolytes for dendrite control would be polymer or single-ion conductive, possessing an ionic conduction activation energy below 10 kJ/mol at room temperature, and exhibiting no phase transitions across a wide operating range from -40°C to 80°C. As of now, an 'ideal' battery meeting all these stringent requirements has not yet been commercialized.

Background & Context

The burgeoning electric vehicle (EV) market has created an urgent demand for high-performance and safe batteries. While conventional lithium-ion batteries are reaching their performance plateaus, safety concerns, particularly fire incidents, act as a significant deterrent for consumer EV adoption. All-solid-state batteries have the potential to resolve these multifaceted challenges simultaneously, prompting automakers, battery manufacturers, startups, and research institutions to enter a fierce development race. This discussion illuminates the gap between technological ideals and current realities, while also outlining the direction for future research and development to bridge this divide.

Strategic Significance & Outlook

The quest for ideal solid electrolyte materials remains at the forefront of R&D for all-solid-state battery commercialization. Addressing the complex interplay of challenges—dendrite suppression, high ionic conductivity, broad operating temperature range, and manufacturing cost reduction—will require further innovation in materials science, interface engineering, and device design. Future advancements are expected to come from refining existing materials, discovering entirely new material systems, or through hybrid approaches to approximate these ideal characteristics. Success in these areas will dramatically enhance the performance and safety of electric vehicles, accelerating the transition towards a more sustainable energy future globally.

Source: <https://news.ycombinator.com/item?id=49109193>

Collected: July 31, 2026 | Automated Research System (Gemini API)

#12 UW-Madison Study Reveals Solid-State Batteries Offer Enhanced Safety but Still Pose Fire Risk in Worst-Case Scenarios

Published July 25, 2026 不明 USA



OVERVIEW

Engineers at the University of Wisconsin-Madison reveal that while all-solid-state batteries offer significant safety advantages over conventional lithium-ion cells, they are not immune to ignition and combustion in severe accident scenarios. Despite eliminating flammable liquid electrolytes, the research indicates thermal runaway remains a possibility, driven by factors like high energy density and lithium metal anodes. This finding underscores the critical need for rigorous safety design and evaluation as next-generation battery technologies approach commercialization.

Background

As the adoption of electric vehicles (EVs) accelerates globally, battery safety has emerged as a paramount concern for both consumers and regulatory bodies. Frequent fire incidents involving existing lithium-ion batteries often escalate into significant public safety issues, intensifying the drive for next-generation battery technologies. All-solid-state batteries (ASSBs) have long been hailed as the 'ultimate solution' to these safety concerns, promising a radical reduction in fire risk by replacing flammable liquid electrolytes with non-flammable solid counterparts. However, new research from the University of Wisconsin-Madison offers a realistic perspective, challenging overly optimistic expectations. Assistant Professor Eric Kazak, who led the research, stated, "Our research shows that as next-generation batteries start to become commercial products, they need to be seriously considered to be as safe as possible," emphasizing the necessity for rigorous safety evaluation and design from the earliest stages of technological development.

Key Findings

Research conducted by engineers at the University of Wisconsin-Madison has revealed that while all-solid-state batteries offer potential safety improvements compared to existing liquid-electrolyte lithium-ion batteries, they cannot completely eliminate the risk of ignition and combustion under harsh conditions or in worst-case accident scenarios. This discovery challenges conventional assumptions about the absolute safety of all-solid-state batteries and emphasizes the need for even more stringent safety measures as they approach commercialization.

Technical Insights

All-solid-state batteries are widely anticipated to significantly reduce the risk of thermal runaway and fire by replacing flammable organic liquid electrolytes with non-flammable solid electrolytes. However, this study demonstrated that even lithium metal batteries utilizing solid electrolytes can experience thermal runaway under specific conditions, potentially leading to fire. The researchers point out that the lower heat capacity of solids compared to liquids, combined with the high energy density of all-solid-state batteries and the inherent presence of lithium metal anodes, contributes to intrinsic hazards. This suggests that merely removing liquid electrolytes does not guarantee 'absolute' safety; mechanisms for thermal runaway can still exist if internal short circuits within the solid electrolyte, external physical damage, or overcharging interact in a complex manner. This analysis highlights that further optimization of material selection, cell structure, and battery management systems (BMS) is essential for the safety design of all-solid-state batteries.

Strategic Implications & Outlook

This study presents new considerations for safety design to all-solid-state battery developers. Moving forward, the selection of materials (e.g., more thermally stable solid electrolytes), cell structural design (enhancing internal short-circuit prevention mechanisms), and the development of advanced battery management systems (capable of detecting thermal runaway precursors and preventing them proactively) will become even more critical. While all-solid-state batteries remain a promising technology, ensuring their true safety and reliability requires collaboration between academia and industry to establish comprehensive risk assessment and robust safety design standards. This collaborative effort is expected to lead to the realization of truly safe, next-generation batteries that consumers can trust and utilize with confidence.

Source: <https://pubs.rsc.org/ta/article/doi/10.1039/d6ta03047e/1283229/Fire-safety-profiles-of-lithium-metal-batteries?searchresult=1>

#13 Toyota's 745-Mile Solid-State Battery Demonstrates Range and Safety Advantages Over Honda's Technology

Published July 29, 2026 Top Speed USA



OVERVIEW

Toyota's all-solid-state battery is projected to overcome existing EV limitations, theoretically offering a 745-mile (approx. 1,200 km) range, rapid charging capability, and robust performance across extreme temperatures. Key features include significant weight reduction and resistance to degradation during fast charging, along with resilience to extreme heat and cold. These advancements promise to substantially alleviate EV drivers' range and charging time anxieties.

Key Findings

Toyota's all-solid-state battery, currently under development, theoretically promises an astonishing 745-mile (approximately 1,200 km) driving range, positioning it to fundamentally resolve the major weaknesses inherent in existing electric vehicles (EVs), namely range anxiety, charging times, and safety concerns. This revolutionary technology is characterized by a dramatic reduction in battery weight, the capacity to withstand rapid charging without accelerated degradation, and robust functionality even under extreme hot or cold conditions.

Technical / Clinical Details

All-solid-state batteries achieve exponential leaps in safety and energy density by replacing the flammable liquid electrolytes found in current lithium-ion batteries with solid materials. Toyota's specific approach is believed to focus on sulfide-based solid electrolytes, known for their high ionic conductivity. This enables the use of lithium metal anodes, allowing for greater energy storage in a smaller volume, leading to lighter and more compact, yet higher-capacity, battery packs. The elimination of liquid electrolytes eradicates risks of leakage and fire, dramatically enhancing safety. Furthermore, all-solid-state batteries typically exhibit lower internal resistance and reduced performance degradation in high and low-temperature environments, ensuring stable operation across diverse climates and preserving battery life during rapid charging by suppressing heat generation. This technology is expected to significantly mitigate primary anxieties for current EV drivers, such as 'searching for charging stations,' 'waiting for charging,' and 'reduced range in winter.'

Background & Context

While the electric vehicle market is rapidly expanding, range anxiety, inadequate charging infrastructure, long charging times, and battery safety (particularly fire incidents) remain major barriers to mass consumer adoption. Automakers and battery companies, including Toyota, are investing colossal sums into all-solid-state battery development to address these challenges. Toyota, in particular, holds one of the world's largest portfolios of battery-related patents and is recognized as a pioneer in all-solid-state battery technology. Although Honda is also developing solid-state batteries, Toyota's 745-mile target significantly exceeds current industry benchmarks, holding crucial implications for establishing competitive superiority in the EV market.

Strategic Significance & Outlook

If Toyota successfully achieves its all-solid-state battery performance targets and establishes large-scale mass production capabilities, it would revolutionize the electric vehicle industry. This would allow EVs to offer comparable or even superior convenience to gasoline-powered cars, significantly boosting consumer interest. However, challenges towards commercialization persist, including cost reduction in mass production, complexity of manufacturing processes, and ensuring long-term durability. Toyota's success with this technology would accelerate the global automotive industry's transition to all-solid-state batteries, marking a pivotal turning point towards a sustainable mobility society.

Source: <https://www.topspeed.com/how-toyota-745-mile-solid-state-battery-different-hondas/>

Collected: July 31, 2026 | Automated Research System (Gemini API)

#14 ZENCAR Explains All-Solid-State Batteries Surpass Lithium-Ion in Safety, Energy Density, and Structural Simplification

Published July 23, 2026 ZENCAR Unknown



OVERVIEW

ZENCAR details how all-solid-state batteries offer significant advantages over conventional lithium-ion counterparts by replacing liquid electrolytes with solid materials, leading to enhanced safety, higher energy density, and simplified structures. The absence of flammable liquid electrolytes mitigates risks of leakage, fire, and thermal runaway. Furthermore, the use of lithium metal anodes enables energy storage capacities far exceeding traditional batteries, promising extended EV ranges and improved safety.

Key Findings

A recent article by ZENCAR analyzes that all-solid-state batteries offer distinct advantages over existing lithium-ion batteries, including substantially enhanced safety, dramatically higher energy density, and simplified structural design. The fundamental shift from liquid to solid electrolytes forms the basis for these superior attributes. This technology holds immense promise for resolving key challenges in the electric vehicle (EV) market and is widely considered the next-generation battery.

Technical / Clinical Details

The primary distinguishing feature of all-solid-state batteries is the replacement of flammable organic liquid electrolytes with solid materials such as ceramics or polymers. This fundamental change inherently reduces major safety risks associated with current lithium-ion batteries, including electrolyte leakage, fire due to internal short circuits, and thermal runaway. Solid electrolytes also enable the use of lithium metal anodes, which possess a theoretical capacity significantly higher than traditional graphite anodes (e.g., approximately ten times that of graphite). This dramatically boosts the battery's energy storage capacity. Moreover, since the solid electrolyte can also function as a separator, the battery cell structure is simplified, allowing for more compact and lightweight designs. This enables substantial extensions in EV driving range and increases packaging flexibility.

Background & Context

As electric vehicles (EVs) become more prevalent, consumers and regulatory bodies are imposing increasingly stringent demands not only on battery performance but also on safety. While existing lithium-ion batteries are reaching maturity in terms of performance, concerns about fire incidents persist, and further extensions of driving range are facing technical limits. All-solid-state batteries are garnering attention from automakers, battery manufacturers, and research institutions worldwide as the most promising solution to these complex challenges. Leading nations such as Japan, South Korea, China, Germany, and the United States are at the forefront of this development race, investing substantial capital.

Strategic Significance & Outlook

The benefits offered by all-solid-state batteries—enhanced safety, high energy density, and structural simplification—open up applications across a wide range of sectors beyond electric vehicles, including aerospace, drones, mobile devices, and stationary energy storage. However, challenges such as reducing manufacturing costs, addressing interfacial resistance between solid electrolytes and electrodes, and completely suppressing dendrite formation still exist for large-scale commercialization. If these challenges are overcome, all-solid-state batteries have the potential to replace existing lithium-ion batteries, establish a new standard for energy storage technology, and significantly contribute to the realization of a sustainable society.

Source: <https://www.zencar.net/solid-state-battery-vs-lithium-ion/>

Collected: July 31, 2026 | Automated Research System (Gemini API)

#15 BYD Files Patent for Dual Electrolyte Cathode Using Halide and Sulfide to Extend All-Solid-State Battery Lifespan

Published July 30, 2026 Autoblog USA



OVERVIEW

BYD has filed a patent for a dual-electrolyte cathode combining halide and sulfide materials, aimed at addressing solid-solid interfacial degradation in all-solid-state batteries. This approach seeks to directly counter the loss of physical contact between solid materials during repeated charge-discharge cycles. By blending rigid halide particles with a flexible sulfide matrix, the technology aims to maintain critical contact points under continuous electrical stress, ensuring long-term battery performance.

Key Findings

BYD, a prominent Chinese automotive and battery manufacturer, has filed a patent for an innovative dual-electrolyte cathode technology designed to extend the lifespan of all-solid-state batteries. This patent aims to resolve a critical challenge in solid-state batteries—solid-solid interfacial degradation—by employing a composite of halide and sulfide materials, thereby suppressing performance decline during repeated charge-discharge cycles. This approach is expected to significantly contribute to the practical implementation and market competitiveness of all-solid-state batteries.

Technical / Clinical Details

One of the primary factors degrading all-solid-state battery performance is the increased interfacial resistance caused by the loss of physical contact between the solid electrolyte and electrodes during charge-discharge cycling. BYD's new patented technology directly addresses this issue by utilizing a dual-electrolyte cathode. Specifically, a composite material combining rigid halide solid electrolyte particles with a more flexible sulfide solid electrolyte matrix is applied to the cathode. Halide electrolytes offer high ionic conductivity and excellent oxidative stability, while sulfide electrolytes provide high room-temperature ionic conductivity and superior mechanical flexibility. By integrating these materials, the flexible sulfide matrix maintains contact between the rigid particles, ensuring stable ion transport pathways even when the battery is subjected to electrical stress. This dramatically improves the stability of the solid-solid interface, significantly extending the expected cycle life of all-solid-state batteries.

Background & Context

All-solid-state batteries are garnering significant attention from automakers and battery companies worldwide as a next-generation battery technology that offers higher energy density and improved safety compared to existing lithium-ion batteries. While they are expected to enhance electric vehicle (EV) range and safety, the instability of solid-solid interfaces has long been a major technical barrier. BYD, as one of the world's largest EV and battery manufacturers, demonstrates its strong commitment to commercializing all-solid-state battery technology through this patent filing. This innovative approach presents a novel solution to interfacial problems faced by other research institutions and companies, potentially stimulating technological advancements across the entire industry.

