SolidStateBattery

Weekly Intelligence Report

2026-07-05 | 43 articles | 10 countries

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This Week's Keyword

Solid-State Batteries

Race to commercialization intensifies

43 articles	10 countries	2026 year	2000 Wh/kg
Total Articles	Source Countries	Earliest Mass Prod.	Highest Energy Density

All 43 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	CATL 2030 SSB Outlook	Corporate Strategy	●○○○○	●●○○○	●●●●○	●●○○○	●●●●○	CATL chairman predicts post-2030 SSB commercialization, currently at 'Level 4' maturity.
#02	China SSB Revolution	Market Overview	●●●○○	●●●●○	●●●●●	●●●○○	●●●●●	Chinese firms (CATL, GAC, Chery, SVOLT) push 500-600Wh/kg SSBs, GAC targets 2026 mass production.
#03	Honda-QS Alliance	Corporate Strategy	●●●●○	●●●○○	●●●●○	●●●○○	●●●●●	Honda and QuantumScape partner on QSE-5 solid-state Li-metal batteries (800Wh/L, <15min charge).
#04	Toyota & Samsung SDI	Corporate Strategy	●●●○○	●●●○○	●●●●●	●●●○○	●●●●●	Toyota holds 1000+ SSB patents, targets 2027-28 mass production; Samsung SDI targets late 2027 anode-free SSB.
#05	Dragonfly Dry Electrode	IP/Corporate Strategy	●●●○○	●●○○○	●●●○○	●●●○○	●●●●●	Dragonfly Energy secures dry electrode manufacturing patents for SSBs in US, Japan, EU; pouch cell deferred to 2027.
#06	Solidion & SpaceX	Corporate Strategy	●●○○○	●●○○○	●●○○○	●●○○○	●●●●●	Solidion acquires SpaceX stock, highlights its SSBs for demanding space applications (Starship, Falcon, Starlink).
#07	SSB Key Attributes	Market Overview	●○○○○	●○○○○	●●●○○	●●○○○	●●●○○	SSBs promise 400-500 Wh/kg, enhanced safety, rapid charging, and long lifespan for EVs and grid storage.
#08	Semi- vs All-SSB	Comparison	●○○○○	●○○○○	●●○○○	●●○○○	●●●○○	Compares semi-solid (5-20% liquid) and all-solid-state (<5% liquid) batteries on 8 key characteristics.
#09	Li-S & Tsinghua SSB	Research	●●●●●	●○○○○	●●●●○	●●●○○	●●●○○	Li-S SSB hits 505 Wh/kg; Tsinghua quasi-SSB achieves 604 Wh/kg, 1027 Wh/L, doubling Li-ion.
#10	O_2 in Sulfide SSE	Research	●●●●●	●○○○○	●●●○○	●●●●●	●●●●○	Oxygen introduction in sulfide SSEs stabilizes interfaces, maintains high Li-ion conductivity for SSBs.
#11	PIL/MOF Composite SE	Research	●●●●●	●○○○○	●●●○○	●●●●●	●●●○○	Novel PIL/MOF composite solid electrolyte achieves high ionic conductivity (1.4 mS cm^{-1}) and mechanical strength.
#12	Degradable Fireproof PE	Research	●●●●●	●○○○○	●●●●○	●●●●●	●●●●○	Degradable, fireproof polymer composite electrolyte developed for safe, environmentally friendly Li-metal batteries.

#	Article Title	Type	Tech Novelty	Market Proximity	Market Impact	Data Reliability	US/EU Relevance	Summary
#13	MOF-Modified SSE	Research	●●●●○	●○○○○	●●●○○	●●●●●	●●●●○	MOF ZIF-8 modified solid electrolyte (LATP/PEO) achieves 3.04 × 10^{-4} S cm^{-1} at 60°C, enhancing stability.
#14	UCLA 3D Zn-Ion Batt	Research	●●●●○	●○○○○	●●●○○	●●●○○	●●●●●	UCLA develops 3D-printed Zn-Fe battery with 7x higher energy density, a safer Li-ion alternative.
#15	Si Anode Volume Strain	Research	●●●○○	●●○○○	●●●○○	●●●●●	●●●●○	Carbon and high-modulus additives mitigate volume strain in silicon anodes, enhancing battery stability.
#16	Toyota 1000-Mile SSB	Product Announcement	●●●●●	●●●○○	●●●●●	●●○○○	●●●●●	Toyota claims 1000-mile EV range, 5-min charging with SSB, targeting 2027-28 production for hybrids.
#17	Pulsedeon Scale-up	Corporate Strategy	●●●○○	●●●●○	●●●○○	●●●○○	●●●●●	Finnish Pulsedeon secures €700K to scale PLD-based SSB manufacturing, begins global sample supply.
#18	Swiss BTRY Thin-Film	Corporate Strategy	●●●○○	●●●●○	●●●○○	●●●○○	●●●●●	Swiss BTRY secures €2.2M EIC grant to industrialize thin-film SSBs for microelectronics, building EU plant.
#19	US Air Energy Li-Air	Product Development	●●●●●	●●○○○	●●●●●	●●○○○	●●●●●	US Air Energy pilots 2000Wh/kg all-solid-state Li-air batteries for electric aircraft, backed by DOE.
#20	Ilika Commercialization	Corporate Strategy	●●●○○	●●●●○	●●●●○	●●●○○	●●●●●	UK's Ilika secures £4.56M to accelerate SSB commercialization for medical, EV, defense; shipping 10Ah samples.
#21	LiNa Na-Ion SSB	Corporate Strategy	●●●●○	●●○○○	●●●●○	●●●○○	●●●●●	UK's LiNa Energy raises £29.2M to develop all-solid-state sodium batteries for energy storage and EVs.
#22	China SSB Standard	Market Analysis	●●○○○	●●●●○	●●●●●	●●●○○	●●●●●	China issues new SSB standard ($<0.5\%$ liquid for true SSB), predicts semi-solid mass production & cost parity by 2027.
#23	SSB Commercialization	Market Overview	●●●○○	●●●●○	●●●●○	●●●○○	●●●●●	Syensqo/Axens form Argylium for sulfide SSE; Ilika ships 10Ah samples; Donut Lab 400Wh/kg SSB for Verge Motorcycles.
#24	Samsung SDI Client Fdbk	Corporate Strategy	●●●○○	●●●●○	●●●●●	●●●○○	●●●●●	Samsung SDI SSBs get positive client feedback on safety/energy density, targets late 2027 mass production.
#25	TIES Liquid-Solid Cells	Product Announcement	●●●○○	●●●●○	●●●●○	●●●○○	●●●●○	Nio supplier TIES unveils 'liquid-solid cells' (5-20% liquid) with $<10\%$ factory modification, adhering to China's standard.
#26	Donut Lab 400Wh/kg	Product Announcement	●●●●○	●●●●○	●●●●○	●●●○○	●●●●●	Finnish Donut Lab's 400Wh/kg SSB achieves 5-min charge, 100k cycles, for Verge Motorcycles Q1 2026.
#27	Factorial Stellantis	Corporate Strategy	●●●○○	●●●●○	●●●●○	●●●○○	●●●●●	Factorial Energy begins on-road SSB testing with Stellantis, claims 80% CAPEX reduction via existing Li-ion lines.
#28	Samsung Ulsan Invest	Corporate Strategy	●●○○○	●●●○○	●●●●○	●●○○○	●●●●○	Samsung Chairman pledges investment in Ulsan for Samsung SDI's next-gen SSBs and BESS plants.
#29	Sulfide SSE Anode	Research	●●●●○	●○○○○	●●●○○	●●●○○	●●●○○	Research highlights sulfide SSE anode compatibility issues; polymer electrolyte pouch cell achieves 401.1 Wh/kg.
#30	Ti-Doped LLZO	Research	●●●●○	●○○○○	●●○○○	●●●●○	●●●○○	Ti-doping improves LLZO solid electrolyte density and ionic conductivity by stabilizing the cubic phase.
#31	Disordered LLZO	Research	●●●●●	●○○○○	●●●○○	●●●●●	●●●●○	Disordered Li sublattice in LLZO achieves 10^{-3} S/cm room-temp ionic conductivity via first-principles calculations.

#	Article Title	Type	Tech Novelty	Market Proximity	Market Impact	Data Reliability	US/EU Relevance	Summary
#32	Korean SSB Lifespan	Research	●●●●●	●○○○○	●●●●○	●●●○○	●●●●○	Korean team triples sulfide SSB lifespan to 2500+ hours using elastic ion-conductive polymer, improving capacity retention.
#33	CATL Sulfide SSB Perf	Product Development	●●●●●	●●○○○	●●●●●	●●○○○	●●●●●	CATL's sulfide SSB achieves liquid-level ionic conductivity, stable -40°C to 100°C, and 6C fast charging.
#34	Fast-Charge Li-Ion	Research	●●●●○	●●○○○	●●●○○	●●●●○	●●●●●	UK/Australia team achieves 85%+ charge in 6 mins for Li-ion (240.4 Wh/kg) via interfacial catalysis.
#35	$LiBF_4$ Sulfohalide	Research	●●●●○	●○○○○	●●●○○	●●●●●	●●●○○	$LiBF_4$ doping stabilizes sulfohalide electrolyte interfaces, enabling 800+ hours stable Li-metal battery operation.
#36	Sulfide SSB Pressure	Research	●●●●○	●●○○○	●●●○○	●●●●○	●●●○○	Three-stage pressure optimization achieves 1.54 mS/cm ionic conductivity, 97% retention over 50 cycles for sulfide SSBs.
#37	rGO LATP Stability	Research	●●●●○	●○○○○	●●○○○	●●●●●	●●●○○	rGO coating enhances LATP composite SSE surface stability, achieving 125 mAh/g in Li-LFP full cells.
#38	Caltech Co-Free LFP	Research	●●●●○	●○○○○	●●●○○	●●●○○	●●●●●	Caltech develops cobalt-free, robust LFP-carbon 3D electrodes, aiming for future solid-state battery integration.
#39	Lactone Na-Ion SE	Research	●●●○○	●○○○○	●●○○○	●●●●●	●●●○○	Lactone electrolytes for 4.5V Na-ion batteries show high-voltage advantages but face ionic conductivity/SEI stability issues.
#40	Ganfeng Li-Metal/Si	Product Development	●●●●○	●●●○○	●●●●○	●●○○○	●●●●●	Ganfeng Lithium achieves 400Wh/kg (Li-metal, 1100+ cycles) and 320-480Wh/kg (Si-anode, 1000+ cycles) SSBs.
#41	QS QSE-5 Robotics	Product Development	●●●●○	●●●○○	●●●○○	●●●○○	●●●●●	QuantumScape's QSE-5 SSB (301Wh/kg, 844Wh/L) targets extended robotics operation and fast charging.
#42	DOE SSB Mfg Funding	Government Policy	●●○○○	●●●○○	●●●●○	●●●●○	●●●●●	US DOE awards $16M to advance domestic SSB manufacturing, including Solid Power partnership, for pilot production.
#43	LLZO Uniaxial Press	Research	●●○○○	●●○○○	●●○○○	●●●○○	●●●○○	Uniaxial pressing is critical for LLZO solid electrolyte green pellet production, ensuring high density and ionic conductivity.

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

Three Questions That Demand Your Decision This Week

❶ Is your EV platform ready for 5-minute charging?

Toyota claims 1000-mile range and 5-minute charging by 2027-28, while Donut Lab targets Q1 2026 integration for motorcycles. This aggressive timeline demands immediate assessment of your charging infrastructure and battery integration strategy.

❷ How will China's SSB standards impact your market access?