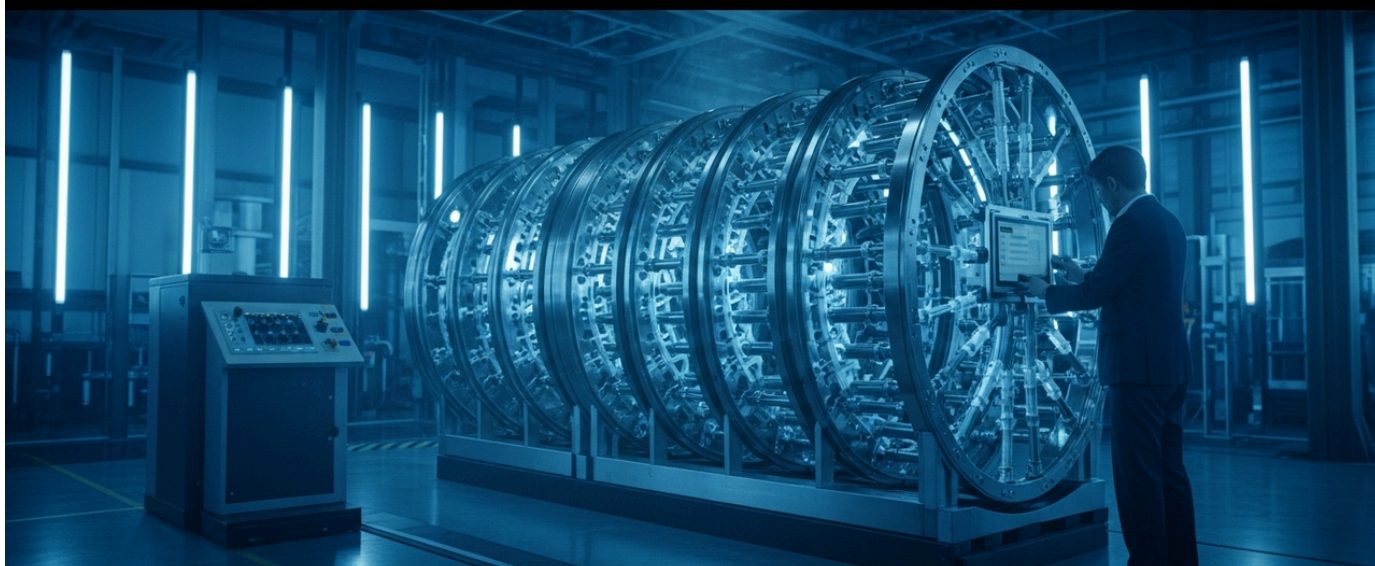
Strategic Significance & Outlook

BYD's dual-electrolyte cathode technology holds substantial promise for enhancing the longevity and reliability of all-solid-state batteries. Attention now turns to how this patented technology will be integrated into actual battery products and scaled for mass production. If successful, this approach would not only improve the cost-efficiency and performance of all-solid-state batteries, further strengthening BYD's competitiveness in the electric vehicle market, but also become a crucial factor in accelerating the widespread adoption of all-solid-state batteries. Moreover, this technology could provide valuable insights applicable to other battery development efforts, contributing to the advancement of next-generation energy storage systems.

Source: <https://www.autoblog.com/news/byd-finds-a-way-to-make-solid-state-ev-batteries-last-longer>

#16 Darcy & Roy Press Reviews Challenges and Opportunities in All-Solid-State Electrolytes: Comparing Oxides, Sulfides, Polymers, and Composites

Published July 28, 2026 Darcy & Roy Press Unknown



Darcy & Roy Press

Publication 2026

OVERVIEW

A paper by Darcy & Roy Press comprehensively reviews the material properties, performance advantages, key issues, and improvement strategies for oxide, sulfide, polymer, and composite solid electrolytes. Oxide and sulfide electrolytes are inorganic materials offering good thermal stability and relatively high ionic conductivity, while polymer electrolytes provide flexibility, and composites merge the strengths of both. However, these materials commonly face challenges such as insufficient ionic conductivity, high interfacial resistance, and limited stability, underscoring the need for further R&D to commercialize all-solid-state batteries.

Key Findings

A paper published by Darcy & Roy Press provides a comprehensive review of solid electrolyte materials—oxides, sulfides, polymers, and composites—which are at the core of all-solid-state batteries. This research meticulously analyzes the unique advantages and shared technical challenges of each material, such as insufficient ionic conductivity, high interfacial resistance, and limited stability, thereby suggesting future directions for R&D towards the commercialization of all-solid-state batteries.

Technical / Clinical Details

Solid electrolytes are broadly categorized into four types, each possessing distinct characteristics and challenges:

- **Oxide Electrolytes:** Generally exhibit good thermal stability and relatively high ionic conductivity, with excellent chemical stability. However, they face challenges such as high grain boundary resistance and difficulty in achieving good physical contact with electrodes. Examples include garnet-type oxides (LLZO).
- **Sulfide Electrolytes:** Demonstrate very high ionic conductivity at room temperature and good interfacial contact with electrodes, making them one of the most promising candidates for electric vehicle (EV) applications. Materials like $\text{Li}_6\text{PS}_5\text{Cl}$ (argyrodite type) are gaining attention. However, they have a drawback of low air stability (H_2S gas evolution).
- **Polymer Electrolytes:** Offer excellent flexibility and are relatively easy to manufacture, which allows for potentially good contact with electrodes. The main challenge, however, is their low ionic conductivity at room temperature, typically requiring elevated operating temperatures.
- **Composite Electrolytes:** Aim to merge the advantages of organic (polymer) and inorganic (oxide or sulfide) materials to achieve both flexibility and high ionic conductivity. This approach seeks to compensate for the shortcomings of individual materials, providing a more balanced performance.

While each of these electrolytes offers distinct advantages, they commonly face challenges such as achieving sufficiently high ionic conductivity, minimizing interfacial resistance with electrodes, and ensuring long-term stability. Crucially, the suppression of lithium dendrite formation and the simplification of manufacturing processes remain key focuses for commercialization.

Background & Context

All-solid-state batteries are globally recognized as a next-generation technology poised to deliver superior safety and energy density compared to existing lithium-ion batteries by eliminating flammable liquid electrolytes. Extended EV range, faster charging times, and reduced fire risk are highly attractive features for consumers. Consequently, materials scientists and engineers are intensely focused on developing higher-performance and more reliable solid electrolyte materials, and this paper provides valuable insights into the current state and challenges of such R&D efforts.

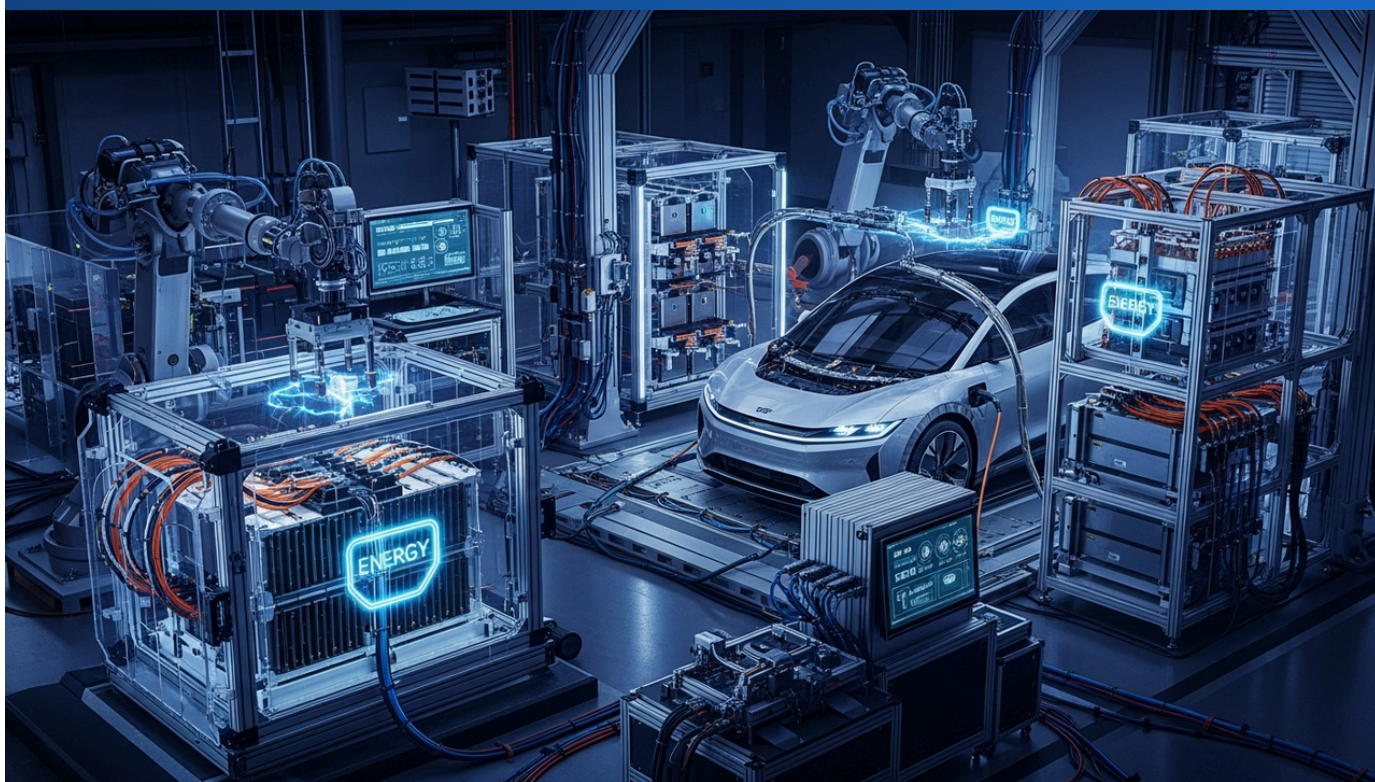
Strategic Significance & Outlook

This review unequivocally indicates that continued R&D is essential to further enhance the performance of solid electrolytes for the practical application of all-solid-state batteries. Particularly, the design of composite electrolytes that maximize synergistic effects between different materials and advancements in interface engineering will be key to future breakthroughs. In time, as these challenges are overcome, all-solid-state batteries are expected to provide innovative energy storage solutions across a wide range of sectors, including electric vehicles, aerospace, medical devices, and wearable electronics.

Source: <https://drpress.org/ojs/index.php/ije/article/view/35467>

#17 Factorial Energy and Stellantis Begin North American Testing of FEST Solid-State Battery, Accelerating EV Commercialization

Published July 29, 2026 Electrek USA



OVERVIEW

Factorial Energy announced the start of North American testing for its FEST all-solid-state battery cells in partnership with Stellantis. These 77Ah FEST cells, integrated into Stellantis' STLA Large platform, are powering the Dodge Charger Daytona prototype. The cells achieved an energy density of 375 Wh/kg over 600 cycles, maintained performance across extreme temperatures from -30°C to 45°C , and demonstrated ultra-fast charging from 15% to 90% in just 18 minutes. This marks a significant milestone towards all-solid-state battery commercialization in EVs.

Key Findings

Factorial Energy has announced the commencement of North American testing for its FEST (Factorial Electrolyte System Technology) all-solid-state battery cells, through a strategic partnership with automotive giant Stellantis. This advanced technology has been integrated into Stellantis' next-generation EV platform, STLA Large, and is actively powering the Dodge Charger Daytona prototype. Notably, Factorial's 77Ah FEST cells have achieved an impressive energy density of 375 Wh/kg maintained over 600 cycles. Beyond this, they demonstrate stable operation across an extreme temperature range from -30°C to 45°C and achieve ultra-fast charging from 15% to 90% in a mere 18 minutes, establishing a critical milestone for the practical implementation of all-solid-state batteries in electric vehicles.

Technical / Clinical Details

Factorial's FEST technology aims to overcome the safety, energy density, and charging speed limitations of existing liquid-electrolyte lithium-ion batteries by employing a solid electrolyte alongside proprietary electrode materials. The tested 77Ah FEST cells have unequivocally demonstrated their superior performance. The 375 Wh/kg energy density suggests a significant potential for extending EV driving ranges. Achieving high capacity retention over 600 cycles indicates robust long-term reliability and durability. Most impressively, the ability to maintain stable performance across a wide temperature spectrum, from frigid -30°C to scorching 45°C, is paramount for enabling EV operation in diverse geographical regions. Furthermore, the ultra-fast charging capability—allowing a 15% to 90% charge in just 18 minutes—elevates EV convenience to a level comparable with gasoline vehicles, dramatically reducing waiting times at charging stations. These metrics clearly demonstrate that all-solid-state battery technology is progressing beyond laboratory-scale achievements to reach a deployable level in real-world vehicles.

Background & Context

While the electric vehicle (EV) market is experiencing rapid growth, key consumer concerns remain range anxiety, lengthy charging times, and battery safety. All-solid-state batteries are anticipated as the 'holy grail' solution to these challenges, spurring intense global competition among automakers and battery developers. The partnership between Factorial Energy and Stellantis represents a powerful strategic move, combining an emerging battery technology firm with a traditional automotive manufacturer to accelerate development from research to real-vehicle integration and, ultimately, mass production. The integration of FEST cells into the Dodge Charger Daytona prototype signifies that all-solid-state battery technology is indeed beginning to shape the future of the automotive industry.

Strategic Significance & Outlook

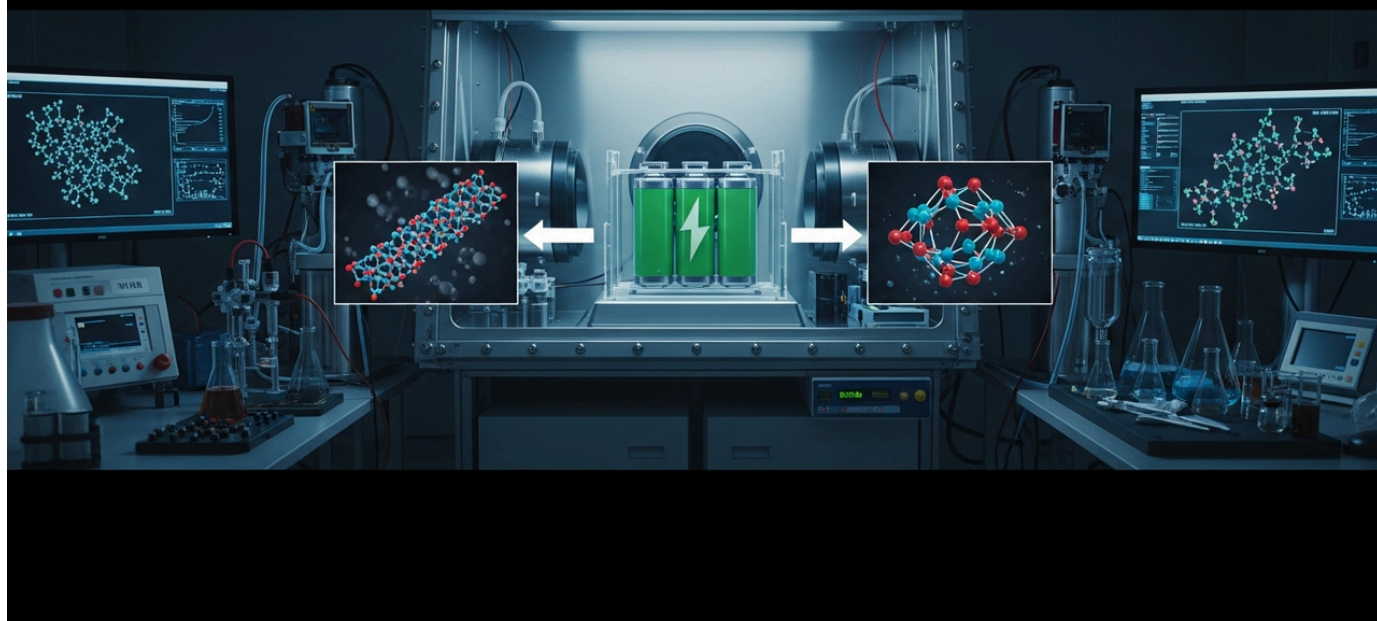
The success of Factorial Energy's FEST cells strongly reinforces the potential for all-solid-state batteries to profoundly transform the electric vehicle market. The immediate focus will now shift to optimizing manufacturing processes and reducing costs for large-scale production of this technology. The collaboration with Stellantis is crucial for Factorial to rapidly bring its technology to market and establish itself as a key player in the global EV supply chain. This development is expected to significantly impact other automakers and battery companies, acting as a catalyst to further accelerate the development and adoption of all-solid-state batteries. Ultimately, consumers can look forward to enjoying safer, longer-range, and faster-charging electric vehicles.