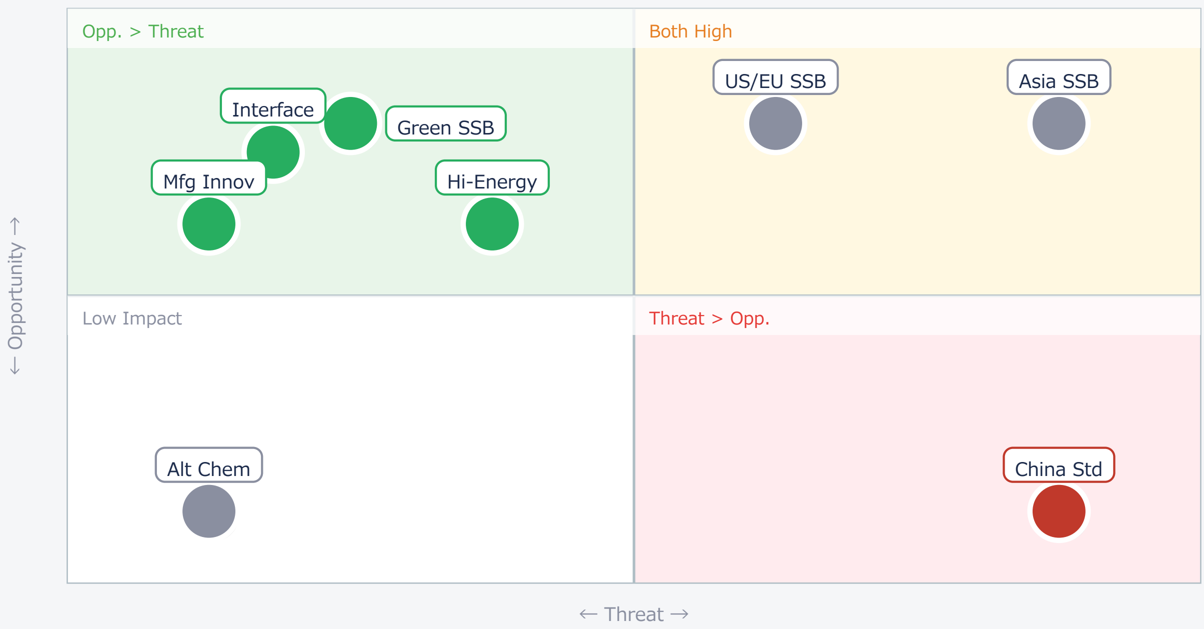
China's new national standard defines 'all-solid-state' as <0.5% liquid electrolyte, banning ambiguous terms. This clarity, coupled with aggressive semi-solid production targets by 2027, could create a distinct competitive landscape. Are your products compliant or at risk?

❸ Are you investing enough in fundamental SSB interface science?

Breakthroughs like oxygen in sulfide SSEs (#10) and elastic polymers (#32) are solving critical interface and durability issues. Without deep R&D; into these fundamental challenges, US/EU firms risk falling behind Asian competitors who are actively publishing and commercializing.

Opportunities vs. Threats for US/European Companies

Opportunity vs. Threat Matrix for US/European Companies



Item	Quadrant	↑ Opportunity	↓ Threat
● Asia SSB	Critical	Asian mkt lead	US/EU market loss
● US/EU SSB	Critical	Domestic SSB	Catch-up race
● Mfg Innov	Opp.	Cost/Scale	Lagging tech
● Hi-Energy	Opp.	Future tech	Missed future
● Interface	Opp.	Core tech fix	Stalled R&D;
● Green SSB	Opp.	Eco-friendly	Compliance risk
● Alt Chem	Ref.	Sustain. alt	Niche focus

● China Std	Threat	Clear mkt	Regulatory lock

Deep Dive ① — Toyota's Aggressive SSB Roadmap

#16 | 2026/06/29 | Unnamed source | Tech Novelty●●●●● Proximity●●●○○ Market Impact●●●●● Data Reliability●●○○○ US/EU Relevance●●●●●

Toyota claims a groundbreaking solid-state battery achieving 1000-mile EV range and 5-minute charging. The company aims for mass production in hybrid vehicles by 2027-2028, with subsequent expansion to EVs, leveraging sulfide-based solid electrolytes for rapid ion movement and enhanced safety.

This aggressive timeline, significantly earlier than many competitors, positions Toyota to potentially redefine EV performance and accelerate market adoption, impacting global automotive and energy industries.

▶ Strategic Analyst's Perspective

Strategic Analyst's Perspective: Toyota's claims of 1000-mile range and 5-minute charging by 2027-28 are extremely optimistic, especially given the 'unnamed source' and typical SSB development hurdles. While Toyota has a strong patent portfolio, scaling sulfide SSBs for automotive at this performance level and cost by 2027 is highly challenging due to interface stability, dendrite suppression, and manufacturing complexity. [Opportunity] for US/EU OEMs to benchmark and accelerate their own SSB development, potentially through partnerships. [Threat] of being significantly outmaneuvered in EV performance if Toyota's claims materialize, forcing a rapid re-evaluation of product roadmaps. Next actions: [R&D;] Validate Toyota's technical claims through competitive intelligence (Q3 2026). [Strategy] Develop contingency plans for accelerated SSB adoption scenarios (Q4 2026).

Deep Dive ② — CATL's Sulfide SSB Performance Breakthrough

#33 | 2026/06/27 | YouTube | Tech Novelty●●●●● Proximity●●○○○ Market Impact●●●●● Data Reliability●●○○○ US/EU Relevance●●●●●

CATL's sulfide all-solid-state battery (argyrodite Li_6PS_5Cl) reportedly achieves ionic conductivity comparable to liquid electrolytes (10-25 mS/cm) at room temperature. It also demonstrates stable operation from -40°C to 100°C and supports ultra-fast 6C charging, addressing critical performance and reliability challenges.

This technical achievement from the world's largest battery manufacturer indicates significant progress in overcoming key barriers for solid-state battery commercialization, particularly for rapid charging and broad environmental stability in EVs.

▶ Strategic Analyst's Perspective

Strategic Analyst's Perspective: CATL's reported 6C charging and wide temperature stability for sulfide SSBs are highly impressive, potentially setting new industry benchmarks. While the 'YouTube' source raises data reliability concerns, CATL's R&D; capabilities are undeniable. The technical barrier of achieving liquid-level ionic conductivity across such a wide temperature range is immense, suggesting significant material and interface engineering breakthroughs. [Opportunity] for US/EU materials suppliers to develop compatible components (e.g., high-stability cathodes, advanced packaging) for such demanding performance. [Threat] that CATL's early mastery of these critical parameters could lead to a dominant market position, making it harder for US/EU OEMs to compete on performance. Next actions: [R&D;] Investigate CATL's specific electrolyte and interface chemistries for replication or counter-development (Ongoing). [Business Dev] Explore potential partnerships with companies demonstrating similar thermal management or fast-charging capabilities (Q3 2026).

Deep Dive ③ — Oxygen for Sulfide SSE Interface Stability

#10 | 2026/06/25 | EurekAlert! | Tech Novelty●●●●● Proximity●○○○○ Market Impact●●●○○ Data Reliability●●●●● US/EU Relevance●●●●○

New research demonstrates that introducing oxygen into sulfide-based solid electrolytes (e.g., via Li_2SO_4 in argyrodite) can stabilize unstable interfaces while preserving high lithium ion conductivity. This restructures lithium pathways, activates inter-cage ion conduction, and suppresses interfacial reactions.

This discovery offers a crucial strategy for the practical implementation of next-generation all-solid-state batteries by addressing a major challenge: the poor atmospheric stability and high interfacial resistance of sulfide electrolytes, which are otherwise highly conductive.

▶ Strategic Analyst's Perspective

Strategic Analyst's Perspective: This research presents a fundamental breakthrough in sulfide solid electrolyte stability, a critical barrier for high-performance SSBs. The mechanism of oxygen incorporation to activate inter-cage ion conduction is novel and highly promising. While currently at the basic research stage (Proximity 1), the published numbers and detailed mechanism (Data Reliability 5) suggest realism. Technical barriers remain in scaling this precise oxygen introduction for large-scale manufacturing and ensuring long-term stability under cycling. [Opportunity] for US/EU materials and component suppliers to license or develop similar interface stabilization technologies, potentially creating a competitive advantage in electrolyte manufacturing. [Threat] that if Asian competitors integrate this faster, US/EU SSB development could face delays due to unresolved interface issues. Next actions: [R&D;] Initiate internal research projects or academic collaborations on interface stabilization for sulfide SSEs (Immediate). [Procurement] Identify potential suppliers of lithium sulfate or similar oxygen-source precursors for R&D; (Short-term).

Other Notable Articles

Chinese Firms Drive Solid-State Battery Revolution: CATL Aims for 500Wh/kg, GAC Targets 2026 Mass Production at 500Wh/kg (EnkiAI)
Tech Novelty●●●○○ Proximity●●●●○ Market Impact●●●●● Data Reliability●●●○○ US/EU Relevance●●●●●

Chinese firms are aggressively targeting 500-600Wh/kg SSBs with mass production as early as 2026, a major competitive benchmark.

SMM H1 2026 Review: China's New National Standard Defines Solid-State Batteries, Predicts Semi-Solid Mass Production & Cost Parity by 2027 (SMM)
Tech Novelty●●○○○ Proximity●●●●○ Market Impact●●●●● Data Reliability●●●○○ US/EU Relevance●●●●●

China's new SSB standard and 2027 semi-solid mass production/cost parity prediction will shape global market dynamics.

Donut Lab's 400Wh/kg Solid-State Battery Achieves 5-Minute EV Charge, Slated for Verge Motorcycles in Q1 2026 (The Robotics Media)
Tech Novelty●●●●○ Proximity●●●●○ Market Impact●●●●○ Data Reliability●●●○○ US/EU Relevance●●●●●

Finnish Donut Lab's 400Wh/kg SSB with 5-min charge and 100k cycles for Q1 2026 EV integration is a significant near-term product.

Factorial Energy Begins On-Road EV Solid-State Battery Testing with Stellantis, Targets 80% Manufacturing CAPEX Reduction (Tracxn)
Tech Novelty●●●○○ Proximity●●●●○ Market Impact●●●●○ Data Reliability●●●○○ US/EU Relevance●●●●●

US-based Factorial's on-road testing with Stellantis and 80% CAPEX reduction claim could accelerate US/EU SSB adoption.

Korean Team Triples Sulfide All-Solid-State Battery Lifespan, Achieves 2500 Hours Stable Operation with Elastic Ion-Conducting Polymer (BigGo Finance)

Tech Novelty●●●●● Proximity●○○○○ Market Impact●●●●○ Data Reliability●●●○○ US/EU Relevance●●●●○

Korean research on elastic polymer for sulfide SSBs addresses critical durability issues, tripling lifespan to 2500+ hours.

Recommended Actions This Week

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

Immediate (this week)

- [R&D;] Initiate competitive analysis on Toyota's and CATL's SSB claims (1000-mile, 5-min charge, 6C) to validate feasibility and identify key technical gaps.
- [Strategy] Review current EV battery roadmap against aggressive Asian SSB commercialization timelines (2026-2028) and China's new national standards.
- [Procurement] Assess supply chain exposure to critical SSB materials, considering potential shifts driven by Asian market leaders.

Short-term (1 month)

- [R&D;] Prioritize internal projects or external collaborations focused on solid-solid interface stability and dendrite suppression, especially for sulfide electrolytes.
- [Business Dev] Evaluate partnership opportunities with US/EU SSB developers (e.g., QuantumScape, Factorial, Ilika, BTRY) to strengthen domestic capabilities.
- [Legal/IP] Conduct a patent landscape analysis on dry electrode manufacturing and advanced electrolyte interface technologies to identify licensing opportunities or threats.

Medium-long term (quarter+)

- [Executive] Develop a long-term strategy for domestic SSB manufacturing, including potential government funding applications (e.g., DOE programs) and site selection for pilot plants.
- [R&D;] Investigate alternative battery chemistries like solid-state sodium-ion and 3D-printed zinc-ion for long-term sustainability and diversification beyond lithium.
- [Strategy] Establish a cross-functional task force to monitor global SSB regulatory developments and prepare for potential international standardization impacts.

SolidStateBattery — Selected Articles

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#19 US Air Energy Advances Pilot Production of 2000Wh/kg All-Solid-State Lithium-Air Batteries for Electric Aircraft

#20 UK's Ilika Secures £4.56M to Accelerate Solid-State Battery Commercialization, Strengthening Medical, EV, and Defense Markets

#21 LiNa Energy Raises £29.2M to Advance Solid-State Sodium Battery Development for Renewable Energy Storage and EV Markets

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#33 CATL's Sulfide All-Solid-State Battery Achieves Liquid Electrolyte-Level Ionic Conductivity at Room Temperature, Stable from -40°C to 100°C with 6C Charging

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#40 Ganfeng Lithium Achieves 400Wh/kg, 1100+ Cycles with Li-Metal Route, Offers 320-480Wh/kg Si-Anode Products with 1000+ Cycles

#41 QuantumScape's QSE-5 Solid-State Cell Achieves 301Wh/kg, 844Wh/L, Targets Extended Robotics Operation and Fast Charging

#42 US Department of Energy Awards $16M to Advance Solid-State Battery Manufacturing, Including Solid Power Partnership

#43 Uniaxial Press Critical for LLZO Solid Electrolyte Green Pellet Production, Lays Foundation for High-Performance Solid-State Batteries

#01 CATL Chairman Predicts Post-2030 Solid-State Battery Commercialization, Citing Current 'Level 4' Maturity

Published June 25, 2026 Electrek USA

OVERVIEW

Robin Zeng, chairman of CATL, the world's largest battery manufacturer, stated that the company's all-solid-state battery technology is currently at 'Level 4' on a nine-tier maturity scale, with full commercialization unlikely before 2030. This assessment tempers market expectations for the technology. China's draft national standard defines a true solid-state battery as containing less than 5% liquid electrolyte, a benchmark requiring significant further innovation. Chief scientist Wu Kai targets 'Level 7-8' by 2027 for pilot verification.