Source: <https://electrek.co/2026/07/29/solid-state-ev-battery-leaders-team-up/>

Collected: July 31, 2026 | Automated Research System (Gemini API)

#19 ACS Energy Letters Paper Unveils Decomposition Mechanism of Quinone-Based Electrodes in Sulfide All-Solid-State Batteries

Published July 23, 2026 ACS Energy Letters USA



OVERVIEW

This study clarifies the decomposition mechanism of quinone-based electrodes in sulfide all-solid-state batteries, addressing the paradox where sulfide solid electrolytes suppress benzoquinone decomposition but cause severe interfacial degradation. It identifies that nucleophilic attack and proton-driven self-discharge coexist and contribute to the overall degradation process. The findings conclude that designing organic electrode materials resistant to initial nucleophilic attack is crucial, providing new material design guidelines for enhancing the stability and lifespan of all-solid-state batteries.

Key Findings

This research, published in ACS Energy Letters, meticulously elucidates the decomposition mechanism of quinone-based electrodes within sulfide all-solid-state batteries. This groundbreaking discovery resolves a long-standing paradox where sulfide solid electrolytes, while suppressing benzoquinone decomposition, simultaneously induce severe degradation at the electrode-electrolyte interface. The study clearly demonstrates that both nucleophilic attack and proton-driven self-discharge contribute synergistically to the overall degradation process, emphasizing the critical importance of resistance to initial nucleophilic attack in future organic electrode material designs.

Technical / Clinical Details

Quinone-based organic electrode materials are drawing significant attention as promising candidates for next-generation batteries due to their high theoretical capacity and abundant resources. However, interfacial stability has been a major challenge, particularly in all-solid-state batteries employing sulfide solid electrolytes. This study utilized advanced analytical techniques, including operando DEMS (Differential Electrochemical Mass Spectrometry) and XPS (X-ray Photoelectron Spectroscopy), to meticulously track electrode degradation behavior during charge-discharge cycles. The results revealed that 'nucleophilic attack' by nucleophilic sulfide ions from the electrolyte on the carbonyl groups of the electrode, combined with 'proton-driven self-discharge' caused by trace amounts of water or protic impurities within the electrolyte, simultaneously accelerate the decomposition of the electrode material. Understanding this complex, combined degradation mechanism provides more effective guidelines for designing electrode materials and interfacial protection layers to enhance the performance and stability of sulfide all-solid-state batteries.

Background & Context

All-solid-state batteries are anticipated as the 'holy grail' for improving safety and energy density in electric vehicles (EVs) and stationary energy storage systems. Sulfide solid electrolytes are among the most promising candidates due to their high ionic conductivity, yet challenges concerning their chemical and electrochemical stability at the electrode interface persist. Organic electrode materials are actively researched for their low cost and environmental friendliness, but the unclear decomposition mechanisms have hindered their practical application. The findings of this study provide crucial scientific insights to resolve this fundamental problem, thereby accelerating the development of high-performance all-solid-state batteries.

Strategic Significance & Outlook

The insights gained from this research on decomposition mechanisms will directly inform the design of new organic electrode materials that are resistant to initial nucleophilic attack, or the development of innovative interfacial layers to protect the interface between the electrolyte and electrode. For example, forming barrier layers against nucleophilic sulfide ions or improving techniques for removing protic impurities could be explored. This is expected to significantly enhance the cycle life and energy efficiency of sulfide all-solid-state batteries, accelerating their commercialization in various applications, including electric vehicles. Ultimately, this will contribute to the realization of more sustainable and high-performance energy storage systems.

Source: <https://pubs.acs.org/doi/10.1021/acsenergylett.6c01251>

#20 Tattu (Grepow) Unveils Revolutionary Semi-Solid-State Battery for Commercial Drones: Achieving 350Wh/Kg Energy Density

Published July 25, 2026 DB旗舰 China



OVERVIEW

Tattu (Grepow) has introduced a groundbreaking semi-solid-state battery designed for commercial drones, achieving an impressive energy density of 350 Wh/kg. This innovative design integrates gel electrolytes with a solid electrolyte coating, significantly reducing liquid electrolyte content to extend drone flight times. Crucially, this hybrid approach effectively suppresses dendrite growth, dramatically enhancing both battery safety and cycle life, poised to redefine capabilities in the commercial drone sector.

Background

The burgeoning commercial drone market, driven by diverse applications and economic promise, has long been constrained by inherent limitations in battery technology. Key operational challenges for drone deployment include optimizing flight duration, ensuring robust safety, and minimizing payload-critical battery weight. Conventional lithium-ion batteries often presented compromises in energy density and safety, necessitating frequent recharging or costly battery replacements. Tattu's introduction of a semi-solid-state battery directly addresses these critical pain points, heralding a significant paradigm shift for the industry. Its design, which minimizes liquid electrolyte, inherently enhances safety over traditional liquid-based chemistries, with additional reliability gains from dendrite suppression.

Key Findings

Tattu (Grepow) has successfully unveiled a groundbreaking semi-solid-state battery specifically engineered for the commercial drone market. This advanced battery significantly curtails the reliance on liquid electrolytes while achieving an impressive energy density of 350 Wh/kg, poised to substantially extend drone flight durations. A critical innovation lies in its ability to effectively suppress lithium dendrite formation, dramatically enhancing both battery cycle life and intrinsic safety, thereby establishing new benchmarks for commercial drone operational capabilities.

Technical Details

The core innovation of Tattu's semi-solid-state battery lies in its unique hybrid electrolyte architecture, which seamlessly integrates gel electrolytes with a solid electrolyte coating. In contrast to conventional liquid electrolytes found in traditional lithium-ion batteries, the employed gel electrolytes exhibit higher viscosity, substantially mitigating leakage risks. This gel component, coupled with a solid electrolyte coating that provides rigid physical integrity, collectively acts to robustly suppress the formation and growth of lithium dendrites. Given that dendrites are a leading cause of internal short circuits and premature battery degradation, their effective suppression directly translates to superior safety profiles and significantly extended cycle life. The achieved energy density of 350 Wh/kg represents a substantial leap forward compared to current commercial drone battery solutions. This performance enhancement directly translates to increased drone flight range and expanded payload capacities, thereby augmenting operational efficiency across a spectrum of demanding commercial applications, including logistics, precision surveying, and persistent surveillance.

Strategic Significance and Outlook

Tattu's semi-solid-state battery technology holds transformative potential to dramatically expand the performance envelopes and application versatility of commercial drones. Looking ahead, this innovation is anticipated to drive increased adoption in critical and demanding sectors, such as long-range logistics deliveries, extensive agricultural surveillance operations, and prolonged infrastructure inspection missions. Furthermore, if successfully industrialized, this semi-solid-state approach could serve as a crucial intermediate technological bridge, accelerating the eventual transition towards fully solid-state battery systems. The immediate next strategic priorities involve optimizing manufacturing costs and establishing robust, large-scale production capabilities, paving the way for potential deployment not only within the drone market but also across a broader array of portable electronic devices and electric vehicles.

Source: <https://www.tattuworld.com/resources/tattu-unveils-revolutionary-semi-solid-state-battery-powering-the-future-of-commercial-drones.html>

#21 MDPI Paper Details Electrolyte and Electrode Material Innovations and Interfacial Engineering Strategies in Sodium-Ion Batteries

Published July 27, 2026 MDPI Switzerland



OVERVIEW

This paper focuses on innovations in electrolyte and electrode materials and interfacial engineering strategies for sodium-ion batteries, arguing that sulfide and halide solid electrolytes hold significant application potential in the solid-state electrolyte field. Sulfide solid electrolytes are noted for their high room-temperature ionic conductivity and good mechanical flexibility, which allow cold pressing to achieve intimate contact with electrodes, effectively reducing interfacial impedance. Halide solid electrolytes, exhibiting high ionic conductivity and excellent oxidative stability, are expected to contribute to enhanced sodium-ion battery performance.

Key Findings

This paper, published in MDPI, comprehensively reviews innovations in electrolyte and electrode materials, alongside interfacial engineering strategies, aimed at improving the performance of sodium-ion batteries (NIBs). Crucially, it highlights that within the solid-state electrolyte domain, sulfide and halide-based solid electrolytes hold significant application potential for future NIBs, owing to their high ionic conductivity and stability. Advancements in these materials are paramount for enhancing the energy density, cycle life, and safety of NIBs.

Technical / Clinical Details

Sodium-ion batteries are gaining traction as a more affordable and resource-abundant alternative to lithium-ion batteries. This paper focuses on the latest technological innovations in key NIB components: electrolytes and electrode materials.

- **Sulfide Solid Electrolytes:** Sulfide-based solid electrolytes are particularly noteworthy for demonstrating very high ionic conductivity at room temperature (comparable to sulfide electrolytes for lithium-ion batteries) and excellent mechanical flexibility. Their flexibility enables intimate contact with electrode materials through simple methods like cold pressing, effectively mitigating the common challenge of high impedance at the solid-solid interface.
- **Halide Solid Electrolytes:** Halide solid electrolytes represent a relatively new class of solid electrolytes. They have been reported to exhibit high ionic conductivity along with superior oxidative stability, meaning stability under high voltage conditions. This makes them particularly advantageous for compatibility with high-voltage cathodes, potentially contributing to increased energy density in NIBs.
- **Interfacial Engineering Strategies:** Interfacial resistance between the solid electrolyte and electrodes is a major factor influencing the performance of all-solid-state batteries. The paper also details various strategies to reduce interfacial impedance and improve stability, including optimization of interface layers, surface modification, and the use of composite electrolytes.

These materials and strategies are critical elements for enhancing the energy density, cycle stability, fast-charging capability, and safety of sodium-ion batteries.

Background & Context

Driven by concerns over lithium supply constraints and escalating prices, sodium-ion batteries are establishing themselves as a cost-effective alternative, especially for stationary energy storage and certain electric vehicle (EV) applications. The transition to an all-solid-state format is an essential step to further boost the safety and energy density of NIBs. This paper presents the current state of NIB solid electrolyte technology and outlines key directions for future R&D, providing crucial insights that contribute to the diversification and sustainability of the battery industry.

Strategic Significance & Outlook

The development of sodium-ion all-solid-state batteries based on sulfide and halide solid electrolytes is expected to accelerate further. The next focus will be on establishing cost-effective manufacturing processes for large-scale production and validating long-term cycle life and safety profiles. If these technologies mature, NIBs have the potential to transcend their complementary role to lithium-ion batteries and emerge as competitive primary batteries in certain markets. This would significantly contribute to the diversification of global energy storage solutions and the realization of a decarbonized society.

Source: <https://www.mdpi.com/2079-6412/16/7/851>

#22 OAE Publishing Inc. Paper: Gel Electrolytes Enhance Safety and Mechanical Flexibility in Hybrid Na-CO₂ Batteries

Published July 30, 2026 OAE Publishing Inc. China



OVERVIEW

Research by OAE Publishing Inc. reports that gel electrolytes effectively suppress liquid electrolyte leakage, providing high safety and excellent mechanical flexibility to hybrid Na-CO₂ battery systems. Gel electrolytes effectively mitigate electrode volume changes and inhibit dendrite growth, combining the interfacial wetting of liquid batteries with the morphological stability of solid batteries. This is expected to accelerate the development of safe, high-performance sodium-based batteries for next-generation energy storage systems.

Key Findings

Research published by OAE Publishing Inc. on hybrid Na-CO₂ batteries has clearly demonstrated that gel electrolytes effectively suppress liquid electrolyte leakage, imparting high safety and excellent mechanical flexibility to the battery system. This innovative approach integrates the benefits of liquid batteries and the morphological stability of solid batteries by effectively mitigating electrode volume changes and inhibiting the growth of sodium dendrites. This holds significant potential to greatly contribute to the development of safer and higher-performing sodium-based batteries.

Technical / Clinical Details

Hybrid Na-CO₂ batteries are garnering attention as next-generation energy storage systems that leverage environmentally friendly CO₂ utilization and abundant, inexpensive sodium. In such systems, the electrolyte is a critical component influencing both safety and performance. The gel electrolyte adopted in this study features a structure where liquid electrolyte is held within a polymer matrix, thereby suppressing the fluidity of the liquid electrolyte and significantly reducing the risk of leakage. While conventional liquid electrolytes struggle to accommodate electrode volume changes, leading to unstable electrode-electrolyte interfaces, the gel electrolyte's superior flexibility effectively mitigates these volume changes. Furthermore, the viscous nature of the gel physically impedes the growth of sodium dendrites (tree-like crystals), preventing internal short circuits and extending cycle life. Thus, it has been shown that the gel electrolyte improves the overall performance and reliability of hybrid Na-CO₂ batteries by combining the good interfacial wettability (contact with electrodes) of liquid electrolytes with the morphological stability and safety of solid electrolytes.

Background & Context

In the context of reducing CO₂ emissions and enhancing energy security, the development of CO₂ batteries that directly utilize carbon dioxide and sodium-ion batteries (NIBs) that use abundant sodium has become an urgent priority. Particularly, Na-CO₂ batteries, which can use CO₂ captured from emission sources as fuel, hold promise for realizing a carbon-neutral society. However, in these battery systems, the safety of liquid electrolytes and the dendrite problem associated with sodium metal anodes have been significant barriers to commercialization. Gel electrolytes are attracting attention from researchers and companies worldwide as a promising approach to solve these issues and accelerate the commercialization of sodium-based batteries.

Strategic Significance & Outlook

The adoption of gel electrolytes represents a groundbreaking step in significantly improving the safety and performance of hybrid Na-CO₂ batteries. Future research will focus on further increasing energy density, extending cycle life, and reducing manufacturing costs. If this technology matures, the practical application of Na-CO₂ batteries is expected to accelerate across a wide range of uses, including stationary energy storage, electric vehicles (EVs), and even large-scale grid storage systems. Notably, combined with CO₂ capture and utilization technologies, it has the potential to play a crucial role in achieving a sustainable energy cycle.

Source: <https://www.oaepublish.com/articles/energymater.2026.115>

Collected: July 31, 2026 | Automated Research System (Gemini API)

#23 Car Advisers Explains All-Solid-State Batteries Hold Potential to Solve EV Challenges in Safety, Energy Density, Charging Speed, and Lifespan

Published July 28, 2026 Car Advisers Unknown

**Car Advisers
Explaining
Solid-State batteries
solve challenges of
EV safety, energy
Charging speed
and lifespans**

Release date, 2026/07/28, Car Advisers..



OVERVIEW

Car Advisers explains that all-solid-state batteries, by replacing liquid electrolytes with solid materials, have the potential to resolve key EV challenges including safety, energy density, charging speed, and battery lifespan. Higher energy density is expected to significantly extend EV driving range through the use of lithium metal anodes, thinner separators, and more compact cell structures. The absence of liquid electrolytes also reduces fire risk and enhances fast-charging tolerance.

Key Findings

An article by Car Advisers highlights that all-solid-state batteries hold the potential to fundamentally resolve the complex issues prevalent in the electric vehicle (EV) market, specifically concerning safety, energy density, charging speed, and battery lifespan. By replacing liquid electrolytes with solid materials such as ceramics, polymers, glass, or sulfide-based compounds, these batteries are expected to dramatically enhance EV performance and reliability.

Technical / Clinical Details

The most innovative aspect of all-solid-state batteries is the substitution of flammable liquid electrolytes with non-flammable solid materials. This change drastically reduces the risk of thermal runaway and fire, thereby significantly improving battery safety. Solid electrolytes also often function as separators, simplifying the cell structure and enabling thinner, more compact designs. This allows for more active material to be packed into the same space, consequently increasing energy density. Crucially, the ability to utilize lithium metal anodes, which possess a theoretical capacity far superior to conventional graphite anodes, can substantially extend the driving range of EVs. Furthermore, solid electrolytes suppress dendrite formation and are thermally and mechanically more stable than liquid electrolytes. This leads to less performance degradation during fast charging and an improved battery cycle life. As a result, EV users can anticipate batteries that offer longer driving distances, shorter charging times, and greater peace of mind.

Background & Context

While the electric vehicle (EV) market is experiencing rapid expansion, range anxiety, lengthy charging times, and safety concerns regarding batteries remain major deterrents for consumer adoption. Existing lithium-ion batteries are nearing their performance plateau, making the development of next-generation battery technologies to address these challenges an urgent priority. All-solid-state batteries are attracting substantial investment and attention from automakers, battery manufacturers, and research institutions worldwide as the 'ultimate solution' to these problems. Particularly amidst increasing environmental regulations and the imperative to transition towards sustainable mobility, all-solid-state batteries are positioned as a critical technology for achieving a decarbonized society.

Strategic Significance & Outlook

The potential of all-solid-state batteries to solve key EV challenges is very high, and their practical implementation is eagerly anticipated. Future focus will be on reducing manufacturing costs, further decreasing interfacial resistance between solid electrolytes and electrodes, and establishing large-scale production technologies. If these challenges are overcome, all-solid-state batteries hold the potential to provide innovative solutions across a wide range of fields—including aerospace, robotics, consumer electronics, and large-scale energy storage systems—fundamentally transforming our lives and industries. They are poised to become indispensable technology for accelerating the adoption of safer, higher-performance EVs and building a sustainable future society.

Source: <https://caradvisers.com/blogs/what-are-all-solid-state-batteries-everything-you-need-to-know>

Collected: July 31, 2026 | Automated Research System (Gemini API)

#24 J&K Scientific Compares Solid Electrolytes for All-Solid-State Batteries: Analyzing Superiority of Sulfide and Oxide Systems

Published July 28, 2026 J&K Scientific China



OVERVIEW

J&K Scientific's article compares the key properties of sulfide and oxide electrolytes, two leading candidates for solid electrolytes in all-solid-state batteries. Sulfide electrolytes offer high ionic conductivity and excellent interfacial contact, with LGPS and $\text{Li}_6\text{PS}_5\text{Cl}$ demonstrating top performance. Oxide electrolytes, conversely, are characterized by superior chemical stability and mechanical strength. The choice between them depends on specific applications, manufacturing requirements, and battery performance targets, underscoring the importance of material selection for all-solid-state battery commercialization.

Key Findings

The J&K Scientific article focuses on solid electrolytes, the core materials determining the performance of all-solid-state batteries, by comparing and analyzing the two major candidates: sulfide electrolytes and oxide electrolytes. Sulfide electrolytes boast high ionic conductivity, comparable to or even exceeding that of liquid electrolytes in existing lithium-ion batteries, and excellent interfacial contact as their primary strengths. Oxide electrolytes, on the other hand, offer superior chemical stability and mechanical strength. This comparison clearly highlights the importance of understanding each material's characteristics and making optimal choices based on the intended application in the development of all-solid-state batteries.

Technical / Clinical Details

The choice of solid electrolyte significantly impacts the overall performance of all-solid-state batteries.

- **Sulfide Electrolytes:** Sulfide-based solid electrolytes exhibit high lithium-ion conductivity (some superionic conductors are reported to reach approximately 25 mS/cm at room temperature) and excellent interfacial contact. Materials such as LGPS ($\text{Li}_{10}\text{GeP}_2\text{S}_{12}$) and argyrodite-type $\text{Li}_6\text{PS}_5\text{Cl}$ are known for demonstrating the highest ionic conductivities. Due to the high polarizability of sulfur ions, they generally tend to achieve higher conductivity than oxides. These properties are advantageous for high-power applications like electric vehicles (EVs). However, their low stability in air and the risk of hydrogen sulfide gas evolution during manufacturing require careful handling.
- **Oxide Electrolytes:** Oxide-based solid electrolytes are characterized by excellent chemical stability, high thermal stability, and good mechanical strength. They are stable in air and relatively easy to handle. Garnet-type LLZO ($\text{Li}_7\text{La}_3\text{Zr}_2\text{O}_{12}$) can potentially achieve very high room-temperature ionic conductivity with appropriate crystal structures and defect engineering. However, challenges include lower ionic conductivity compared to sulfides, a tendency for poor interfacial contact with electrodes, and the requirement for high operating pressures.

The selection between these two types depends on the final battery application (e.g., high-power EVs vs. high-safety wearables), manufacturing process requirements, and specific performance targets (e.g., maximum range vs. longest cycle life).

Background & Context

All-solid-state batteries are garnering global attention as a next-generation battery technology that addresses the safety (fire risk) and energy density (range limitation) challenges faced by conventional liquid-electrolyte lithium-ion batteries. The solid electrolyte is the 'heart' of these batteries, and its properties largely dictate the overall battery performance, leading to intense material development competition. Sulfides and oxides are currently the two most actively researched systems, with vigorous efforts underway to overcome their respective technical advantages and challenges.

Strategic Significance & Outlook

Given that sulfide and oxide electrolytes possess distinct strengths and weaknesses, future developments may see their selective use based on application, or the creation of hybrid composite solid electrolytes that combine the benefits of both. Specifically, improving the stability of sulfide electrolytes and enhancing the ionic conductivity and interfacial contact of oxide electrolytes will be key areas of future research. If these technical barriers are overcome, and mass production and cost reduction are achieved, all-solid-state batteries will accelerate EV adoption and provide safer, higher-performance energy storage solutions across a wide range of sectors.

Source: <https://www.jk-sci.com/blogs/resource-center/sulfide-vs-oxide-solid-electrolytes>

Collected: July 31, 2026 | Automated Research System (Gemini API)

#25 Beyond Battery Explains Lithium-Ion Transport Mechanisms in Solid Electrolytes: Highlighting Sulfide Conductive Superiority

Published July 28, 2026 Beyond Battery Unknown



OVERVIEW

Beyond Battery details three primary mechanisms for lithium-ion transport through solid electrolytes: vacancy hopping, interstitial migration, and cooperative motion. While 1mS/cm at room temperature is a practical threshold, some sulfide superionic conductors reportedly reach approximately 25mS/cm at room temperature, indicating a general tendency for sulfide electrolytes to exhibit higher conductivity. However, oxide systems like LLZO can also achieve high conductivity with appropriate design, emphasizing the critical role of material selection in all-solid-state battery development.

Key Findings

The Beyond Battery article provides a detailed explanation of the lithium-ion transport mechanisms within solid electrolytes, which are crucial for the performance of all-solid-state batteries. It highlights three primary mechanisms: 'vacancy hopping,' 'interstitial migration,' and 'cooperative motion.' The article emphasizes that while a practical ionic conductivity threshold is considered to be 1 mS/cm at room temperature, some sulfide superionic conductors have reported achieving exceptional conductivity of approximately 25 mS/cm at room temperature. This suggests that sulfide electrolytes generally tend to exhibit higher conductivity compared to oxides.

Technical / Clinical Details

The main mechanisms by which lithium ions move through a solid electrolyte are as follows:

- **Vacancy Hopping:** Current flows when a neighboring lithium ion moves into a vacant site (where a lithium ion is missing) within the electrolyte's crystal structure. This is one of the most common mechanisms.
- **Interstitial Migration:** Current is conducted when lithium ions move through the spaces between the crystal lattice points (interstitial sites).
- **Cooperative Motion:** This mechanism involves multiple lithium ions moving simultaneously and cooperatively, leading to more efficient ion transport.

For the commercialization of all-solid-state batteries, an ionic conductivity of at least 1 mS/cm at room temperature is considered a practical threshold. To meet this target, sulfide electrolytes tend to exhibit higher conductivity than oxide electrolytes because the high polarizability of sulfur ions optimizes interactions with lithium ions. Indeed, sulfide-based superionic conductors like LGPS ($\text{Li}_{10}\text{GeP}_2\text{S}_{12}$) have reported impressive ionic conductivities of approximately 25 mS/cm at room temperature, rivaling those of existing liquid electrolytes. Conversely, oxide systems such as the garnet-type oxide electrolyte LLZO ($\text{Li}_7\text{La}_3\text{Zr}_2\text{O}_{12}$) have also been shown to achieve very high room-temperature ionic conductivity through appropriate crystal structure design and defect engineering.

Background & Context

All-solid-state batteries are gaining traction as a next-generation battery technology that enhances safety and energy density for electric vehicles (EVs) and other advanced applications. Their performance is heavily dependent on the lithium-ion conductivity of the solid electrolyte. High ionic conductivity directly translates to faster battery charging/discharging rates, higher power density, and overall efficiency. Therefore, materials scientists and engineers are focusing on discovering and developing materials that maximize this conductivity. Sulfide and oxide systems are currently the two most actively researched solid electrolyte classes, and understanding their respective material properties and ion transport mechanisms forms a crucial scientific foundation for the commercialization of all-solid-state batteries.

Strategic Significance & Outlook

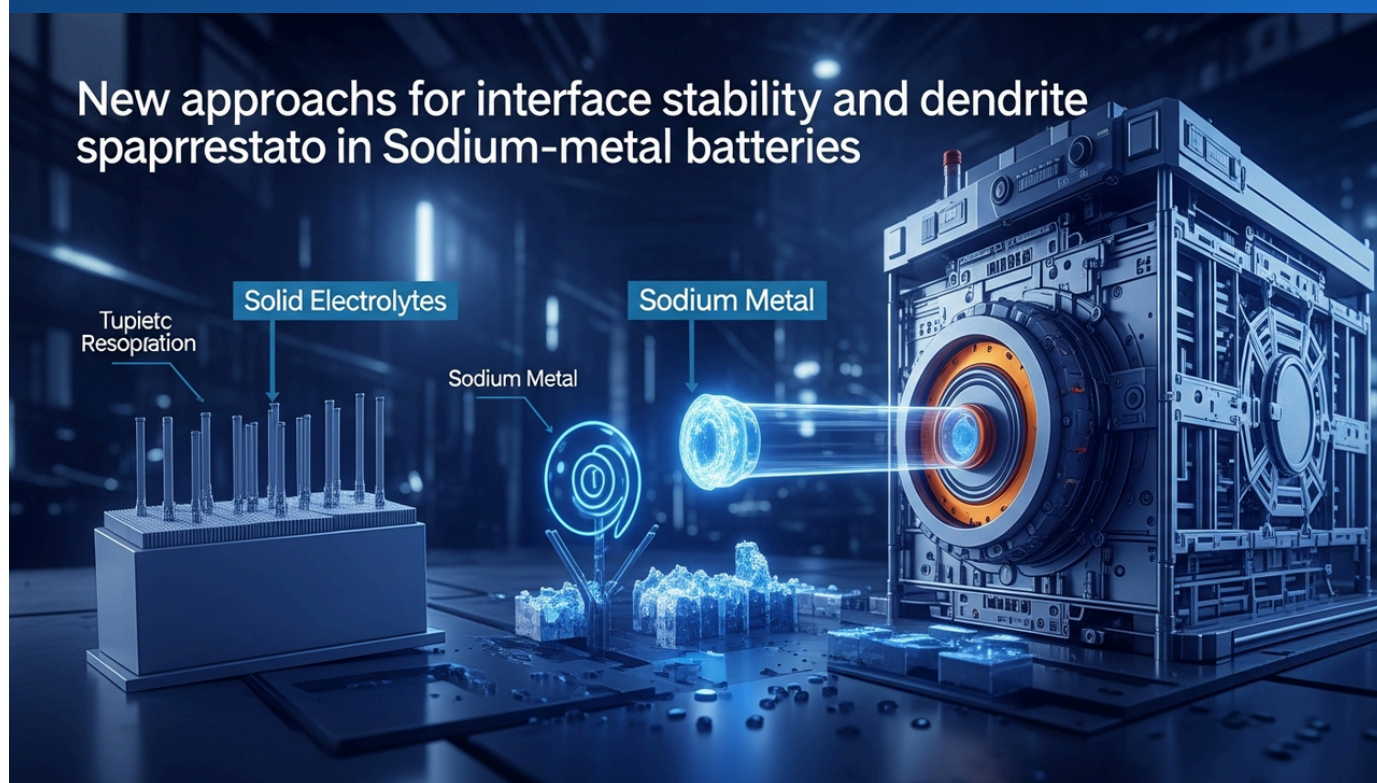
A detailed understanding of lithium-ion transport mechanisms is essential for designing higher-performance solid electrolyte materials. Future research will further accelerate efforts to improve the stability of sulfide electrolytes and reduce the interfacial resistance of oxide electrolytes. Furthermore, it is expected that composite electrolytes combining the strengths of both will be developed, leveraging these insights. If technological innovations can further enhance ionic conductivity while simultaneously reducing manufacturing costs, all-solid-state batteries are anticipated to dramatically improve electric vehicle performance and offer innovative solutions across a wide range of applications, such as renewable energy storage systems.