IN DEPTH

Key Findings

Robin Zeng, chairman of Contemporary Amperex Technology Co. Limited (CATL), a global leader in battery manufacturing, has projected that the mass commercialization of all-solid-state battery technology will not commence until 2030. He further clarified that CATL's current solid-state battery technology stands at 'Level 4' on a nine-tier maturity scale, signaling a cautious outlook on the immediate future of this advanced battery type. This announcement effectively dampens some of the more optimistic market expectations surrounding solid-state batteries.

Technical/Clinical Details

Chairman Zeng emphasized that achieving full commercialization requires the complete resolution of multiple technical challenges, including ensuring safety, reliability, and long-term durability, to reach 'Level 9' maturity. Key hurdles involve stabilizing the solid-electrolyte-electrode interface, suppressing lithium dendrite formation, and significantly reducing manufacturing costs. Wu Kai, CATL's chief scientist, outlined a more immediate goal of reaching 'Level 7-8' by 2027, enabling pilot verification of the technology. According to China's draft national standard for solid-state batteries, a 'true' solid-state battery must contain less than 5% liquid electrolyte, whereas batteries with 5-20% liquid electrolyte are classified as 'hybrid' or 'semi-solid-state,' a distinction that underscores the stringent technical requirements for genuine solid-state technology.

Background & Context

The electric vehicle (EV) industry is intensely pursuing all-solid-state batteries as a potential 'holy grail' solution to critical issues such as extending driving range, dramatically shortening charging times, and enhancing safety by eliminating flammable liquid electrolytes. However, the cautious stance from an industry heavyweight like CATL highlights the significant technical and economic barriers that remain. Other major players, including Toyota and Samsung SDI, are also actively developing solid-state batteries but face similar challenges in manufacturing costs and scalability. The discrepancy between market hype and the realistic timelines articulated by industry leaders like Zeng provides a necessary reality check on the technological readiness of solid-state batteries.

Strategic Significance & Outlook

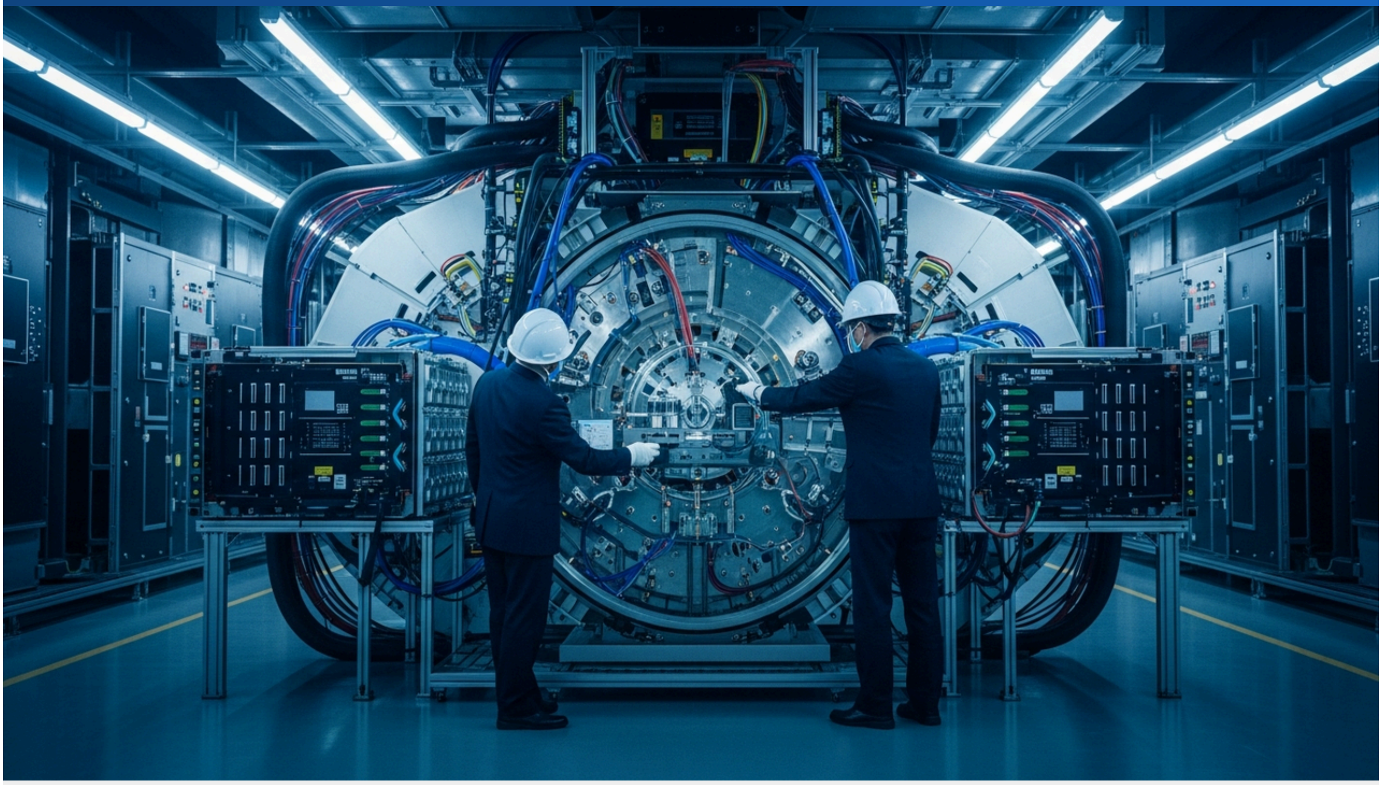
While CATL continues to invest heavily in solid-state battery research and development, the timeline for commercial deployment will hinge on striking a balance between technical readiness and economic viability. The projected 2030 timeline suggests that the interim period will likely see continued advancements in existing lithium-ion battery technologies and the gradual adoption of semi-solid-state solutions. If all-solid-state batteries successfully overcome their current production and cost challenges, their impact could extend far beyond EVs to applications such as drones, robotics, and grid-scale energy storage, fundamentally transforming the energy landscape. Future progress will largely depend on sustained research efforts and innovative breakthroughs in manufacturing processes.

Source: https://electrek.co/2026/06/25/catl-solid-state-battery-level-4-2030/

Collected: July 03, 2026 | Automated Research System (Gemini API)

#02 Chinese Firms Drive Solid-State Battery Revolution: CATL Aims for 500Wh/kg, GAC Targets 2026 Mass Production at 500Wh/kg

Published July 02, 2026 EnkiAI China



OVERVIEW

Leading Chinese battery and automotive manufacturers are accelerating the development and mass production of solid-state batteries, with CATL achieving 500Wh/kg for sulfide-based cells and GAC planning 500Wh/kg EV mass production by 2026. Chery unveiled a 600Wh/kg Rhino S battery in March 2026, and SVOLT anticipates shipping thousands of 450Wh/kg+ solid-state batteries for robotics in Q4 2026. Gotion High-Tech also announced 400Wh/kg+ Jinshi solid-state batteries with a 2GWh production line under construction, as China's national platform targets commercialization by 2030.

IN DEPTH

Key Findings

Chinese battery and automotive giants are rapidly advancing the development and mass production of all-solid-state batteries. GAC Group has announced plans to begin mass production of 500 Wh/kg solid-state batteries for electric vehicles (EVs) in 2026. Concurrently, CATL has achieved 500 Wh/kg in its sulfide-based all-solid-state batteries, demonstrating an impressive 80% charge in just 15 minutes, poised to enhance China's competitive edge in the global EV market.

Technical/Clinical Details

GAC is progressing with plans to integrate 400 Wh/kg solid-state batteries into its 'Hyper' brand vehicles. Chery made headlines in March 2026 with the unveiling of its Rhino S battery, boasting an energy density of 600 Wh/kg. SVOLT has already surpassed 450 Wh/kg in its solid-state battery technology and projects shipping thousands of units for robotics applications in the fourth quarter of 2026. Gotion High-Tech also announced in May 2026 that its Jinshi solid-state battery has exceeded 400 Wh/kg, with a 2 GWh production line actively under construction. These advancements promise significant improvements over traditional liquid-electrolyte lithium-ion batteries in terms of energy density, fast-charging capabilities, and enhanced safety profile.

Background & Context

The Chinese government has designated all-solid-state battery technology as a cornerstone of its national strategy. This commitment led to the establishment of the China All-Solid-State Battery Collaborative Innovation Platform (CASIP) in January 2026, bringing together industry leaders like CATL and BYD as a national team with a shared goal of commercialization by 2030. Automakers are also aggressively pursuing this technology; Dongfeng Motor aims to launch an all-solid-state EV with a range exceeding 620 miles (approximately 1,000 km) in 2026. This comprehensive, state-backed initiative is a critical step for China in solidifying its global leadership in next-generation battery technologies.

Strategic Significance & Outlook

The announcements from various Chinese companies indicate that the mass production of solid-state batteries is on the horizon. However, achieving technical stability, cost reduction, and establishing large-scale production capabilities remain key challenges. It is imperative to balance high energy density with long-term reliability, safety, and fast-charging cycle life. The vast scale of the Chinese market and robust government support could accelerate the resolution of these challenges. The commercialization of solid-state batteries has the potential to further boost EV adoption and revolutionize energy storage across multiple sectors, making it a pivotal factor in the global battery technology race.

Source: https://enkiai.com/data-center/catl-nio-solid-state-storage/

#03 Honda and QuantumScape Forge Alliance for Next-Gen QSE-5 All-Solid-State Lithium-Metal Batteries, Boasting Over 800Wh/L and Sub-15 Minute Fast Charging

Published July 02, 2026 EEPower USA

OVERVIEW

Honda R&D and QuantumScape have signed a multi-year joint development agreement for next-generation all-solid-state lithium-metal battery technology, centered on QuantumScape's QSE-5 battery. The QSE-5 features over 800 Wh/L energy density and sub-15-minute fast charging from 10% to 80% state of charge, utilizing an anode-free design. This partnership follows Honda's successful technical evaluation of QuantumScape's platform and marks a critical step towards mass production of solid-state batteries for electric vehicles. Meeting mass production quality, reliability, and cost requirements remains a key challenge for QuantumScape.

IN DEPTH

Key Findings

Honda R&D Co., Ltd. and QuantumScape Corporation have entered into a multi-year joint research and development agreement focusing on the next-generation all-solid-state lithium-metal battery technology and its associated manufacturing processes. This partnership centers on QuantumScape’s innovative QSE-5 battery, which boasts an energy density exceeding 800 Wh/L and is capable of fast charging from 10% to 80% in under 15 minutes.

Technical/Clinical Details

The QSE-5 battery distinguishes itself with an 'anode-free' design, eliminating the graphite or silicon anodes typically found in conventional lithium-ion batteries. This design choice contributes to higher energy density and superior charging characteristics. The joint research, initiated after Honda's successful technical evaluation of QuantumScape's platform, will prioritize meeting the stringent quality, reliability, throughput, and cost requirements for mass production. Specific technical challenges include ensuring stable interfaces between the solid electrolyte and the lithium metal anode, suppressing dendrite growth, and scaling the production process efficiently.

Background & Context

In the burgeoning electric vehicle (EV) market, extending driving range, dramatically reducing charging times, and enhancing safety are paramount. All-solid-state batteries are widely regarded as a breakthrough technology to address these critical needs. The collaboration between Honda and QuantumScape reflects the automotive industry's intense focus on securing advanced battery technologies. QuantumScape, recognized as a pioneer in solid-state battery technology, activated its pilot production line, 'Eagle Line,' in early 2026 and has begun shipping its first QSE-5 cells to automotive partners for testing. This alliance significantly elevates the potential for QuantumScape's technology to be adopted on a large scale within the automotive sector.

Strategic Significance & Outlook

This joint research agreement represents a crucial milestone towards the commercialization of all-solid-state batteries. The synergy between Honda’s extensive automotive manufacturing expertise and QuantumScape’s cutting-edge battery technology is expected to accelerate advancements in EV performance and adoption. However, numerous challenges persist in bringing this technology to mass production, particularly in establishing cost-effective manufacturing processes and ensuring long-term reliability across diverse operating conditions. A successful outcome from this partnership could set a new standard for next-generation EV batteries, profoundly influencing the broader automotive industry.

Source: https://eepower.com/news/briefs-investing-in-bess-solid-state-ev-chargers-and-solar/

#04 Toyota Holds Over 1,000 Sulfide Solid-State Battery Patents, Samsung SDI Targets 2027 Anode-Free Mass Production

Published July 02, 2026 solidess.com Japan、South Korea

OVERVIEW

Toyota owns over 1,000 patents for sulfide-based all-solid-state batteries, targeting 400Wh/L+ energy density for mass production in 2027-2028, despite acknowledging a 100x cost challenge. Samsung SDI aims for mass production of anode-free solid-state batteries in late 2027, intending to deploy them in EVs, robots, and mobile devices. Both companies face critical challenges in ensuring technical reliability and managing costs for mass commercialization, with particular focus on solid-solid interface resistance and stack pressure in sulfide electrolytes.

IN DEPTH

Key Findings

Toyota Motor Corporation holds over 1,000 patents in the sulfide-based all-solid-state battery sector, aiming for deployment in mass-produced vehicles between 2027 and 2028, with a target energy density exceeding 400 Wh/L. Concurrently, Samsung SDI is developing anode-free solid-state batteries, targeting mass production in late 2027 for EVs, robotics, and mobile devices, intensifying the race for solid-state battery commercialization.

Technical/Clinical Details

Toyota has positioned sulfide-based all-solid-state batteries as a core technology but confronts a significant hurdle: production costs that could be 100 times higher than existing lithium-ion batteries. Sulfide solid electrolytes achieve high ionic conductivity, typically 10^{-3} to 10^{-2} S/cm at room temperature, but challenges remain with solid-solid interface resistance and the need for continuous stacking pressures of 5–100 MPa in module structures, posing barriers to mass production. Samsung SDI is pursuing an anode-free design, which includes a special silver and carbon coating to suppress lithium dendrite formation. The company established a dedicated pilot production line for solid-state batteries in Suwon in March 2023 and successfully developed small-scale solid-state batteries for wearable devices in 2024, demonstrating consistent progress.

Background & Context

All-solid-state batteries represent a next-generation battery technology with the potential for vastly improved safety, significantly higher energy density, and rapid charging capabilities, by replacing flammable liquid electrolytes with solid materials. The strategic importance of this technology is highlighted by the differing approaches of automotive giant Toyota and electronics powerhouse Samsung SDI. While both companies are leaders in their respective fields, the combination of silicon-based anodes with solid electrolytes is a key research direction, with managing silicon's volume expansion and interface design being common challenges.

Strategic Significance & Outlook

As both companies target 2027-2028 for mass production, significant progress in solid-state battery commercialization is anticipated. Overcoming Toyota's high-cost issue and Samsung SDI's lithium dendrite suppression technology will be crucial for market entry. If these challenges can be effectively addressed, solid-state batteries could revolutionize the EV market and contribute to the realization of safer, higher-performance mobile devices and robots. Continued investment in R&D and manufacturing innovation will be pivotal in shaping the future of solid-state battery technology.

Source: https://www.solidess.com/solid-state-battery-mass-production-breakthrough/

#05 Dragonfly Energy Secures Dry Electrode Manufacturing Patents for All-Solid-State Batteries Across US, Japan, and Europe

Published June 28, 2026 XenoSpectrum USA

OVERVIEW

Dragonfly Energy announced the receipt of a U.S. Patent and Trademark Office notice of allowance for 'Powderized Solid-State Electrolyte and Electroactive Materials,' enhancing protection for its solid-state battery manufacturing processes. This follows similar patent approvals from the European Patent Office on June 15, 2026, and the Japan Patent Office on April 23, 2026. The company is advancing cycle testing of coin cells using its dry electrode manufacturing process, although prototype pouch cell production is deferred until at least early 2027.

IN DEPTH

Key Findings

Dragonfly Energy has received a notice of allowance from the U.S. Patent and Trademark Office for its patent application titled 'Powderized Solid-State Electrolyte and Electroactive Materials,' significantly strengthening its intellectual property protection for critical solid-state battery manufacturing processes. This U.S. patent grant follows previous approvals from the European Patent Office on June 15, 2026, for 'Systems and Methods for Dry Powder Coating Layers of an Electrochemical Cell,' and from the Japan Patent Office on April 23, 2026, for an application with a similar title to the U.S. patent.

Technical/Clinical Details

These patents safeguard Dragonfly Energy’s dry electrode process, a technology deemed crucial for enhancing the performance and cost-efficiency of all-solid-state batteries. The dry electrode manufacturing method eliminates the need for liquid solvents in electrode formation, potentially leading to reduced environmental impact, simplified manufacturing, and lower production costs. Dragonfly Energy is currently utilizing this dry electrode process to produce electrode reels and is conducting cycle testing on solid-state battery coin cells. However, the production of larger prototype pouch cells has been deferred until at least early 2027, as stated in the company's 2025 annual report.

Background & Context

A significant challenge in the mass commercialization of all-solid-state batteries is establishing an efficient and cost-competitive manufacturing technology. Traditional wet processes involve the use of toxic solvents and require substantial energy for drying, increasing manufacturing costs and environmental burden. The dry electrode process is gaining considerable attention across the battery industry as a promising approach to overcome these limitations. Dragonfly Energy's successive patent approvals in key markets—the U.S., Japan, and Europe—suggest that its technology could hold a competitive advantage globally, potentially opening avenues for future licensing and strategic partnerships.

Strategic Significance & Outlook

The reinforcement of its patent portfolio in major markets is a critical strategy for Dragonfly Energy to establish a strong presence in the solid-state battery market. The dry electrode technology is expected to accelerate the mass production of solid-state batteries, ultimately contributing to cost reduction and performance improvements in applications such as electric vehicles (EVs) and energy storage systems. While the delay in prototype pouch cell production might be a temporary setback, the ongoing progress in coin cell cycle testing indicates steady technological advancement. The industry will closely watch Dragonfly Energy's future technological developments and its roadmap towards mass production.

Source: https://xenospectrum.com/dragonfly-energy-solid-state-battery-patent-dry-electrode/

#06 Solidion Technology Acquires SpaceX Stock as Strategic Treasury Asset, Highlighting Solid-State Battery Suitability for Space Applications

Published June 29, 2026 Barchart.com USA

OVERVIEW

Solidion Technology announced plans to acquire SpaceX shares as a long-term strategic treasury asset, emphasizing that its silicon anode, graphene-enhanced, and bipolar all-solid-state battery technology is suited for the extreme environments of SpaceX's Starship, Falcon, and Starlink programs. These programs demand high energy density, precise thermal management, and exceptional safety and reliability from batteries, requirements Solidion's technology aims to address. This strategy combines indirect investment in SpaceX's growth with market appeal for its proprietary technology.

IN DEPTH

Key Findings

Solidion Technology has announced its plan to acquire shares of SpaceX as a long-term strategic treasury asset. The company asserts that its silicon anode, graphene-enhanced, and bipolar all-solid-state battery technology platform is perfectly suited for the demanding environments of SpaceX's Starship, Falcon, and Starlink programs, which require high energy density, precise thermal management, exceptional safety, and reliability from their power sources.

Technical/Clinical Details

Solidion Technology's all-solid-state batteries eliminate liquid electrolytes, significantly reducing the risk of thermal runaway and enhancing safety and reliability crucial for space applications. The use of silicon anodes theoretically offers very high energy density, but their volumetric expansion during charge/discharge cycles presents a challenge. Solidion aims to mitigate this issue through graphene reinforcement, ensuring long-term stability. The bipolar design further contributes to a more compact battery pack and lower internal resistance, enabling both high power and high energy density. SpaceX's programs necessitate batteries capable of enduring extreme temperature fluctuations, vibrations, and shocks, making Solidion's technology specifically engineered to meet these rigorous specifications.

Background & Context

Due to their inherent safety and high energy density, all-solid-state batteries are anticipated to find applications not only in electric vehicles (EVs) but also in high-performance sectors such as aerospace, defense, and medical devices. SpaceX's space missions represent one of the most stringent testing grounds for battery technology. By aligning its technology with SpaceX's requirements, Solidion strongly emphasizes its technological advantage and potential market value. Integrating SpaceX stock into its financial strategy is not merely an investment but also a move designed to boost market confidence in the future prospects of its proprietary battery technology.

Strategic Significance & Outlook

Solidion Technology's move underscores the strategic value of next-generation battery technology and expands its potential application to the cutting-edge field of space exploration. If proven successful in SpaceX projects, Solidion's all-solid-state battery technology is likely to extend into other aerospace domains and high-performance, high-reliability ground applications. However, specific adoption details or partnerships have not yet been disclosed, making the deepening of collaboration with SpaceX and further technological validation crucial factors determining the company's growth. This announcement suggests that the technological development race in the solid-state battery market is expanding beyond the traditional automotive industry into diverse sectors.

Source: https://www.barchart.com/story/news/3028339/solidion-technology-nasdaq-sti-adopts-spacex-focused-treasury-strategy-for-corporate-cash-reserves

Collected: July 03, 2026 | Automated Research System (Gemini API)

#07 Key Attributes for Solid-State Battery Adoption: High Energy Density, Enhanced Safety, Rapid Charging, and Extended Lifespan

Published June 27, 2026 Ahead of the Herd Canada

OVERVIEW

Solid-state batteries promise significantly increased energy density, improved safety by eliminating flammable liquids, and faster charging by replacing liquid electrolytes with solid materials. Industry estimates project energy densities of 400–500 Wh/kg, a substantial improvement over current best lithium-ion batteries at 250–300 Wh/kg. Their high safety, rapid charging capabilities, and long lifespan are the primary reasons they are an attractive option for EVs, grid storage, and compact high-power devices.

IN DEPTH

Key Findings

All-solid-state batteries (ASSBs) are garnering significant attention as a next-generation energy storage technology capable of fundamentally improving upon the major limitations of existing lithium-ion batteries: safety, energy density, charging speed, and lifespan. By replacing flammable liquid electrolytes with solid materials, ASSBs eliminate the risk of thermal runaway, achieve nearly double the energy density of the best current lithium-ion cells, and enable ultra-fast charging capabilities.

Technical/Clinical Details

The core innovation of ASSBs lies in replacing liquid electrolytes with non-flammable and chemically stable solid electrolytes, which can be oxide, sulfide, or polymer-based materials. This fundamentally mitigates the risks of battery combustion and electrolyte leakage. In terms of energy density, industry estimates suggest ASSBs can reach 400–500 Wh/kg, substantially surpassing the approximately 250–300 Wh/kg of current high-performance lithium-ion batteries. When coupled with lithium metal anodes, ASSBs can store significantly more energy in the same volume, promising a dramatic extension of electric vehicle (EV) driving ranges. Toyota, for instance, has set an ambitious goal of achieving a 10-minute fast charge from 10% to 80% state of charge.

Background & Context

The rapid expansion of the EV market, accelerated adoption of renewable energy sources, and growing demand for grid-scale energy storage collectively exert immense pressure for continuous innovation in battery technology. Current lithium-ion batteries are approaching their theoretical limits in terms of safety, energy density, and charging speed, making ASSBs a highly anticipated breakthrough. Major players such as CATL, LG Energy Solution, and Toyota are investing heavily in both semi-solid and all-solid-state battery research. However, as noted by BloombergNEF, the inherent manufacturing complexity and high costs remain the most significant barriers to the widespread adoption of ASSBs.

Strategic Significance & Outlook

According to recent analysis by TrendForce, the production volume of all-solid-state batteries could reach GWh levels by 2027. This projection signals the impending era where ASSBs will offer safer and higher-performance energy solutions for EVs, stationary energy storage, and even compact, high-power portable devices. The ongoing challenges include establishing scalable manufacturing techniques and reducing production costs. Nevertheless, the potential benefits of this technology are indispensable for accelerating the transition towards a sustainable society. Further advancements in solid electrolyte materials and innovations in manufacturing processes will be key to realizing the full potential of this groundbreaking technology.

Source: https://aheadoftheherd.com/solid-state-batteries-next-generation-energy-storage-richard-mills/

#08 Eight Key Differences Between Semi-Solid and All-Solid-State Batteries: A Comprehensive Comparison of Safety, Energy Density, Manufacturing Complexity, Cost, and Charging Performance

Published June 30, 2026   EV Insight Daily   Unknown

OVERVIEW

Semi-solid and all-solid-state batteries fundamentally differ in electrolyte composition and function. Semi-solid batteries contain a small amount of liquid or gel electrolyte, acting as a bridging technology to incrementally improve existing lithium-ion battery limitations. In contrast, all-solid-state batteries completely replace liquid electrolytes with solid ones, targeting significant leaps in safety, energy density, and charging performance. These differences impact eight key characteristics including manufacturing complexity, cost, and suitability for lithium metal anodes.