Source: <https://beyond-battery.com/blogs/beyond-battery-blogs/how-do-lithium-ions-actually-move-through-a-solid-electrolyte>

#26 UW-Madison Research: New Approach for Interfacial Stability and Dendrite Suppression in All-Solid-State Sodium-Metal Batteries

Published July 27, 2026 ACS Publications USA

New approaches for interface stability and dendrite suppression in Sodium-metal batteries



OVERVIEW

Researchers at the University of Wisconsin-Madison have developed a high-conductivity, flame-retardant poly(1,3-dioxolane) (PDOL) electrolyte, using GaCl_3 as both initiator and interface modifier. This addresses low Na^+ transport numbers, dendrite growth, and interfacial degradation in quasi-solid sodium-metal batteries (SMBs). The in-situ formed Ga_0/NaCl -rich composition-gradient solid-electrolyte interphase (SEI) membrane at room temperature successfully reduced the Na^+ migration energy barrier and suppressed Na dendrite formation. This marks a critical breakthrough for SMB commercialization.

Key Findings

Researchers at the University of Wisconsin-Madison have developed an innovative quasi-solid polymer electrolyte (QSPE) and interfacial engineering strategy to overcome key challenges in sodium-metal batteries (SMBs): low Na^+ transport numbers, sodium dendrite growth, and interfacial degradation. They successfully synthesized a highly conductive and flame-retardant poly(1,3-dioxolane) (PDOL) electrolyte via room-temperature in situ polymerization, utilizing GaCl_3 as both an initiator and an interface modifier. This process led to the formation of a Ga_0/NaCl -rich composition-gradient solid-electrolyte interphase (SEI) film, which effectively reduces the Na^+ migration energy barrier and suppresses sodium dendrite formation, paving the way for durable quasi-solid sodium-metal batteries.

Technical / Clinical Details

Sodium-metal batteries (SMBs) are gaining attention as next-generation energy storage devices due to their potential for high energy density and low cost. However, especially in SMBs using liquid electrolytes, dendrite formation on the sodium metal anode has been a primary cause of internal short circuits and reduced safety. The QSPE developed in this study aims to combine the advantages of liquid electrolytes (high ionic conductivity) with those of solid electrolytes (morphological stability). The key lies in the dual function of GaCl_3 : it not only initiates the in situ polymerization of the PDOL polymer but also simultaneously forms a Ga_0/NaCl -rich composition-gradient SEI film on the sodium metal anode surface. This SEI film facilitates Na^+ ion permeation, suppresses parasitic reactions between the electrolyte and sodium metal, and critically reduces the Na^+ migration energy barrier. This promotes uniform Na^+ deposition, effectively inhibiting dendrite growth. Consequently, the battery's cycling stability and safety are significantly improved, marking a major step towards the practical implementation of SMBs.

Background & Context

Due to concerns over lithium resource constraints and soaring prices, sodium-ion batteries (NIBs) and sodium-metal batteries (SMBs) are accelerating their research and development as promising alternatives to lithium-ion batteries. SMBs, in particular, hold the potential to achieve high energy density by leveraging the high theoretical capacity of sodium metal anodes, similar to lithium metal anodes. However, sodium metal anodes are more prone to dendrite formation than lithium metal anodes, and lower sodium ion mobility has made it challenging to achieve both high performance and safety. The composition-gradient SEI film formed in situ, proposed in this study, represents an innovative approach to resolve these challenges, significantly advancing sodium-based battery technology commercialization.

Strategic Significance & Outlook

The results of this research provide crucial guidance for the development of durable quasi-solid sodium-metal batteries. Future efforts will focus on further optimizing the PDOL electrolyte and the GaO/NaCl gradient SEI film, scaling up manufacturing processes, and validating long-term cycling stability and safety profiles. If this technology is established, it could accelerate the adoption of safe and cost-effective sodium-metal batteries in a wider range of applications, including stationary energy storage, electric vehicles, and even grid-scale large-capacity storage systems. This is expected to contribute significantly to the realization of a sustainable energy society.

Source: <https://pubs.acs.org/aamick/article/doi/10.1021/acsami.6c10521/5234380/Engineering-Inorganic-Rich-and-Composition?searchresult=1>

#27 Ming Chi University of Technology Advances High-Voltage, High-Safety Battery Technology with 5V Cathodes and DS-SPE Development

Published July 23, 2026 AZoCleantech Taiwan



OVERVIEW

Ming Chi University of Technology's Green Energy Battery Research Center (BRCGE) in Taiwan is advancing high-voltage, high-safety battery technology through multifaceted approaches. These include synthesizing 5V-class $\text{LiNi}_{0.5}\text{Mn}_{1.5}\text{O}_4$ (LNMO) cathodes, developing solvent-free dual-salt solid polymer electrolytes (DS-SPEs) for all-solid-state batteries, and stabilizing cobalt-free Li-rich (LRNMO) cathodes via LaF_3 nano-coating. Real-time monitoring of electrolyte degradation and structural deterioration using in situ DEMS analysis contributes significantly to enhancing the safety and performance of next-generation batteries.

Key Findings

The Green Energy Battery Research Center (BRCGE) at Ming Chi University of Technology in Taiwan is making significant progress in the field of high-voltage and high-safety battery technology. The center is contributing to enhanced safety and performance of next-generation batteries through multifaceted approaches, including the synthesis of 5V-class cathode materials, the development of innovative solvent-free dual-salt solid polymer electrolytes (DS-SPEs) for all-solid-state batteries, and the stabilization of cobalt-free Li-rich cathodes via LaF₃ nano-coating. These achievements are crucial for maximizing the potential of batteries in electric vehicles (EVs) and energy storage systems.

Technical / Clinical Details

BRCGE employs several advanced research strategies to push the boundaries of battery technology:

- **Synthesis of 5V-class LiNi_{0.5}Mn_{1.5}O₄ (LNMO) cathodes:** High-voltage cathode materials are key to improving battery energy density. LNMO, with its 5V operating voltage, holds potential for achieving high energy density. BRCGE is optimizing its synthesis methods to enhance performance.
- **Development of solvent-free dual-salt solid polymer electrolytes (DS-SPEs) for all-solid-state batteries:** Solvent-free solid polymer electrolytes are promising candidates for all-solid-state batteries due to their higher safety compared to traditional liquid electrolytes and their retained flexibility. DS-SPEs optimize ionic conductivity by combining multiple lithium salts, contributing to safety and reduced environmental impact by eliminating solvents.
- **Stabilization of cobalt-free Li-rich cathodes via LaF₃ nano-coating:** Cobalt is a scarce and expensive material, making the development of cobalt-free cathodes vital for cost reduction and sustainability. While Li-rich cathodes offer high initial capacity, they historically faced challenges like structural degradation and voltage fade during cycling. BRCGE's application of LaF₃ nano-coating improves the interfacial stability of these Li-rich cathodes, enabling long-term performance retention.

These developments are supported by In situ DEMS (Differential Electrochemical Mass Spectrometry) analysis. This technique allows for real-time monitoring of electrolyte degradation and electrode structural deterioration, providing deep insights into material degradation mechanisms that are fed back into designing more robust batteries.

Background & Context

The rapid growth of the electric vehicle (EV) market and the increasing demand for stationary energy storage systems driven by renewable energy proliferation have accelerated the development of high-performance and safe battery technologies. Specifically, increasing voltage is crucial for boosting battery energy density, but this simultaneously introduces safety challenges. BRCGE's multi-pronged research approach represents a significant contribution to overcoming these technical trade-offs and advancing the commercialization of next-generation batteries. Cobalt-free approaches also contribute to stabilizing the supply chain, and DS-SPEs are a major step towards the practical implementation of all-solid-state batteries.

Strategic Significance & Outlook

BRCGE's research achievements showcase Taiwan's technological prowess in the high-voltage and high-safety battery sector globally. As these technologies mature and are applied to large-scale production, they are expected to enhance EV range and safety, while reducing costs and improving reliability for stationary energy storage. Solvent-free all-solid-state batteries, in particular, will be a crucial pillar for realizing a sustainable energy society. The continued utilization of in situ analytical methods will enhance the efficiency of future R&D, enabling more rapid technological innovation.

Source: <https://www.azocleantech.com/article.aspx?ArticleID=2178>

#28 U.S. DOE Awards \$11M to Three Projects for Domestic Solid-State Battery Manufacturing Scale-Up

Published July 26, 2026 Department of Energy USA



OVERVIEW

The U.S. Department of Energy (DOE) has granted \$11 million to three solid-state battery projects under the FY22 AMMTO Battery Manufacturing Lab Call, aiming to overcome key barriers in domestic large-scale production. Oak Ridge National Laboratory, in collaboration with Intecells and High-T Tech, will transition oxide-based solid-state electrolyte manufacturing from batch to continuous processes, scaling up to 1Ah, >350Wh/kg cells. Argonne and Oak Ridge National Laboratories, with partners like Ampcera, will comprehensively investigate both slurry-based and dry roll-to-roll processes to optimize solid electrolytes and enhance productivity, crucial for strengthening the national battery manufacturing capacity.

Key Findings

The U.S. Department of Energy (DOE) has announced an \$11 million funding commitment across three projects designed to accelerate domestic large-scale manufacturing of solid-state batteries. These initiatives, part of the FY22 AMMTO Battery Manufacturing Lab Call, specifically target the critical challenges associated with scaling up solid-state battery production and integrating these advanced technologies into existing manufacturing infrastructures.

Technical / Clinical Details

- **Oak Ridge National Laboratory (ORNL) Project:** Collaborating with Intecells and High-T Tech, ORNL will focus on converting the manufacturing process for oxide-based solid-state electrolytes from batch to continuous production. The ambitious goal is to scale up to large-format cells of 1 Ampere-hour (Ah) with an energy density exceeding 350 Watt-hours per kilogram (Wh/kg), which represents a significant leap in production efficiency and cell performance. This transition is vital for making solid-state batteries economically viable for mass markets.
- **Argonne National Laboratory (ANL) and ORNL Joint Project:** In partnership with industrial collaborators including Ampcera, this project will undertake a comprehensive examination of both slurry-based and dry processes within roll-to-roll (R2R) manufacturing. The core objectives include optimizing solid electrolytes to improve their ionic conductivity and stability, while simultaneously enhancing the productivity and throughput of manufacturing lines. Key areas of focus will involve managing defects, reducing interfacial resistance, and improving compatibility between solid electrolytes and electrode materials.

Background & Context

Solid-state batteries are heralded as a transformative technology due to their potential for higher energy density, enhanced safety (eliminating flammable liquid electrolytes), and longer cycle life compared to conventional lithium-ion batteries. However, mass production challenges, particularly the technical complexities and cost implications of scaling these novel materials and manufacturing processes, have hindered their widespread adoption. The DOE's strategic investment underscores a national priority to de-risk and accelerate the domestic development and production of these next-generation batteries. This move is aligned with broader efforts to secure a resilient domestic battery supply chain, reducing reliance on foreign sources for critical components and advancing clean energy goals.

Strategic Significance & Outlook

The success of these funded projects will be pivotal in establishing a robust domestic ecosystem for solid-state battery manufacturing in the U.S. The development of continuous manufacturing techniques and optimized R2R processes promises substantial reductions in production costs and significant improvements in efficiency, thereby accelerating the commercialization timeline for solid-state technology. Furthermore, close collaboration between national laboratories and industrial partners is expected to facilitate rapid translation of research breakthroughs into practical applications. In the long term, these advancements are poised to underpin the widespread deployment of solid-state batteries across various sectors, including electric vehicles (EVs), grid-scale energy storage, and critical defense applications, cementing the U.S.'s leadership in advanced battery technologies.

Source: <https://www.energy.gov/cmei/ammto/funding-selections-fy23-ammto-battery-manufacturing-lab-call>

#29 SK On and Factorial Energy Partner for Mass Production of Solid-State Batteries

Published July 30, 2026 BigGo Finance South Korea



OVERVIEW

SK On has signed an MOU with U.S. solid-state battery startup Factorial Energy to evaluate the manufacturability of next-generation battery technology. This partnership will assess if Factorial's FEST platform can be efficiently produced within SK On's existing global lithium-ion battery manufacturing facilities. SK On aims for commercialization of solid-state batteries by 2029, accelerating its push into next-gen tech following its collaboration with Solid Power.

Key Findings

SK On, a leading South Korean battery manufacturer, has announced a Memorandum of Understanding (MOU) with U.S. solid-state battery developer Factorial Energy to explore strategic manufacturing cooperation for the mass production of next-generation solid-state batteries. This collaboration aims to evaluate the feasibility of producing Factorial's innovative FEST (Factorial Electrolyte System Technology) platform within SK On's existing lithium-ion battery manufacturing facilities, maximizing the utilization of current infrastructure.

Technical / Clinical Details

Factorial Energy's FEST platform is a promising solid-state battery technology that utilizes a lithium metal anode to deliver both high energy density and enhanced safety, mitigating the fire risks associated with conventional liquid electrolytes. The partnership will scrutinize whether Factorial's cell designs and material specifications can be effectively scaled for mass production within SK On's gigafactories. Key assessments will include manufacturing process compatibility, cost efficiency, and overall scalability, seeking to establish a pathway for cost-effective, high-quality solid-state battery production with robust yield rates.

Background & Context

The rapid expansion of the electric vehicle (EV) market intensifies the demand for superior battery performance and uncompromising safety—challenges that solid-state batteries are poised to address as the "holy grail" of battery technology. Major automakers and battery manufacturers are locked in a fierce development race. SK On has already forged a partnership with Solid Power for sulfide-based solid-state battery development, and this new collaboration with Factorial Energy further diversifies its approach to solid electrolyte technologies. This strategic move is intended to broaden SK On's technological portfolio and reinforce its market leadership, supporting its ambitious goal of commercializing solid-state batteries by 2029.

Strategic Significance & Outlook

This strategic alliance represents a significant milestone for the solid-state battery industry's journey towards mass production. The synergy between SK On's extensive manufacturing expertise and Factorial's cutting-edge technology could lead to the establishment of cost-efficient, large-scale production techniques, thereby accelerating the market introduction of solid-state batteries. Looking ahead, this technology is expected to dramatically enhance EV range, shorten charging times, and improve safety, fostering greater consumer adoption. Furthermore, leveraging existing manufacturing infrastructure can mitigate capital expenditure risks associated with the transition to solid-state batteries, stimulating broader technological innovation across the industry.