IN DEPTH

Key Findings

Semi-solid-state batteries and all-solid-state batteries are both next-generation battery technologies, yet they exhibit fundamental differences in electrolyte composition and function. Semi-solid-state batteries, containing a small amount of liquid or gel electrolyte, act as a 'bridging technology' that partially improves the limitations of existing lithium-ion batteries. In contrast, all-solid-state batteries aim to be the 'ultimate battery' by completely replacing liquid electrolytes with solid ones, promising revolutionary advancements in safety, energy density, and charging performance.

Technical/Clinical Details

There are eight key differences between these two battery types:

- **Electrolyte Composition:** Semi-solid-state batteries typically contain 5% to 20% liquid electrolyte, whereas all-solid-state batteries use less than 5%, ideally 0%, liquid electrolyte.
- **Safety:** All-solid-state batteries inherently offer higher safety by eliminating flammable liquids, significantly reducing the risk of thermal runaway. Semi-solid-state batteries also improve safety by reducing liquid electrolyte content, but not to the same extent.
- **Energy Density:** All-solid-state batteries can achieve the highest theoretical energy densities (over 500 Wh/kg) when combined with lithium metal anodes. Semi-solid-state batteries also improve energy density through high-performance materials but have limitations.
- **Manufacturing Complexity:** All-solid-state batteries present significant manufacturing challenges due to solid-solid interface issues and the need for high-pressure stacking processes. Semi-solid-state batteries are relatively easier to transition to from existing technologies.
- **Cost:** Currently, the manufacturing cost of all-solid-state batteries is very high, posing a major barrier to mass production. Semi-solid-state batteries can leverage existing manufacturing infrastructure to some extent, offering a cost advantage.

- **Charging Performance:** All-solid-state batteries can achieve ultra-fast charging if high-speed lithium ion transport is realized. Semi-solid-state batteries also allow for fast charging but are constrained by their liquid electrolyte component.
- **Separator Design:** In all-solid-state batteries, the solid electrolyte itself often acts as the separator, allowing for thinner designs and higher energy density. Semi-solid-state batteries still require a porous separator.
- **Compatibility with Lithium Metal Anodes:** All-solid-state batteries are better at suppressing dendrite growth from lithium metal anodes, which is advantageous for achieving higher capacities. Dendrite issues may persist in semi-solid-state batteries.

Background & Context

The evolution of battery technology is crucial for extending the range and adoption of electric vehicles (EVs) and for integrating renewable energy sources. As the technical limits of liquid-electrolyte lithium-ion batteries become apparent, there is a strong demand for safer and higher-performing alternatives. Semi-solid-state batteries are positioned as an 'intermediate step' from current technologies to all-solid-state batteries, facilitating earlier market entry and risk diversification. Conversely, all-solid-state batteries are the long-term ultimate goal, attracting massive investments from governments and leading corporations worldwide.

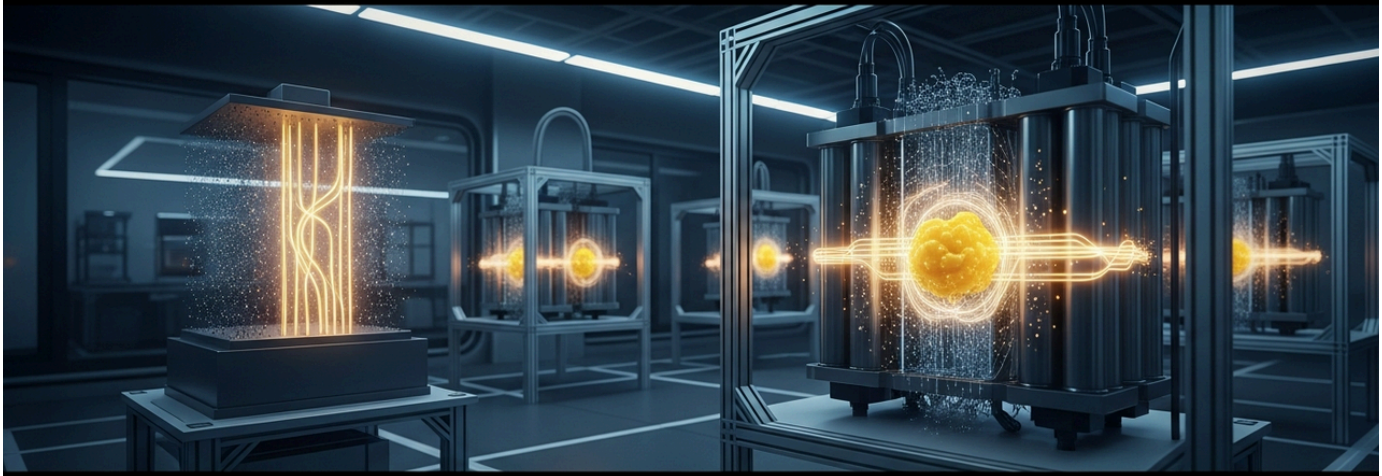
Strategic Significance & Outlook

In the coming years, semi-solid-state batteries are expected to be gradually introduced into the EV market, balancing performance and cost. Meanwhile, research and development for all-solid-state batteries will continue, focusing on resolving fundamental issues such as interface resistance, volumetric changes, and manufacturing costs. In the long term, all-solid-state batteries hold the potential to become mainstream across a wide range of applications, from mobile devices to EVs and grid-scale energy storage. However, achieving both technological breakthroughs and economic viability will be essential for this vision to materialize.

Source: https://evinsightdaily.com/semi-solid-battery-vs-solid-state/

#09 All-Solid-State Lithium-Sulfur Battery Achieves 505 Wh/kg at Cell Level, Tsinghua Quasi-Solid-State Battery Records Over Double Conventional Energy Density at 604 Wh/kg

Published June 28, 2026 Space Daily Editorial Team Unknown



OVERVIEW

A 2025 study on all-solid-state lithium-sulfur (Li-S) batteries achieved a groundbreaking energy density of approximately 505 Wh/kg at the cell level. Simultaneously, a quasi-solid-state battery developed by a Tsinghua University research team recorded an astonishing 604 Wh/kg and 1,027 Wh/L, more than double that of many conventional lithium-ion cells. These achievements pave new pathways for significantly increasing next-generation battery energy density, potentially extending electric vehicle ranges dramatically.

IN DEPTH

Key Findings

Recent research breakthroughs reveal an all-solid-state lithium-sulfur (Li-S) battery achieving an energy density of approximately 505 Wh/kg at the cell level. Concurrently, a quasi-solid-state battery developed by a Tsinghua University research team recorded an impressive 604 Wh/kg and 1,027 Wh/L, more than double the energy density of many conventional lithium-ion cells. These advancements significantly elevate the potential of next-generation battery technologies.

Technical/Clinical Details

All-solid-state lithium-sulfur batteries leverage solid electrolytes to replace flammable liquid ones and utilize a lightweight sulfur cathode, offering a very high theoretical energy density of 2,500 Wh/kg. The 505 Wh/kg achieved marks a significant step closer to this theoretical maximum. The Tsinghua University quasi-solid-state battery achieved its remarkable 604 Wh/kg and 1,027 Wh/L volumetric energy density by minimizing liquid electrolyte content while optimizing the properties of its solid electrolyte component. To put this in perspective, cutting-edge lithium-ion batteries currently in electric vehicles (EVs) typically offer 250-300 Wh/kg, demonstrating a dramatic performance improvement. This high energy density has the potential not only to significantly extend EV driving ranges but also to enable longer operational times for other applications like drones and mobile devices.

Background & Context

To accelerate the adoption of electric vehicles, enhancing battery energy density and extending driving range are critical. Conventional lithium-ion batteries are approaching their physical and chemical limits for performance improvement, necessitating the exploration of new materials and architectures. Lithium-sulfur and all-solid-state batteries are promising candidates, attracting substantial investment and research from institutions and corporations worldwide. Sulfur, in particular, is an attractive option due to its low cost and abundant availability, offering potential economic advantages.

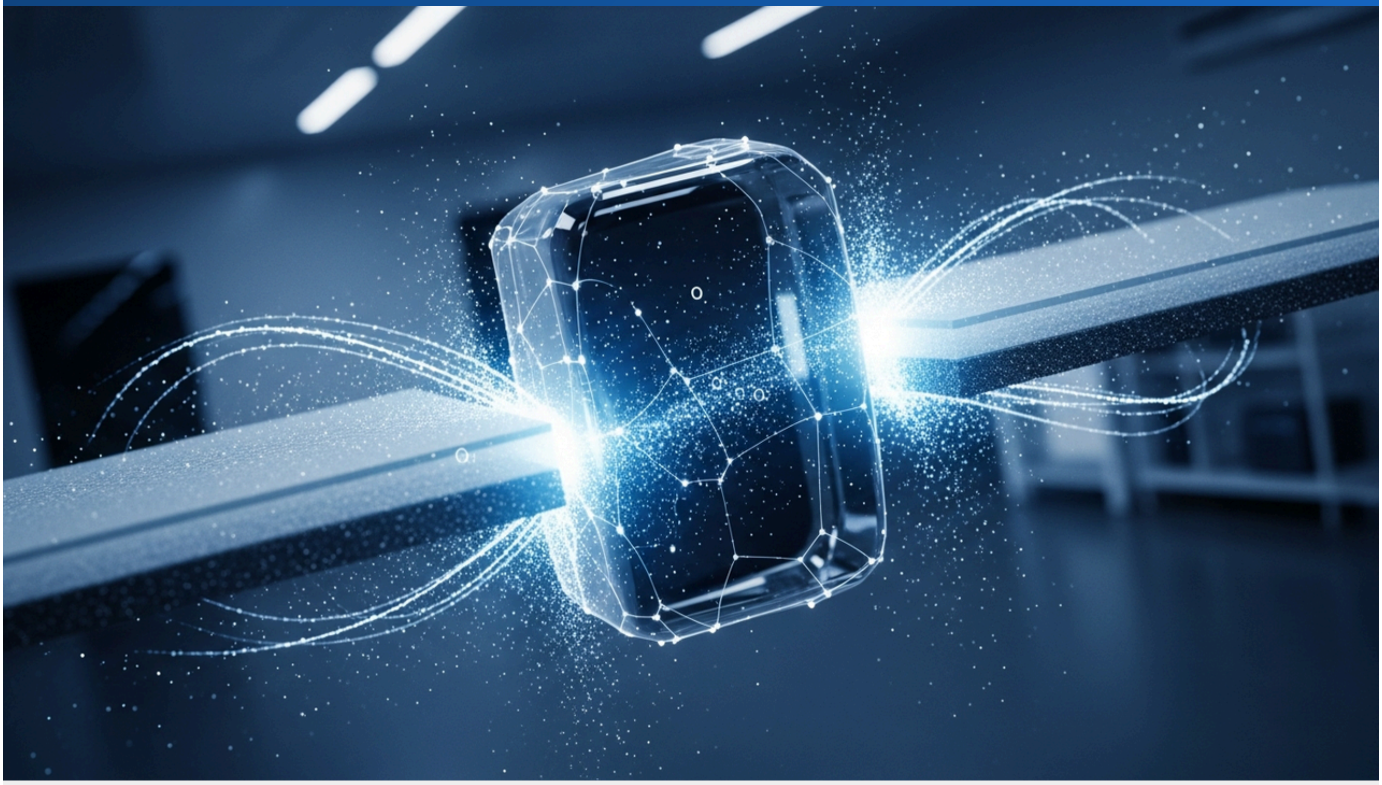
Strategic Significance & Outlook

While these research achievements represent crucial progress towards practical high-energy-density batteries, numerous challenges remain in transitioning from lab-scale success to mass-produced EV packs. Specifically, extending cycle life, improving safety profiles, reducing manufacturing costs, and establishing scalable production techniques are essential. However, the overwhelming energy density demonstrated could alleviate 'range anxiety' in EVs and open new frontiers for battery technology. Continued R&D progress and accelerated commercialization through industrial collaboration are eagerly anticipated.

Source: https://spacedaily.com/t-a-2025-solid-state-lithium-sulfur-study-hit-about-505-wh-kg-at-the-cell-level-and-a-tsinghua-quasi-solid-state-battery-reached-604-wh-kg-more-than-double-many-conventional-lithium-ion-cells/

#10 Oxygen Introduction in Sulfide Solid Electrolytes: Stabilizing Interfaces While Maintaining Lithium Ion Conduction for Next-Gen Batteries

Published June 25, 2026 EurekAlert! USA



OVERVIEW

New research demonstrates that carefully introducing oxygen into sulfide-based solid electrolytes can stabilize unstable interfaces while preserving high lithium ion conductivity. By using lithium sulfate (Li_2SO_4) as an oxygen source, researchers restructured lithium pathways in argyrodite electrolytes, activating inter-cage ion conduction. This discovery enables solid electrolytes that support high capacity, fast charging/discharging, and long cycle stability, offering a crucial strategy for the practical implementation of next-generation all-solid-state batteries.

IN DEPTH

Key Findings

A novel strategy has been discovered to stabilize unstable interfaces in sulfide-based solid electrolytes while maintaining rapid lithium ion transport. Researchers successfully overcame this challenge by carefully introducing oxygen, significantly contributing to the realization of solid electrolytes capable of supporting high capacity, fast charging/discharging, and long cycle stability.

Technical/Clinical Details

This breakthrough was achieved by incorporating lithium sulfate (Li_2SO_4) as an oxygen source into sulfide solid electrolytes. Specifically, Li_2SO_4 was added to argyrodite-type sulfide solid electrolytes (e.g., Li_6PS_5Cl), and subsequent heat treatment introduced oxygen atoms into the electrolyte structure. This process was found to restructure the lithium ion transport pathways within the sulfide electrolyte, crucially activating 'inter-cage ion conduction.' The oxygen incorporation effectively suppresses interfacial reactions and reduces resistance between the solid electrolyte and electrode materials, all while preserving the high ionic conductivity (10^{-3} to 10^{-2} S/cm at room temperature) of the bulk material. This approach also effectively inhibits lithium dendrite growth, thereby enhancing battery safety and lifespan.

Background & Context

All-solid-state batteries are anticipated as the 'dream battery' technology that will enable extended driving ranges, faster charging times, and improved safety for electric vehicles (EVs). However, sulfide-based solid electrolytes, despite offering high ionic conductivity, have faced significant challenges such as poor atmospheric stability, detrimental interfacial side reactions with electrodes, and high interfacial resistance. These issues have been major impediments to the practical application of all-solid-state batteries. The innovative approach of oxygen introduction provides a groundbreaking solution to these interfacial problems, marking a substantial step towards the mass production of sulfide-based all-solid-state batteries.

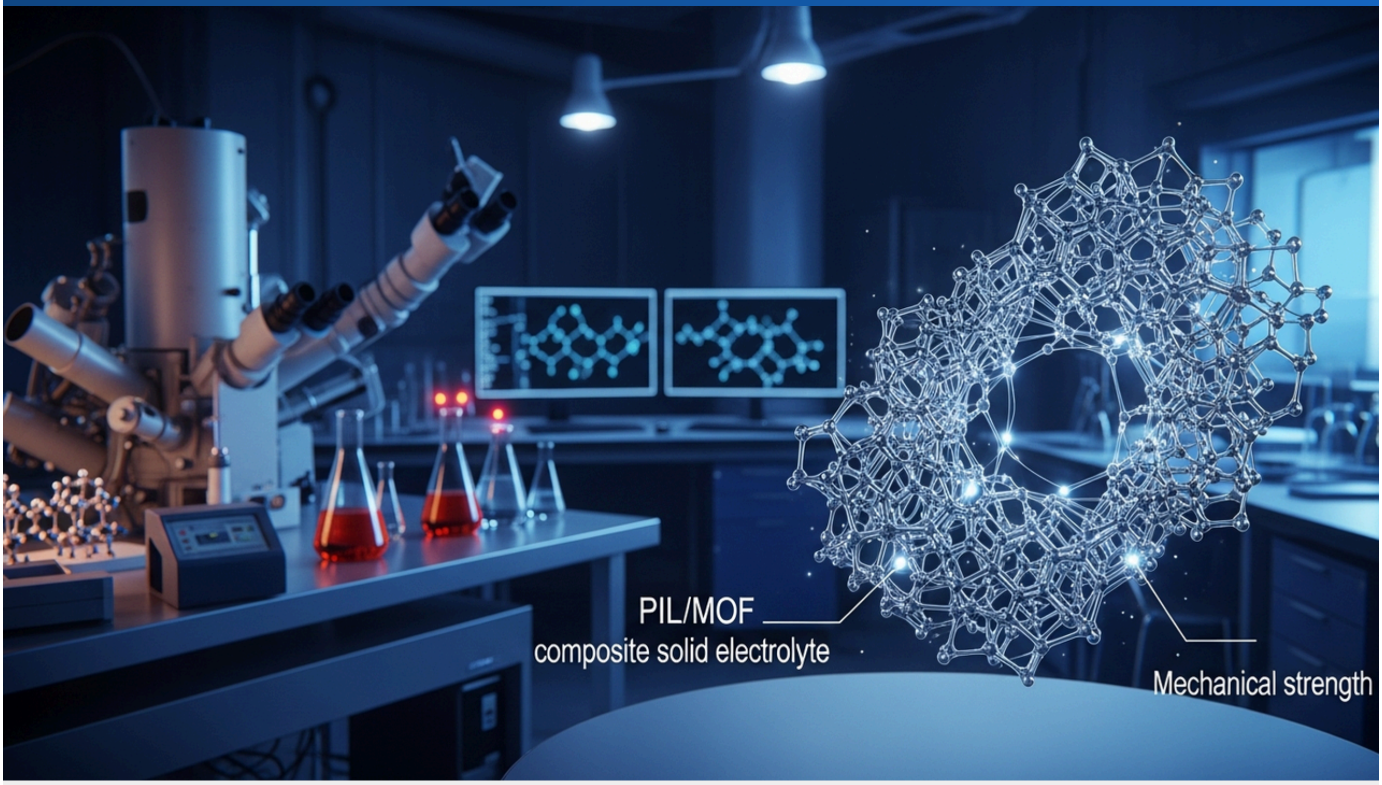
Strategic Significance & Outlook

These research findings open new avenues for the design and development of next-generation all-solid-state batteries. If the interface stabilization technology through oxygen introduction is successfully commercialized, it could resolve current lithium-ion battery safety concerns and accelerate the adoption of all-solid-state batteries that offer both high energy density and fast charging. Future challenges include demonstrating the scalability of this technology, optimizing manufacturing costs, and proving long-term reliability. Success in these areas would make all-solid-state batteries a realistic option for a wide range of applications, including EVs, smartphones, drones, medical devices, and large-scale energy storage systems.

Source: https://www.eurekalert.org/news-releases/1133819

#11 Synergistic Integration Achieves High Ionic Conductivity and Mechanical Strength: PIL/MOF Composite Solid Electrolyte Boosts Performance of Li-Metal Batteries

Published June 29, 2026 PubMed (Small Methods) Unknown



OVERVIEW

A novel composite poly(ionic liquid)-based solid electrolyte (CPLE) was designed through the synergistic integration of poly(ionic liquid) (PIL) and MOF-5, achieving high-performance all-solid-state lithium metal batteries. This CPLE demonstrated high ionic conductivity of 1.4 mS cm^{-1} at room temperature, an excellent Li^+ transference number of 0.7, and a wide electrochemical stability window up to 4.6 V. A Li||$LiFePO_4$ full cell maintained 80% capacity after 700 cycles at 1 C and showed compatibility with high-voltage $LiNi_{0.8}Co_{0.1}Mn_{0.1}O_2$ cathodes.

IN DEPTH

Key Findings

A groundbreaking composite poly(ionic liquid)-based solid electrolyte (CPLE), synergistically integrating poly(ionic liquid) (PIL) and MOF-5, has been successfully developed. This innovative material overcomes the long-standing trade-off between ionic conductivity and mechanical strength, two critical properties for high-performance all-solid-state lithium metal batteries, achieving high levels in both simultaneously.

Technical/Clinical Details

The developed CPLE exhibits a high lithium-ion conductivity of 1.4 mS cm^{-1} at room temperature, meeting the demanding requirements for practical all-solid-state batteries. Furthermore, it demonstrates an exceptionally high Li^+ transference number of 0.7, indicating efficient transport predominantly by lithium ions. The electrochemical stability window is also broad, extending up to 4.6 V, making it compatible with high-voltage cathodes. Indeed, a Li||$LiFePO_4$ full cell utilizing this CPLE maintained an impressive 80% capacity retention after 700 cycles at a 1 C rate, showcasing excellent cycle stability. Compatibility with even higher-voltage $LiNi_{0.8}Co_{0.1}Mn_{0.1}O_2$ cathodes has also been confirmed, broadening its potential applications. The porous structure of MOF-5 synergistically optimizes the ionic conduction pathways within the PIL and enhances mechanical strength.

Background & Context

All-solid-state lithium metal batteries hold immense promise over conventional liquid-electrolyte lithium-ion batteries due to their superior safety, higher energy density, and longer lifespan. However, the development of solid electrolytes has been hampered by key challenges: low ionic conductivity, high interfacial resistance with electrodes, and insufficient mechanical strength. Specifically, a persistent trade-off, where enhancing ionic conductivity often compromises mechanical strength, has complicated material design. This research, through its innovative approach of PIL and MOF hybridization, demonstrates a pathway to resolve these challenges concurrently, significantly advancing the practical application of all-solid-state batteries.

Strategic Significance & Outlook

The development of this PIL/MOF composite solid electrolyte marks a significant breakthrough towards realizing high-performance all-solid-state lithium metal batteries. Given its ability to achieve high energy density and excellent cycle stability simultaneously, it is expected to find applications across various sectors, including electric vehicles (EVs), drones, mobile electronic devices, and stationary energy storage systems. Future research will likely focus on optimizing the scalability and cost-efficiency of the manufacturing process for this composite electrolyte. If commercialized, this technology could establish new standards for battery performance, contributing significantly to the realization of a sustainable energy society.

Source: https://pubmed.ncbi.nlm.nih.gov/42374816/

#12 Degradable Yet Fireproof: Trace Multifunctional Additive Enables Highly Safe Polymer Composite Electrolyte, Resolving Environmental Challenges for Li-Metal Batteries

Published July 01, 2026   The Royal Society of Chemistry (Chemical Communications)   UK

OVERVIEW

A truly safe polymer electrolyte system has been realized by incorporating a trace multifunctional flame retardant into an inherently degradable polycaprolactone-based composite electrolyte. This innovation resolves long-standing environmental challenges associated with polymer electrolyte waste while delivering excellent electrochemical performance and fire safety for all-solid-state batteries. It is expected to significantly reduce the environmental footprint and dramatically improve the safety of next-generation lithium-metal batteries.

IN DEPTH

Key Findings

A polymer electrolyte system that is both inherently degradable and exhibits exceptionally high fire safety has been developed by integrating a trace amount of multifunctional flame retardant into a polycaprolactone-based composite electrolyte. This breakthrough addresses the persistent environmental challenge of polymer electrolyte waste while simultaneously endowing all-solid-state lithium metal batteries with superior electrochemical performance and an unprecedented level of fire safety.

Technical/Clinical Details

The developed polymer composite solid electrolyte utilizes polycaprolactone (PCL), a biodegradable polymer, as its main framework. Its flame retardancy is dramatically enhanced by incorporating a trace amount of a phosphorus-based flame retardant, such as specific organic phosphorus compounds. This flame retardant is designed not only to effectively suppress electrolyte combustion but also to do so without compromising the electrolyte's ionic conductivity or mechanical properties. Consequently, the material maintains high ionic conductivity (on the order of 10^{-4} S/cm at room temperature) and sufficient mechanical strength to suppress lithium dendrite growth, while significantly reducing the risk of ignition even in the event of battery damage. Furthermore, the degradability of PCL offers a distinct environmental advantage, with a much lower post-use environmental footprint compared to conventional polymer electrolytes.

Background & Context

While lithium-ion batteries are widely used in electric vehicles (EVs) and mobile devices, the flammability of their liquid electrolytes has always posed a risk of thermal runaway. All-solid-state batteries aim to improve safety by replacing this liquid electrolyte with a solid one. Polymer solid electrolytes, in particular, are attractive due to their flexibility and ease of manufacturing but have been challenged by low ionic conductivity and insufficient flame retardancy. Additionally, the issue of waste from used batteries is a pressing environmental concern demanding urgent solutions for a sustainable society. This research offers an innovative solution to these critical challenges by combining safety and environmental consciousness.