Source: <https://finance.biggo.com/news/c47e1142-57a9-490f-8835-2ec873ce289b>

Collected: July 31, 2026 | Automated Research System (Gemini API)

#30 Sila Nanotechnologies Private Stock Reaches \$2.33 Billion Valuation on Forge Global

Published July 31, 2026 Forge Global USA



OVERVIEW

Sila Nanotechnologies, a privately held next-generation battery materials developer, recorded a Forge Price of \$16.42 per share as of July 31, 2026, valuing the company at \$2.33 billion. The company has cumulatively raised \$1.61 billion from key investors including Mercedes-Benz Group AG and Panasonic to scale up its silicon anode material production. Sila is recognized for its innovative silicon anode technology designed to enhance battery energy density, reflecting high investor confidence in next-generation battery advancements.

Key Findings

Sila Nanotechnologies, a privately held developer of next-generation battery materials, saw its private stock trading at a "Forge Price" of \$16.42 per share on Forge Global as of July 31, 2026. This valuation positions the company at approximately \$2.33 billion (around 340 billion JPY), highlighting strong investor interest in its silicon anode technology and its potential impact on the battery market.

Technical / Clinical Details

Sila Nanotechnologies is at the forefront of developing innovative silicon anode materials designed to replace traditional graphite anodes, capable of increasing the energy density of lithium-ion batteries by up to 20%. The company leverages silicon's superior capacity to store lithium ions, targeting applications in high-performance battery sectors such as electric vehicles (EVs), portable electronics, and aerospace. To date, Sila has successfully raised a total of \$1.61 billion in funding, with prominent global corporations like Mercedes-Benz Group AG and Panasonic as key investors. These substantial investments have primarily been allocated towards expanding production facilities and accelerating technological development.

Background & Context

Amid escalating demand for extended EV ranges and improved smartphone battery life, enhancing battery energy density remains a critical challenge for the entire industry. Silicon anode technology is considered one of the key technologies for next-generation batteries, with Sila Nanotechnologies leading its development. The company's gigafactory under construction in Moses Lake, Washington, aims to significantly expand its production capacity, targeting a scale capable of supplying tens of thousands of EVs annually. The high valuation in the private stock market suggests that Sila's technology is progressing towards commercialization and is likely to establish a strong competitive advantage in the market.

Strategic Significance & Outlook

Sila Nanotechnologies' continued fundraising success and high market valuation signal its potential to play a crucial role in the next-generation battery materials market. As production at the Moses Lake facility ramps up, the expanded supply of silicon anode materials will enable EV manufacturers to develop vehicles with higher-performance batteries. This, in turn, is expected to further accelerate EV adoption and enhance consumer appeal. With a potential IPO on the horizon, Sila is poised to become an indispensable entity in the global battery supply chain, shaping the future of energy storage.

Source: https://forgeglobal.com/sila-nanotechnologies_stock/

Collected: July 31, 2026 | Automated Research System (Gemini API)

#31 Sila Nanotechnologies Raises \$300M to Expand Next-Gen Battery Production Amid Surging AI Demand

Published July 23, 2026 Times of San Francisco USA



OVERVIEW

Battery materials company Sila Nanotechnologies secured \$300 million to expand its Moses Lake manufacturing facility, addressing soaring demand from AI-powered drones, spacecraft, and wearables. This investment aims to accelerate the transition of its silicon anode battery technology from pilot to mass production, meeting market needs for high-power batteries in compact packages. Sila's technology is expected to enable lighter, longer-lasting devices in consumer electronics, aerospace, and robotics, driving industry-wide innovation.

Key Findings

Sila Nanotechnologies, a battery materials company based in Moses Lake, Washington, announced it has completed a \$300 million funding round to expand its manufacturing facility. This investment is specifically aimed at meeting the surging demand from AI-powered drones, spacecraft, and wearables, and will be directed towards capital expenditures to accelerate the mass production of its silicon anode technology.

Technical / Clinical Details

Sila Nanotechnologies' silicon anode materials are capable of increasing the energy density of existing lithium-ion batteries by up to 20% compared to traditional graphite anodes. This enables devices to store more energy within the same volume and weight, leading to extended flight times for drones, increased payload capacity for spacecraft, and smaller, longer-lasting wearable devices. The recent \$300 million funding will facilitate a significant expansion of the Moses Lake factory's production capacity, moving from pilot scale to a level capable of supplying tens of thousands of electric vehicles annually. Crucial to this scale-up will be the establishment of efficient manufacturing processes and robust quality control systems.

Background & Context

The convergence of AI advancements and the proliferation of IoT devices has created an explosive demand for compact, high-energy-density batteries. In applications such as drones requiring extended operational periods, spacecraft with stringent weight limitations, and always-on wearable devices, battery performance is a critical factor determining device functionality and market competitiveness. Sila Nanotechnologies' silicon anode technology offers a promising solution to these escalating demands and is gaining recognition as a viable next-generation anode material to succeed graphite. This latest funding round signifies a pivotal moment for the company, transitioning its technology beyond initial development into the commercialization and large-scale production phases.

Strategic Significance & Outlook

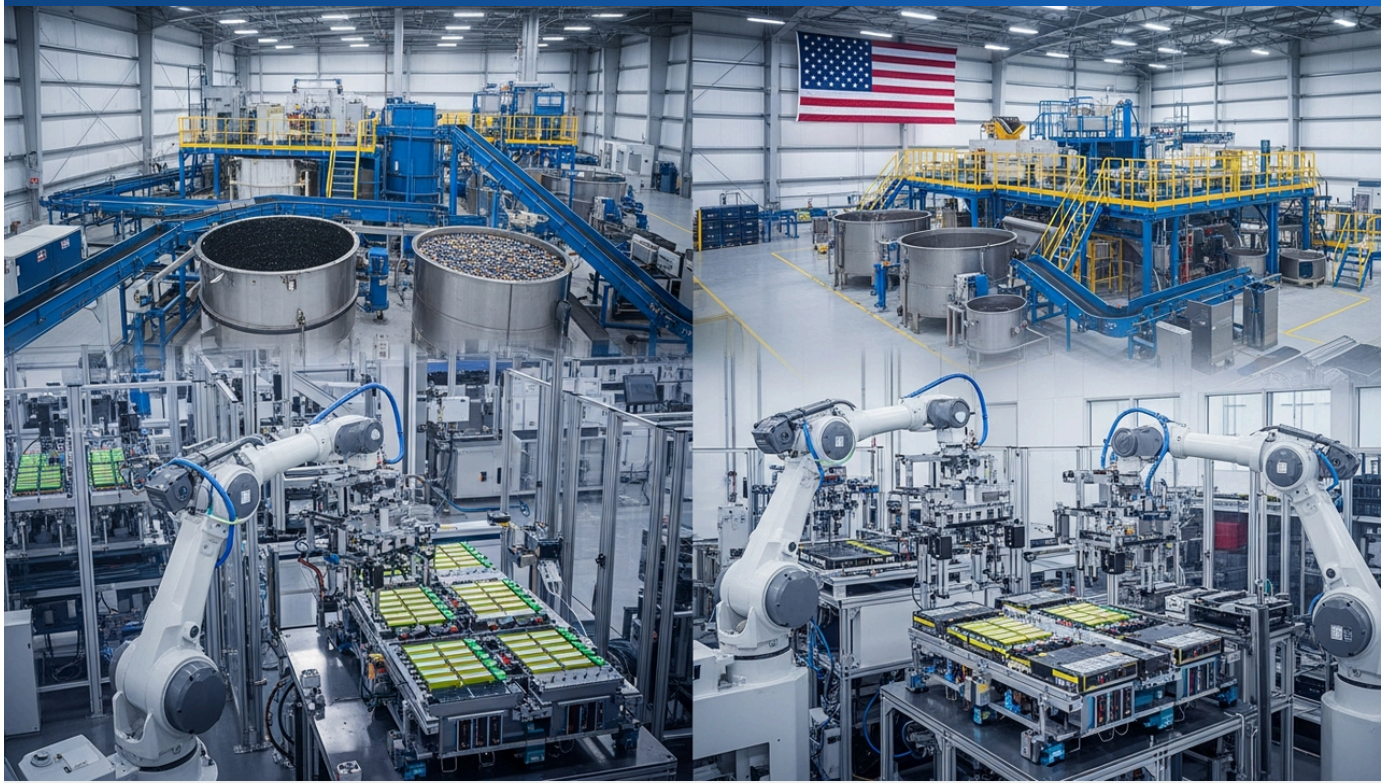
The expansion of Sila Nanotechnologies' Moses Lake facility will significantly boost its supply capacity for the AI and high-performance device markets. This, in turn, is expected to lead to the widespread adoption of products powered by Sila's silicon anode materials, fostering new technological innovations. This funding will serve as a powerful impetus for Sila to establish leadership in the next-generation battery market, with a clear eye on eventual full-scale entry into the electric vehicle (EV) sector. The proliferation of lighter, longer-lasting batteries is anticipated to enable novel product development and service offerings across diverse industries, contributing to global digitalization and sustainability efforts.

Source: <https://www.timesofs.com/articles/sila-300m-battery-expansion>

Collected: July 31, 2026 | Automated Research System (Gemini API)

#32 U.S. Government Invests Heavily in Domestic Battery Production and Recycling to Fortify National Security

Published July 27, 2026 RealClearDefense USA



OVERVIEW

The U.S. is expanding federal funding for domestic battery production, recycling, and manufacturing, with a strong focus on critical minerals and supply chain resilience. The Department of Energy (DOE) has committed up to \$500 million to scale domestic battery material processing and manufacturing, a strategic investment directly contributing to national defense and energy security. Factorial Energy CEO Siyu Huang emphasizes batteries as core national power systems, underpinning military readiness, data infrastructure, grid stability, and industrial competitiveness, highlighting the imperative of a domestic supply chain.

Key Findings

The U.S. government is prioritizing the strengthening of its domestic battery supply chain as a cornerstone of national security, significantly expanding federal funding for domestic production, recycling, and advanced manufacturing technologies. A particular emphasis is placed on enhancing the resilience of the entire value chain, from critical mineral sourcing and processing to final battery manufacturing.

Technical / Clinical Details

The U.S. Department of Energy (DOE) has announced a commitment of up to \$500 million (approximately 73 billion JPY) to expand domestic battery material processing and manufacturing capabilities. This funding will primarily support securing domestic supplies of critical minerals such as lithium, nickel, cobalt, and graphite, establishing refining facilities, and investing in research and development to scale up production of next-generation battery technologies, including solid-state batteries. The objective is to reduce reliance on foreign sources, particularly China, and establish a sustainable and secure domestic battery ecosystem. Investments will also target advanced battery recycling technologies to foster a closed-loop supply chain.

Background & Context

Battery technology has become an indispensable component in nearly every aspect of modern society, from electric vehicles (EVs) and renewable energy storage to portable electronics and military equipment. Amid increasing global supply chain disruptions and geopolitical tensions, the stability and security of battery supply are pressing concerns for many nations. Siyu Huang, CEO of Factorial Energy, underscores this critical role, stating that "Batteries are at the very core of national power systems, underpinning military readiness, data infrastructure, grid stability, and industrial competitiveness." This perspective highlights batteries not merely as energy storage devices but as crucial strategic national assets.

Strategic Significance & Outlook

This substantial investment by the U.S. government is expected to powerfully bolster the growth of the domestic battery industry and accelerate technological innovation. Solid-state batteries, like next-generation technologies, will enhance U.S. competitiveness, support the transition to a clean energy economy, and establish self-sufficiency in the defense sector. Strengthening the domestic supply chain will mitigate risks and lay the foundation for future energy security, positioning the U.S. to play a leading role in global battery technology and manufacturing.

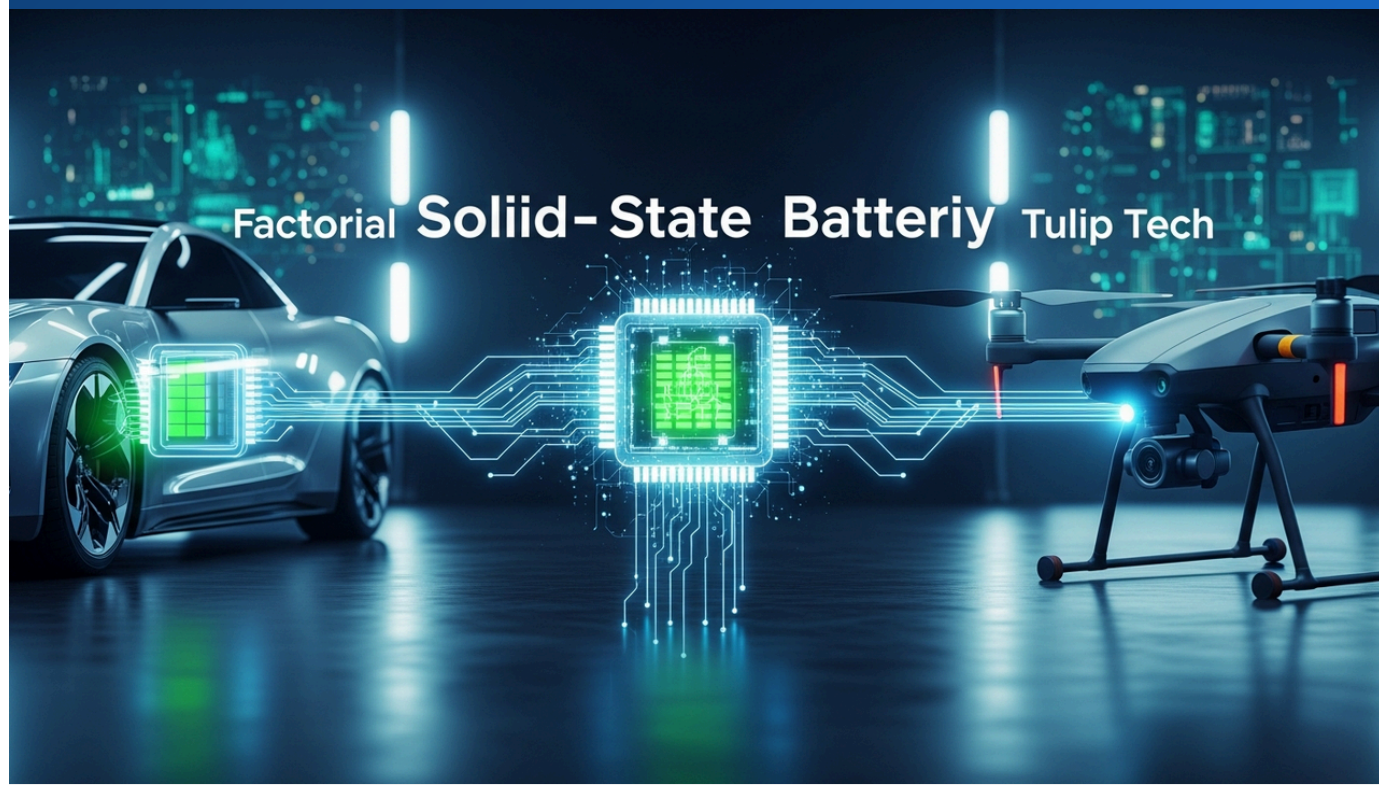
Source:

https://www.realcleardefense.com/articles/2026/07/27/national_security_starts_with_battery_security_1196765.h

Collected: July 31, 2026 | Automated Research System (Gemini API)

#33 Factorial Energy Partners with Tulip Tech to Expand Solid-State Batteries from Automotive to UAV Market

Published July 28, 2026 Disrupts USA & Netherlands



OVERVIEW

Factorial Energy has forged a strategic partnership with Dutch UAV battery integrator Tulip Tech, signaling a significant expansion of its solid-state battery technology beyond electric vehicles into the unmanned aerial vehicle market. This collaboration leverages Factorial's lithium metal cells, which have already demonstrated over 30% extended drone flight range in initial tests. The aim is to combine Factorial's FEST and Solstice platforms with Tulip Tech's integration expertise to rapidly develop and mass-produce high-performance battery systems for UAV fleets, enhancing operational efficiency in industrial drone applications.