Strategic Significance & Outlook

This degradable and highly flame-retardant polymer composite solid electrolyte holds significant potential to accelerate the practical application of next-generation lithium metal batteries. Its environmentally conscious design and exceptional safety characteristics are particularly responsive to consumer and regulatory demands, making it a crucial factor in establishing a competitive edge in the EV market. Future research will likely focus on long-term performance stability, optimization of mass production processes, and cost reduction. Should this technology gain widespread adoption, it is expected to lead to safer and more environmentally friendly batteries, contributing significantly to the transition towards a sustainable society.

Source: https://pubs.rsc.org/cc/article/doi/10.1039/D6CC02302A/1268283/Degradable-Yet-Fireproof-A-Highly-Safe-Polymer?searchresult=1

#13 MOF-Modified Solid Electrolyte Optimizes Interfacial Ion Transport Pathways: Achieving 3.04 × 10^{-4} S cm^{-1} Ionic Conductivity at 60°C

Published June 30, 2026   ACS Publications (The Journal of Physical Chemistry C)   USA

OVERVIEW

A new design approach utilizing metal-organic framework (MOF) ZIF-8 as an interfacial bridge effectively resolves LATP aggregation and interfacial compatibility issues within PEO matrices, optimizing ion transport pathways in solid electrolytes. The optimized electrolyte membrane exhibits high ionic conductivity of 3.04 × 10^{-4} S cm^{-1} at 60°C, a broad electrochemical stability window of 5.13 V, and robust mechanical properties. This breakthrough demonstrates significant potential for enhancing the performance and stability of all-solid-state batteries.

IN DEPTH

Key Findings

A novel design approach utilizing the metal-organic framework (MOF) ZIF-8 as an interfacial bridge has effectively resolved critical challenges in solid electrolyte development, specifically LATP (lithium aluminum titanium phosphate) aggregation and interfacial compatibility within polyethylene oxide (PEO) matrices. This innovation shows significant potential to optimize ion transport pathways in solid electrolytes, leading to substantial improvements in the performance and stability of all-solid-state batteries.

Technical/Clinical Details

The research team successfully integrated ZIF-8 into LATP/PEO composite solid electrolytes to overcome interfacial issues. ZIF-8, with its porous structure and chemical stability, acts as an 'interfacial bridge' to inhibit aggregation between LATP particles and enhance adhesion with the PEO matrix. This optimized electrolyte membrane achieved an impressive lithium ion conductivity of 3.04×10^{-4} S cm^{-1} at an operating temperature of 60°C, a marked improvement compared to conventional PEO-based electrolytes and a critical value for practical applications. Furthermore, this electrolyte demonstrates a wide electrochemical stability window up to 5.13 V, offering compatibility with high-voltage cathodes. Its enhanced mechanical properties also contribute to suppressing lithium dendrite growth, thereby increasing battery safety and long-term stability.

Background & Context

All-solid-state batteries are considered key to next-generation energy storage for electric vehicles (EVs) and other high-performance devices. However, solid electrolyte development has faced multiple hurdles, including low ionic conductivity, high interfacial resistance with electrodes, and insufficient mechanical strength. Particularly in composite electrolytes combining inorganic solid electrolytes (like LATP) and polymer solid electrolytes (like PEO), interfacial compatibility between the two materials significantly dictates performance, creating a strong demand for improvement technologies. This MOF-driven approach offers a promising solution to these long-standing interfacial problems.

Strategic Significance & Outlook

The development of MOF-modified solid electrolytes incorporating ZIF-8 represents a crucial advancement towards improving the performance and practical implementation of all-solid-state batteries. This technology holds the potential to accelerate the development of next-generation batteries that combine high energy density, high power output, long lifespan, and enhanced safety. Future research will likely focus on the scalability of the manufacturing process for this composite electrolyte, its cost efficiency, and long-term performance validation in various cell configurations. If this breakthrough leads to mass production, it could further promote EV adoption and drive innovation across a wide range of sectors, including grid-scale energy storage systems.

Source: https://pubs.acs.org/doi/10.1021/acs.jpcc.6c00524

Collected: July 03, 2026 | Automated Research System (Gemini API)

#14 UCLA Develops 3D-Printed Zinc-Ion Battery with 7x Higher Energy Density Than Conventional Designs

Published Published July 03, 2026　テック・アイ技術情報研究所　Japan

OVERVIEW

Researchers at UCLA have developed a novel zinc-iron (Zn-Fe) battery utilizing advanced 3D printing, achieving a remarkable sevenfold increase in both charge/discharge performance and energy density compared to conventional designs. This breakthrough is attributed to precisely fabricated complex porous electrode structures, which significantly enhance reaction surface area and ion transport efficiency. The innovation promises a safer, more sustainable energy storage alternative to address the limitations of lithium-ion batteries.

IN DEPTH

Background

Lithium-ion batteries, despite their widespread adoption in electric vehicles (EVs) and portable electronics, grapple with inherent challenges including raw material scarcity, high costs, and significant safety concerns like thermal runaway. Zinc-ion batteries, conversely, present compelling advantages as a next-generation alternative, leveraging abundant and inexpensive zinc, coupled with enhanced safety due to their compatibility with aqueous electrolytes. Historically, however, zinc-ion technology has been hampered by lower energy density and limited cycle life compared to its lithium-ion counterparts. The integration of advanced manufacturing techniques such as 3D printing holds transformative potential to revolutionize electrode architectures, thereby substantially improving the performance of zinc-ion batteries and surmounting these critical limitations.

Key Findings

A research team at the University of California, Los Angeles (UCLA) has successfully engineered a zinc-iron (Zn-Fe) battery utilizing advanced 3D printing technology. This innovative design achieves an approximate sevenfold increase in both charge/discharge performance and energy density when compared to batteries constructed with conventional methods. This significant breakthrough opens new avenues for the architectural design and scalable manufacturing of next-generation energy storage devices.

Technical Details

The UCLA research team employed high-precision 3D printing to meticulously fabricate intricate porous architectures directly within the electrode materials. This sophisticated structural engineering dramatically expands the crucial contact area between the electrolyte and the active electrode material, thereby profoundly enhancing the efficiency of electrochemical reactions. Moreover, these optimized porous pathways facilitate superior ion transport kinetics, leading to accelerated charging and discharging rates. This novel 3D-printed architecture critically bolsters the performance of zinc-ion batteries—a highly promising alternative to lithium-ion systems—by effectively mitigating historical issues such as dendrite formation and constrained cycle life. The documented sevenfold improvement in energy density unequivocally underscores the technology's superiority and marks a pivotal advancement toward widespread practical applications.

Strategic Significance & Outlook

This pioneering research from UCLA substantially expands the viability of zinc-ion batteries as a sustainable and inherently safer alternative to current lithium-ion technologies. The strategic optimization of electrode design via 3D printing not only delivers significant enhancements in battery performance but also introduces greater flexibility and efficiency into the manufacturing pipeline. Future research endeavors will likely concentrate on critical aspects such as the scalability of this additive manufacturing approach, further cost optimization, and achieving extended cycle stability. Successful commercialization of this technology could usher in a new era of environmentally benign and high-performance battery solutions, poised for deployment across diverse sectors including electric vehicles, grid-scale stationary energy storage, and sophisticated wearable electronic devices.

Source: https://tiisys.com/blog/2026/07/03/post-196788/

#15 Strategies for Mitigating Volume Strain in Silicon-Based Anodes: Carbon and High-Modulus Additives Enhance Battery Stability

Published July 03, 2026 The Royal Society of Chemistry (The Journal of Physical Chemistry C)
UK

OVERVIEW

High-capacity anode materials, particularly silicon-based ones, achieve high specific capacity through alloying and conversion reactions but are plagued by significant volume strain due to electrochemical products having substantially larger molar volumes than reactants. This volume strain is a primary cause of battery degradation. Therefore, strategies incorporating carbon and high-modulus additives are widely adopted to stabilize electrode structures and manage volumetric changes. This approach is essential for improving the long-term cycle stability of silicon anodes.

IN DEPTH

Key Findings

Silicon-based high-capacity anode materials hold immense promise for significantly boosting the energy density of lithium-ion batteries. However, substantial volume strain during charge-discharge cycles remains a major hurdle to their practical application. In response, cutting-edge research focuses on integrating carbon materials and high-modulus (stiffness) additives into electrodes to effectively manage volumetric changes and enhance the mechanical stability of the electrode structure.

Technical/Clinical Details

Silicon, with a theoretically very high specific capacity of approximately 4200 mAh/g, is a highly anticipated anode material for next-generation lithium-ion and all-solid-state batteries. Nevertheless, it undergoes up to 300% volume expansion when alloying with lithium. This expansion leads to electrode structure pulverization, destabilization of the solid electrolyte interphase (SEI) layer, delamination from the current collector, and accelerated lithium dendrite formation. These phenomena contribute to battery capacity fade and shortened cycle life.

Key strategies to mitigate this volume strain include:

- **Incorporation of Carbon Materials:** Nano-scaling silicon particles and compounding them with carbon materials (such as graphene, carbon nanotubes, or amorphous carbon) helps to alleviate expansion stress, improve electrical conductivity, and stabilize the SEI layer. The flexible carbon matrix acts as a cushioning material that absorbs silicon's volume changes.
- **Utilization of High-Modulus Additives:** Introducing high-modulus polymers or ceramic particles as electrode binders or within the active material enhances the overall mechanical strength of the electrode. This suppresses fracture caused by volume expansion, improving electrode morphological stability and enabling stable long-term operation.

These strategies are critical for distributing internal stress within the electrode and maintaining the stability of the electrode-electrolyte interface.

Background & Context

Maximizing battery energy density is essential for improving the performance of electric vehicles (EVs) and portable electronic devices. Silicon anodes offer significant potential to surpass existing graphite anodes in this regard, driving active research and development by battery manufacturers and research institutions worldwide. In all-solid-state batteries, interface stability with the solid electrolyte is particularly crucial, making the volume change issue of silicon anodes even more critical. Therefore, innovative approaches in electrode design and materials science are key to the practical implementation of silicon anodes and the realization of high-performance all-solid-state batteries.

Strategic Significance & Outlook

The development of composite electrode materials combining carbon and high-modulus additives represents a vital direction for establishing silicon anodes as a mainstream material for next-generation batteries. Future research will focus on further optimizing these strategies and scaling up manufacturing processes. Effectively resolving the volume strain issue will not only significantly extend the driving range of EVs and improve fast-charging capabilities but also contribute to enhancing overall battery safety and lifespan. This will accelerate the commercialization of high-performance all-solid-state batteries, potentially making a substantial contribution to achieving a sustainable energy society.

Source: https://pubs.rsc.org/ee/article/19/8/2420-2491/1236482

#16 Toyota Achieves 1000-Mile EV Range, 5-Minute Charging with Solid-State Battery, Targeting Production by 2027

Published June 29, 2026 Unnamed source Japan

OVERVIEW

Toyota has announced a significant breakthrough in solid-state battery technology, enabling electric vehicles (EVs) to achieve a range of 1,600 km (approximately 1,000 miles) and a rapid 5-minute charging time. The company aims to begin mass production for hybrid vehicles by 2027-2028, with subsequent expansion to EVs. This advancement, eliminating flammable liquid electrolytes, dramatically enhances safety and is poised to revolutionize the EV market.

IN DEPTH

Key Findings

Toyota Motor Corporation has achieved groundbreaking performance in its next-generation solid-state battery technology, demonstrating an electric vehicle (EV) range of 1,600 km (approximately 1,000 miles) and a full charge in just 5 minutes. This represents a significant leap forward compared to conventional EV batteries, with Toyota aiming for mass production in hybrid vehicles starting 2027-2028, followed by a broader rollout into EVs.

Technical Details

Toyota's solid-state battery utilizes a solid electrolyte instead of a liquid one, balancing high energy density with enhanced safety. The adoption of a sulfide-based solid electrolyte facilitates rapid lithium-ion movement, enabling the ultra-fast 5-minute charging. This fundamentally addresses the fire risks associated with traditional liquid electrolytes, leading to a substantial improvement in safety. Furthermore, the technology allows for smaller and lighter battery packs, increasing design flexibility for vehicles and contributing to overall performance enhancements. The development involves close collaboration with Idemitsu Kosan for sulfide lithium solid electrolytes and Sumitomo Metal Mining for cathode materials.

Background & Context

Solid-state batteries are widely regarded as a 'game-changer' for EVs, with automotive manufacturers and battery developers globally engaged in intense competition. Extended range, reduced charging times, and improved safety are crucial for increasing consumer adoption of EVs. Toyota's announcement significantly impacts the global competitive landscape, particularly in terms of energy density (targeting over 700 Wh/kg) and fast-charging capability. The target of mass production by 2027-2028, considerably earlier than many competitors aiming for the 2030s, underscores Toyota's strong technological lead.