Background

The global drone and UAV market is experiencing rapid expansion across a wide array of industrial sectors, encompassing logistics, agriculture, surveillance, and defense.

However, the energy density and weight of current battery technologies have consistently presented significant bottlenecks, constraining UAV operational endurance and payload capacity. While Factorial Energy has primarily directed its efforts towards the commercialization of solid-state batteries for electric vehicles (EVs), fostering key collaborations with automotive giants like Mercedes-Benz, Hyundai, Kia, and Stellantis, this new partnership with Tulip Tech signals a strategic pivot. It unlocks novel market opportunities for Factorial's technology in high-performance applications extending beyond the automotive sphere, notably within the aerospace domain. This strategic expansion is anticipated to broaden the scope of both commercial and military applications for UAVs, simultaneously contributing to a reduction in their overall operational costs.

Key Findings

U.S. solid-state battery innovator Factorial Energy has announced a strategic partnership with Tulip Tech, a Netherlands-based UAV battery integrator. This alliance signifies a pivotal expansion of Factorial's advanced solid-state battery technology beyond the traditional automotive sector, targeting the UAV market with promises of substantial improvements in drone flight range and payload capacity.

Technical Details

Factorial Energy's lithium metal solid-state cells have demonstrated exceptional performance in preliminary flight tests, achieving over a 30% extension in drone flight range compared to conventional battery systems. This performance advantage is attributed to the high theoretical capacity inherent in the lithium metal anode and the enhanced safety profile provided by the solid electrolyte, significantly augmenting UAV endurance for extended missions and enabling heavier payload transport. Tulip Tech contributes extensive expertise in integrating battery solutions specifically optimized for diverse UAV mission profiles. The collaboration will merge Factorial's FEST (Factorial Electrolyte System Technology) and Solstice platform cell chemistry with Tulip Tech's specialized system design and optimization capabilities, establishing a joint roadmap for the development and mass production of high-performance, reliable battery systems for the UAV sector.

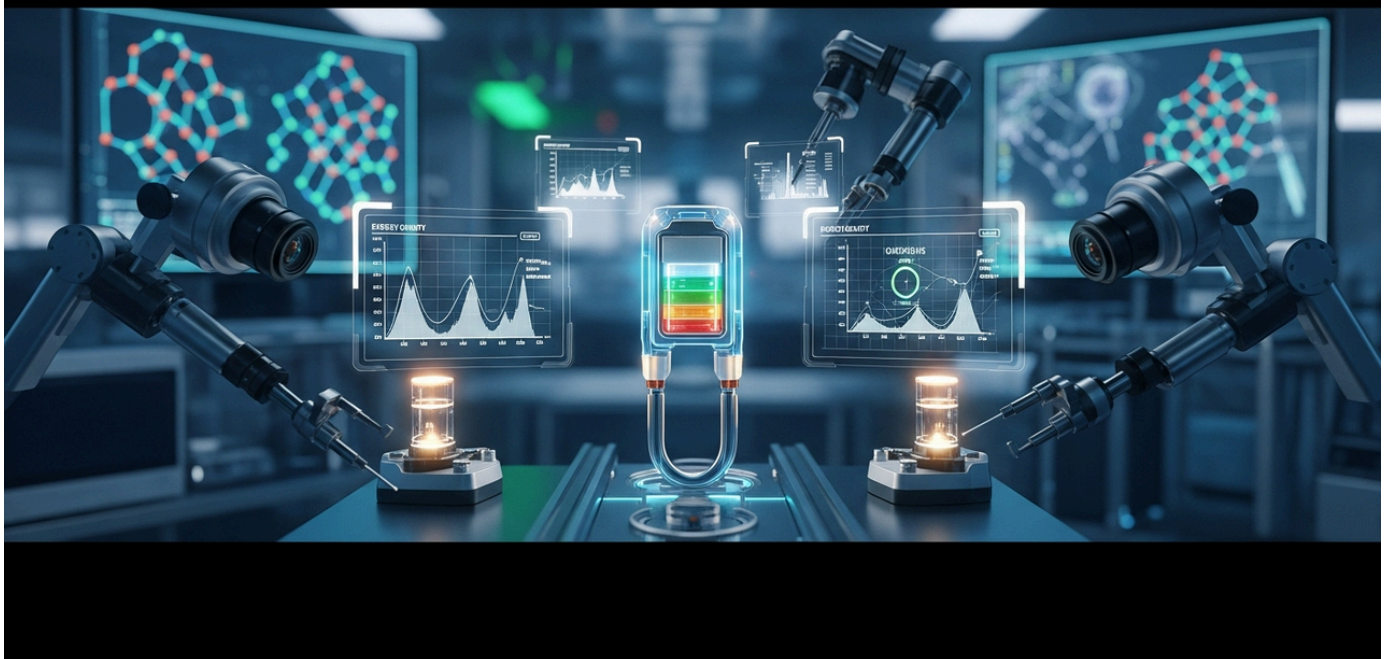
Strategic Outlook

The collaboration between Factorial Energy and Tulip Tech holds the potential to establish a new performance benchmark for battery technology within the burgeoning UAV market. Both entities will synergistically focus on strengthening customer engagement and accelerating the deployment of these advanced battery systems into operational UAV fleets. This technological advancement is poised to enable drones with significantly extended flight range and duration, driving innovation across various industries, including optimizing logistics efficiency, enhancing wide-area surveillance capabilities, and advancing precision agriculture methodologies. Moreover, the demonstrated adaptability and robust performance of solid-state batteries are expected to catalyze broader advancements in battery technology, fostering its application across other demanding high-performance sectors.

Source: <https://disrupts.disruptsmedia.com/defence/factorial-and-tulip-extend-solid-state-battery-gains-road-uav>

#34 French ITEN Launches "SOLIMED" Project for High-Capacity Solid-State Batteries in Class III Implantable Medical Devices: Targeting 600Wh/L and 20-Minute Fast Charging

Published July 23, 2026 Power Electronics News France



OVERVIEW

French solid-state energy storage company ITEN announced "SOLIMED," a major development program under Europe's IPCEI Tech4Cure initiative, to adapt high-capacity solid-state battery technology for Class III implantable medical devices. The project targets cell energy density over 600 Wh/L, cell capacity over 2 Ah, and fast charging capable of 80% capacity recovery within 20 minutes. ITEN's ceramic batteries eliminate thermal runaway and fire risks by removing liquid electrolytes and organic materials, aiming to drastically enhance the safety, energy density, fast charging, reliability, and lifespan of implantable medical devices.

Key Findings

ITEN, a French solid-state energy storage technology company, has announced the launch of "SOLIMED," a major development program aimed at optimizing high-capacity solid-state batteries for Class III implantable medical devices. This initiative is part of Europe's Important Project of Common European Interest (IPCEI) Tech4Cure, and it seeks to dramatically enhance the safety and performance of implantable medical devices through innovative battery technology.

Technical / Clinical Details

The SOLIMED project has set ambitious specific development targets:

- **Cell Energy Density:** Achieving over 600 Wh/L (Watt-hours per liter). This represents a significant increase in energy density compared to current small-format batteries, contributing to the miniaturization of medical devices and extended operational times.
- **Cell Capacity:** Ensuring a capacity greater than 2 Ah (Ampere-hours). This will enable more power delivery and expanded functionality for medical devices.
- **Fast Charging Capability:** Rapid charging to recover 80% of capacity within 20 minutes. This will improve patient convenience and reduce maintenance frequency.

ITEN's ceramic solid-state batteries entirely eliminate liquid electrolytes and organic materials, thereby completely removing conventional battery safety risks such as thermal runaway and fire. This intrinsic safety is critically important for Class III medical devices, such as pacemakers and neurostimulators, which are implanted directly into the human body and can pose serious risks to patients. Furthermore, solid-state technology enables extended lifespan, reduced self-discharge rates, and stable performance across high and low-temperature environments, significantly boosting the reliability of medical devices.

Background & Context

Implantable medical devices play an indispensable role in life support and improving patients' quality of life, but their battery life, safety, and charging convenience have always presented challenges. Class III medical devices, in particular, are subject to the most stringent regulations and safety standards due to their potential to cause serious patient harm. ITEN's SOLIMED project addresses these unmet needs, enabling the development of safer and higher-performing next-generation medical devices through battery technology innovation. Its inclusion in the European IPCEI program signifies recognition of the project's contribution to Europe's strategic independence and technological leadership.

Strategic Significance & Outlook

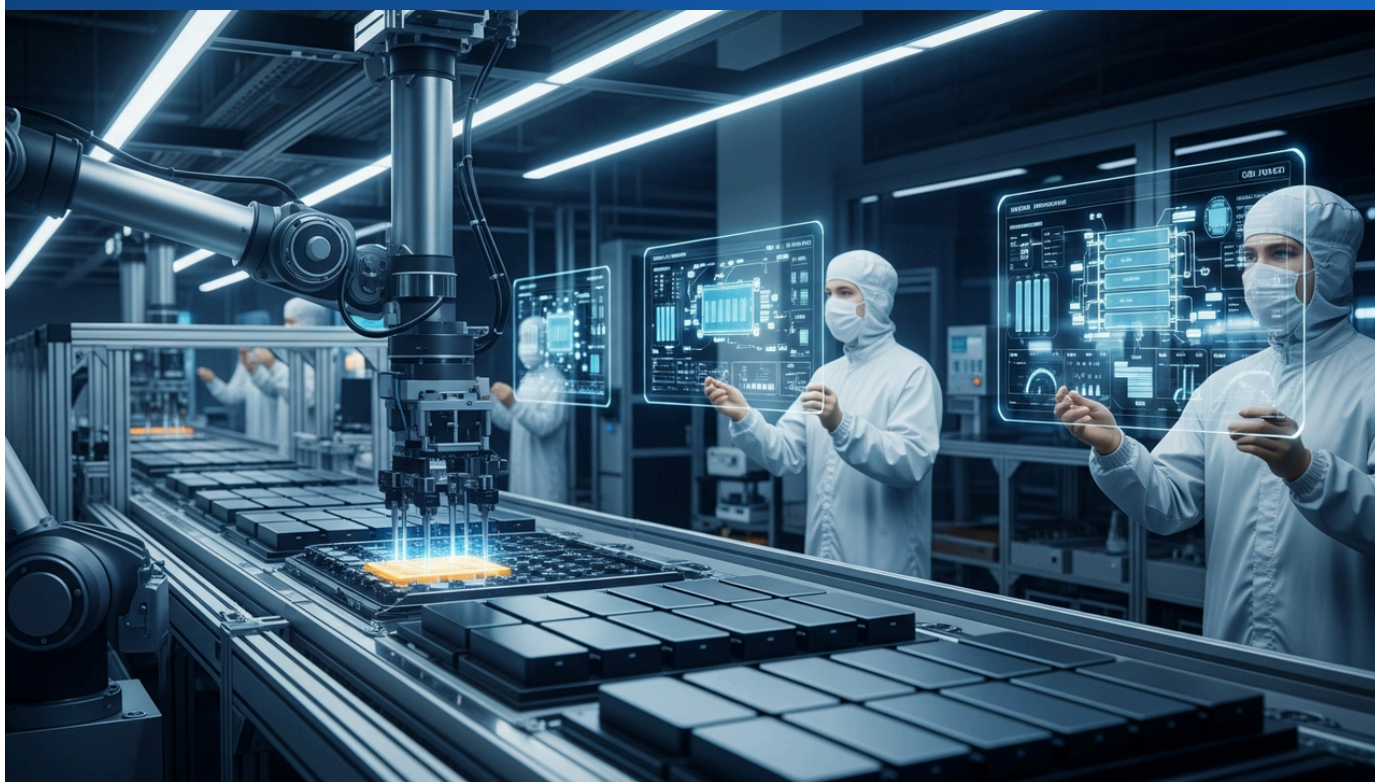
The success of the SOLIMED project holds the potential to revolutionize the implantable medical device market. High-safety, high-energy-density, and fast-charging solid-state batteries will break through current battery technology limitations, enabling new treatment modalities and device designs. This will allow patients to receive safer and more comfortable medical care, and healthcare professionals to utilize more reliable tools. ITEN's technology is also expected to find applications beyond the medical sector in other high-value niche markets, such as IoT devices and industrial equipment requiring high reliability, expanding the diverse possibilities of solid-state battery technology.

Source: https://powerelectronicsmagazine.net/article/124784/ITEN_to_develop_solid-state_batteries_for_medical_devices

Collected: July 31, 2026 | Automated Research System (Gemini API)

#35 SK On and Factorial Energy Ink MOU to Explore Solid-State Battery Manufacturing, Eyeing Existing Facilities for Mass Production

Published July 30, 2026 The Elec Inc. South Korea



OVERVIEW

SK On has signed an MOU with U.S. solid-state battery developer Factorial Energy for manufacturing collaboration on next-generation solid-state batteries. The partnership aims to jointly assess if Factorial's FEST® (Factorial Electrolyte System Technology) solid-state battery platform can be produced using SK On's existing lithium-ion battery manufacturing infrastructure. This move strengthens SK On's diverse approach to solid electrolyte technologies, building on its existing collaboration with Solid Power for sulfide-based tech. Factorial also intends to bolster its manufacturing base in South Korea and partner with local material and equipment suppliers.

Key Findings

SK On, a leading South Korean battery manufacturer, has announced the signing of a Memorandum of Understanding (MOU) with Factorial Energy, a U.S.-based solid-state battery development company, for manufacturing cooperation on next-generation solid-state batteries. The primary objective of this partnership is to jointly evaluate whether Factorial's innovative FEST® (Factorial Electrolyte System Technology) solid-state battery platform can be efficiently mass-produced by leveraging SK On's existing lithium-ion battery manufacturing infrastructure and equipment.

Technical / Clinical Details

Factorial Energy's FEST® technology utilizes a unique fluorine-based solid electrolyte, achieving both high ionic conductivity and stability, thereby enabling high-energy-density and safe solid-state batteries with lithium metal anodes. Under this MOU, the two companies will examine the applicability of SK On's existing battery production lines, particularly dry electrode processes, to Factorial's solid-state battery manufacturing. This approach aims to reduce capital expenditure for new equipment while applying expertise gained from current lithium-ion battery production to solid-state battery manufacturing, targeting early mass production and cost competitiveness. SK On had already established a pilot production line at its Future Technology Research Institute in Daejeon last year, pursuing internal development of solid-state battery technology concurrently.

Background & Context

As the electric vehicle (EV) market continues to grow, extending driving range, shortening charging times, and enhancing safety are urgent challenges, and solid-state batteries are anticipated as the ultimate solution to these issues. SK On has already established a cooperative relationship with Solid Power for sulfide-based solid-state battery technology, and this new partnership with Factorial Energy is seen as a strategic move to strengthen and diversify its approach to various solid electrolyte technologies, thereby mitigating risks. This is a crucial step for SK On to establish technological superiority in the fiercely competitive next-generation battery market and achieve its goal of commercializing solid-state batteries by 2029.

Strategic Significance & Outlook

This strategic partnership represents a significant advancement towards the mass production of solid-state batteries and could impact the entire battery industry. The synergy between SK On's manufacturing capabilities and Factorial's advanced technology is expected to reduce the production cost and complexity of solid-state batteries, accelerating their market introduction. Factorial has also indicated its intention to strengthen its manufacturing base in South Korea and collaborate with local material and equipment suppliers, suggesting the formation of a robust global supply chain. In the future, this technology is expected to dramatically enhance EV performance, encouraging more consumers to choose electric vehicles.

Source: <https://www.thelec.net/news/articleView.html?idxno=12666>

Collected: July 31, 2026 | Automated Research System (Gemini API)

#36 Factorial Energy and SK On to Jointly Evaluate Solid-State Battery Manufacturing Using Existing Facilities

Published July 29, 2026 Pluang South Korea と USA



OVERVIEW

SK On and Factorial Energy have signed an MOU to jointly assess the feasibility of manufacturing Factorial's advanced solid-state battery technology within SK On's global lithium-ion battery production infrastructure. This strategic collaboration aims to accelerate the industrialization of next-generation solid-state batteries for high-performance applications in mobility, aerospace, and data centers, capitalizing on a capital-efficient approach to expedite market adoption.

Background

The escalating global demand for electric vehicles (EVs) and other high-performance devices underscores a critical need for safer, more energy-dense, and efficient battery technologies. Solid-state batteries, often hailed as the "holy grail" of next-generation energy storage due to their inherent advantages, are a focal point for intensive research and commercialization efforts across the industry. SK On, a prominent global battery manufacturer, brings extensive production expertise and market presence. Factorial Energy, a U.S.-based startup, specializes in developing advanced solid-state battery technology. This strategic partnership is designed to synergize their respective strengths, aiming to secure a competitive advantage in the rapidly evolving battery landscape.

Key Findings

Factorial Energy (U.S.) and SK On (South Korea) have formalized a Memorandum of Understanding (MOU) to collaboratively assess the viability of integrating Factorial's solid-state battery manufacturing processes into SK On's existing global lithium-ion battery production infrastructure. This strategic alliance seeks to leverage the core competencies of both entities to expedite the industrialization of advanced solid-state batteries, specifically targeting demanding applications in mobility, aerospace, and data centers.

Technical Details

Factorial Energy's solid-state battery technology distinguishes itself through high energy density and enhanced safety characteristics, primarily attributed to the integration of a lithium metal anode. This core innovation promises substantial improvements over conventional lithium-ion battery performance. The partnership will involve a comprehensive evaluation to ascertain the adaptability of SK On's current battery manufacturing facilities and operational processes for Factorial's solid-state battery production. This assessment will also identify necessary modifications and optimizations. The overarching goal is to devise a capital-efficient mass production strategy for solid-state batteries, capitalizing on existing infrastructure to minimize the need for significant new capital expenditure. This approach is paramount for accelerating market entry and optimizing the total supply chain costs for solid-state battery solutions.

Strategic Significance & Outlook

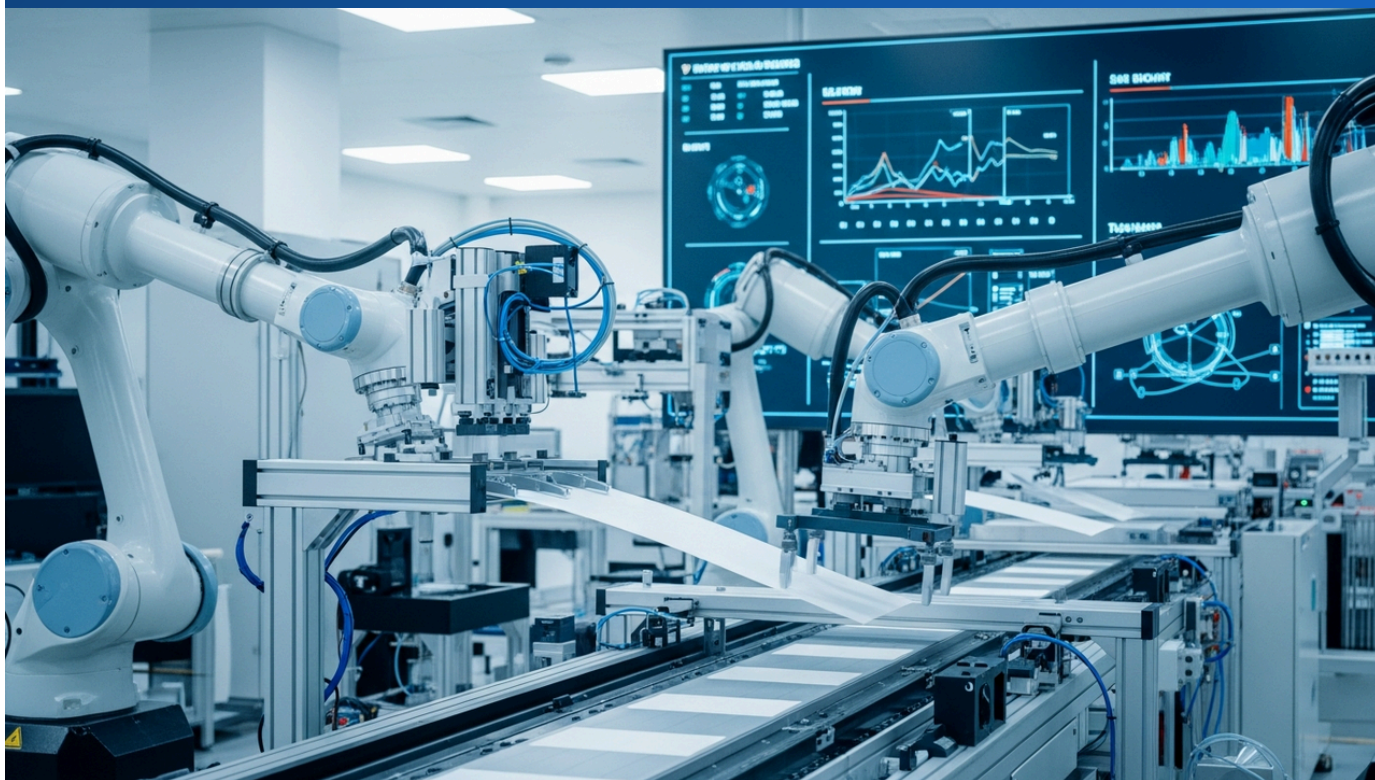
The collaboration between Factorial Energy and SK On represents a pivotal moment in the journey towards solid-state battery commercialization. By strategically repurposing existing manufacturing assets, this initiative has the potential to significantly reduce the inherent capital intensity and production costs associated with solid-state battery fabrication, thereby accelerating their mainstream adoption. Such advancements are poised to deliver substantial benefits, including extended range for electric vehicles, reduced charging times, and superior safety profiles. Moreover, the expanded application of these advanced batteries in high-power demand sectors like aerospace and data centers is anticipated, driving cross-industry technological innovation. This partnership is also expected to enhance the diversification and resilience of the global battery supply chain.

Source: <https://pluang.com/en/news-feed/factorial-dan-sk-on-jalin-kolaborasi-baterai-solid-state>

Collected: July 31, 2026 | Automated Research System (Gemini API)

#37 LG Energy Solution Returns to Profit in Q2, Prepares Dry Electrode Pilot Line for Solid-State Batteries in H2 2026

Published July 30, 2026 Investing.com South Korea



OVERVIEW

LG Energy Solution announced a return to profitability in Q2 2026, driven by strong performance in its Energy Storage System (ESS) business. The company revealed plans to prepare a dry electrode process pilot line for solid-state batteries in H2 2026 as part of its technology roadmap. This strategy aims to future-proof the market through existing product enhancements and next-generation battery development, with stable expansion of North American ESS production sites and increased orders from renewable energy and data center clients boosting profitability.

Key Findings

LG Energy Solution has announced a return to profitability in the second quarter of 2026, primarily driven by robust growth in its Energy Storage System (ESS) business and successful strategic efforts to improve profitability. The company also revealed plans to commence preparation of a dry electrode process pilot line for solid-state batteries in the second half of 2026, aligning with its commitment to meet future market demands.

Technical / Clinical Details

LG Energy Solution's technology roadmap emphasizes the development of next-generation solid-state battery technology in parallel with enhancing the performance of existing liquid-electrolyte lithium-ion batteries. The dry electrode process pilot line, scheduled for preparation in H2 2026, is critically important for reducing the manufacturing cost and improving the production efficiency of solid-state batteries. The dry electrode process is environmentally friendly as it avoids the use of solvents, contributing to simplified manufacturing and reduced energy consumption. Through this pilot line, the company aims to establish mass production technology for solid-state batteries, working towards the commercialization of products that offer high energy density, fast charging, and superior safety.

Background & Context

With the growth of the global electric vehicle (EV) and renewable energy markets, the demand for batteries has dramatically increased. LG Energy Solution is one of the world's leading suppliers of EV batteries, and it is also intensifying its focus on the Energy Storage System (ESS) market. The stable expansion of ESS production sites, particularly in North America, has significantly contributed to the company's improved profitability. Solid-state batteries hold the potential to surpass the limitations of current battery technology, and amidst intense competition among major battery manufacturers, LG Energy Solution's establishment of a pilot line using a dry electrode process is positioned as a crucial investment to maintain its technological leadership.

Strategic Significance & Outlook

LG Energy Solution's preparation of a dry electrode process pilot line for solid-state batteries will significantly enhance its competitiveness in the next-generation battery market. As this technology matures, it is expected to accelerate the mass production of solid-state batteries, contributing to extended EV range, shorter charging times, and improved safety. In the ESS sector, it will enable the provision of safer and longer-lasting battery systems, forming a foundation for expanding renewable energy adoption and ensuring stable operation of data centers. The company aims to further strengthen its leadership in the global market by providing sustainable energy solutions.

Source: <https://www.investing.com/news/company-news/lg-energy-solution-q2-2026-slides-show-ess-surge-profit-recovery-93CH-4822284>

Collected: July 31, 2026 | Automated Research System (Gemini API)

#38 European EV Demand and US BESS Drive LG Energy Solution's Q2 Profit Turnaround, Solid-State Battery Pilot Line Forthcoming

Published July 30, 2026 Energy-Storage.news South Korea



OVERVIEW

LG Energy Solution returned to profitability in Q2 2026, attributing its success to increased EV cell demand in Europe and robust Battery Energy Storage System (BESS) sales in the U.S. The company plans to prepare a dry electrode process-based pilot line for solid-state batteries in H2 2026 and aims for initial sodium battery sample shipments to ESS customers by 2027, accelerating product development and production line preparations. This strengthens its technology and manufacturing capacity for sustainable energy solutions.

Key Findings

LG Energy Solution successfully turned to profit in the second quarter of 2026. This recovery was primarily fueled by an increase in demand for electric vehicle (EV) cells in the European market and robust sales of Battery Energy Storage Systems (BESS) in the United States. The company also announced plans to proceed with preparations for a dry electrode process-based pilot line for solid-state batteries in the second half of 2026, signifying its commitment to next-generation battery technologies.

Technical / Clinical Details

LG Energy Solution continues to pursue technological innovation and diversification of its product portfolio. The dry electrode process-based pilot line for solid-state batteries, slated for preparation in H2 2026, is a critical step for the company to maintain competitiveness in the future battery market. The dry electrode process promises significant environmental benefits by eliminating solvent use in manufacturing, alongside substantial reductions in production costs. Furthermore, the company aims for initial sample shipments of sodium-ion batteries to Energy Storage System (ESS) customers by 2027. This offers a new, lithium-independent option, contributing to supply chain stabilization and cost reduction. These initiatives accelerate the provision of high-performance, sustainable battery solutions.

Background & Context

As global decarbonization and the transition to renewable energy accelerate, high-performance battery technology is indispensable. The surge in EV demand in Europe is driven by stringent emissions regulations and heightened consumer awareness. Concurrently, the BESS market in the U.S. is experiencing rapid growth due to expanding renewable energy integration and the need for grid stabilization. LG Energy Solution is leveraging its success in these key markets and investing in next-generation battery technologies to ensure sustained growth. The development of both solid-state and sodium-ion batteries represents a strategic move to adapt to market changes and secure long-term technological leadership.

Strategic Significance & Outlook

LG Energy Solution's preparations for a solid-state battery pilot line and the planned sample shipments of sodium batteries will strengthen its leadership in the battery market. Solid-state batteries are expected to dramatically improve EV range and safety, while sodium batteries, as cost-effective ESS solutions, are poised to further accelerate the adoption of renewable energy. These technological innovations are projected to expand the company's role in the global clean energy transition and contribute to the realization of a sustainable society. LG Energy Solution is committed to addressing technological challenges and seizing market opportunities to establish a sustainable growth trajectory.

Source: <https://www.energy-storage.news/ev-demand-in-europe-bess-in-the-us-drive-lg-energy-solutions-return-to-profit-in-q2/>

Collected: July 31, 2026 | Automated Research System (Gemini API)