Strategic Significance & Outlook

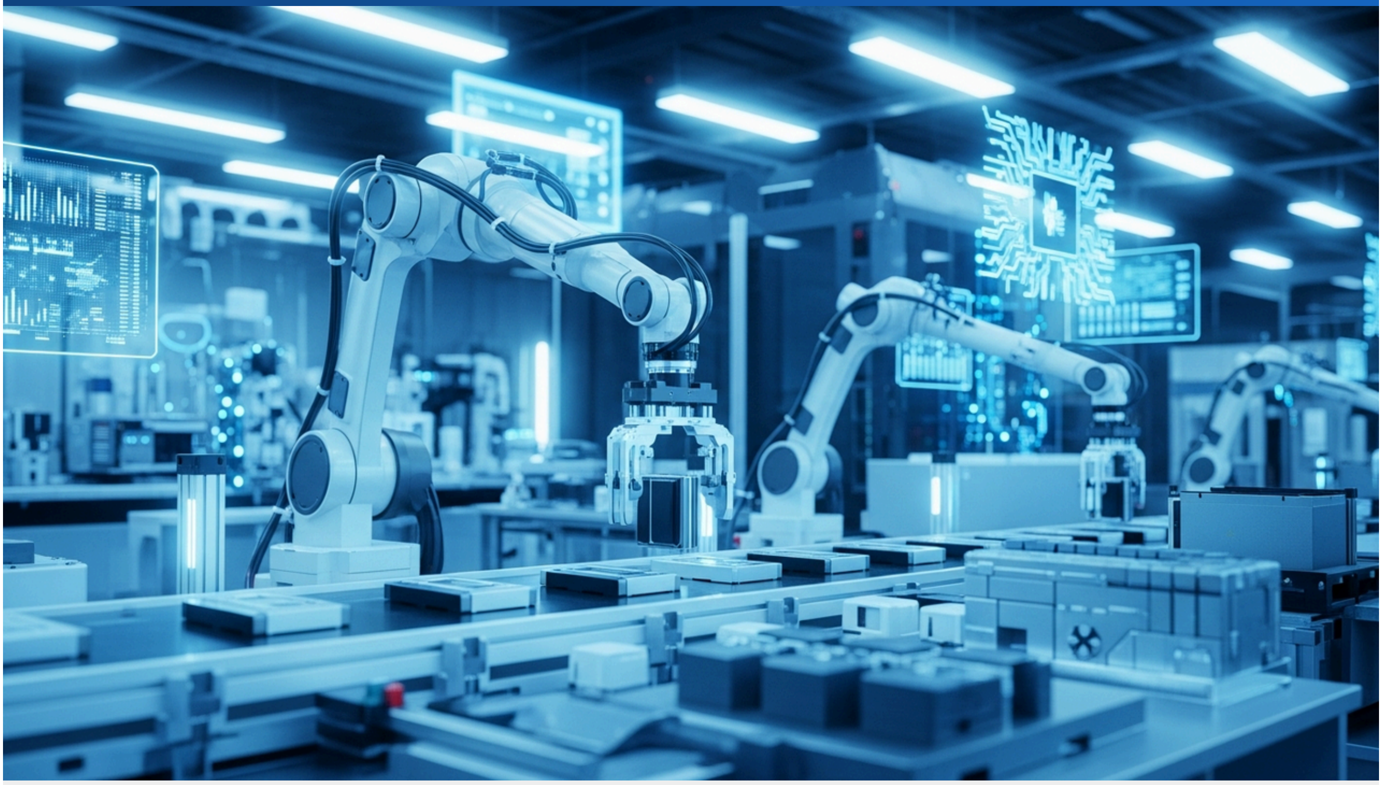
Toyota is focusing on simplifying manufacturing processes and reducing costs to establish mass production technology for solid-state batteries. The strategy involves an initial rollout in hybrid vehicles to mature the technology, followed by broad application across EV models. If successfully commercialized, this technology could dramatically accelerate EV adoption and trigger a major transformation in the global automotive and energy industries. Potential applications extend beyond passenger vehicles to long-haul transport, commercial vehicles, and even aerospace sectors, indicating a wide-ranging impact.

Source: https://mavigadget.com/blogs/auto/toyotas-solid-state-battery-breakthrough-700-mile-range-10-min-ev-charging

Collected: July 03, 2026 | Automated Research System (Gemini API)

#17 Pulsedeon Secures €700K to Scale Next-Gen Solid-State Battery Manufacturing, Begins Global Sample Supply

Published Published June 25, 2026　Pulsedeon　フィンランド



OVERVIEW

Finnish deep-tech firm Pulsedeon Oy has secured €700,000 in funding to significantly scale its advanced manufacturing platform for next-generation solid-state batteries. Leveraging proprietary pulsed laser deposition (PLD) technology, the company is now set to supply material samples globally, a critical step towards the commercialization of high-performance solid-state battery technology.

IN DEPTH

Background

The global race for solid-state battery development increasingly emphasizes efficient, high-quality manufacturing techniques, moving beyond fundamental materials research. Solid electrolytes, a cornerstone of this technology, have historically presented significant production challenges and high costs, hindering commercialization. Advanced manufacturing solutions, such as those pioneered by Pulsedeon, are therefore critical to overcome these barriers and accelerate the practical implementation of solid-state batteries. The expansion to supply samples across Europe, America, and Asia underscores the growing global recognition of Pulsedeon's technology and its potential to shape future supply chains.

Key Findings

Pulsedeon Oy, a Finnish deep-tech innovator, has successfully completed a funding round of approximately €700,000. This capital injection is earmarked for significantly scaling up its next-generation solid-state battery manufacturing technology and initiating the global supply of material samples to customers across Europe, the United States, and Asia.

Technical Details

Pulsedeon's core innovation lies in its unique 'multi-technology manufacturing platform,' underpinned by proprietary pulsed laser deposition (PLD). PLD facilitates the precise and efficient fabrication of solid electrolytes and electrode materials at an atomic layer scale. This atomic-level precision is paramount for optimizing interfacial quality – a determinant factor for solid-state battery performance. Such capabilities are projected to yield solid-state batteries boasting both high energy density and extended cycle life. The recent funding specifically targets the transition of this advanced manufacturing technology from pilot-scale to near-commercial production.

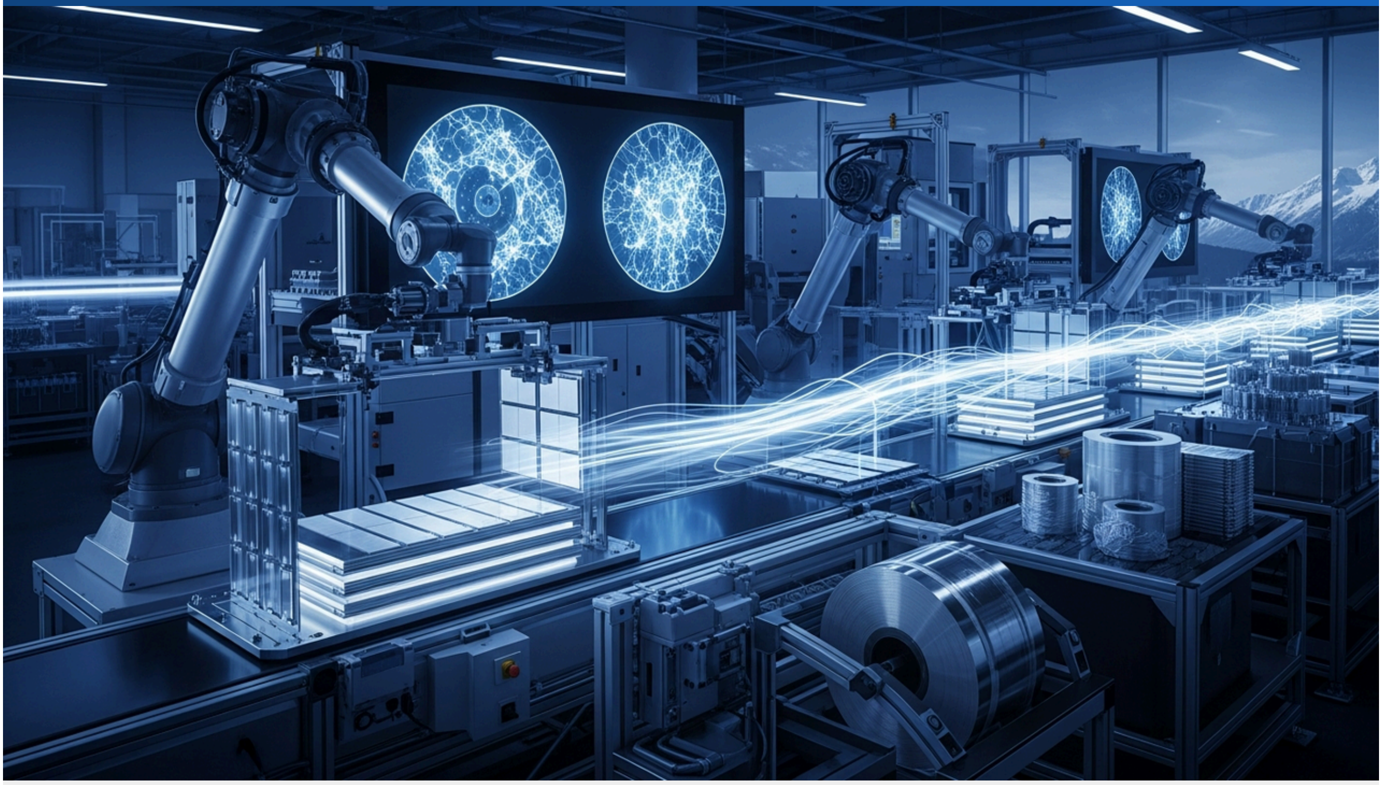
Strategic Significance & Outlook

This funding and expanded manufacturing capacity will significantly accelerate Pulsedeon's roadmap toward the commercialization of solid-state batteries. Providing material samples is a crucial initial step for prospective customers to integrate Pulsedeon's technology into their product development cycles. Moreover, the company's active participation in four EU Horizon Europe consortia highlights its strategic integration within the wider European solid-state battery development ecosystem and the promising trajectory of its technology. Future adoption is broadly anticipated across diverse sectors, including electric vehicles (EVs), portable electronic devices, and stationary energy storage systems.

Source: https://www.pulsedeon.com/uncategorized/pulsedeon-raises-eur-700000-to-scale-next-generation-solid-state-battery-manufacturing-technology/

#18 Swiss BTRY Secures €2.2M EIC Grant to Industrialize Thin-Film Solid-State Batteries, Establish Large-Scale European Plant

Published July 02, 2026 BTRY Switzerland



OVERVIEW

Swiss battery company BTRY has secured a €2.2 million grant from the EIC Accelerator to advance the industrialization of its thin-film solid-state battery technology. This funding will be used to establish Europe's first large-scale thin-film battery factory, scaling up vacuum coating manufacturing to produce millions of batteries annually. BTRY aims to solve energy storage challenges in microelectronics, medical devices, and IoT devices.

IN DEPTH

Key Findings

BTRY, an innovative battery technology company based in Switzerland, has been awarded a 2.2 million euro grant from the European Innovation Council (EIC) Accelerator program. This significant funding will propel the industrialization of BTRY's thin-film solid-state battery technology, supporting the establishment of Europe's first large-scale thin-film battery manufacturing facility and dramatically expanding its vacuum coating production capacity to achieve an annual output of millions of batteries.

Technical Details

BTRY's thin-film solid-state batteries are specifically designed for compact, low-power applications such as smart cards, medical implants, wireless sensors, and IoT devices, leveraging their minute size and high energy density. Thin-film technology employs solid electrolytes to physically suppress lithium dendrite growth, ensuring superior safety and extended lifespan. The vacuum coating manufacturing process, enhanced by this grant, is crucial for efficiently forming the precise layered structures of thin-film batteries, directly improving yield and reducing costs. This technology aims to deliver performance and reliability unattainable by conventional small-form-factor batteries.

Background & Context

The evolution of miniaturized electronics has driven increasing demand for thinner, safer, and higher energy density batteries. The proliferation of IoT devices, in particular, has introduced new requirements for battery form factor, durability, and environmental compatibility. Thin-film solid-state batteries represent a promising solution to these demands, with active research and development efforts worldwide. The EIC Accelerator grant is viewed as a strategic investment to establish European technological sovereignty in this domain and enhance competitiveness against predominantly Asian markets in battery manufacturing.

Strategic Significance & Outlook

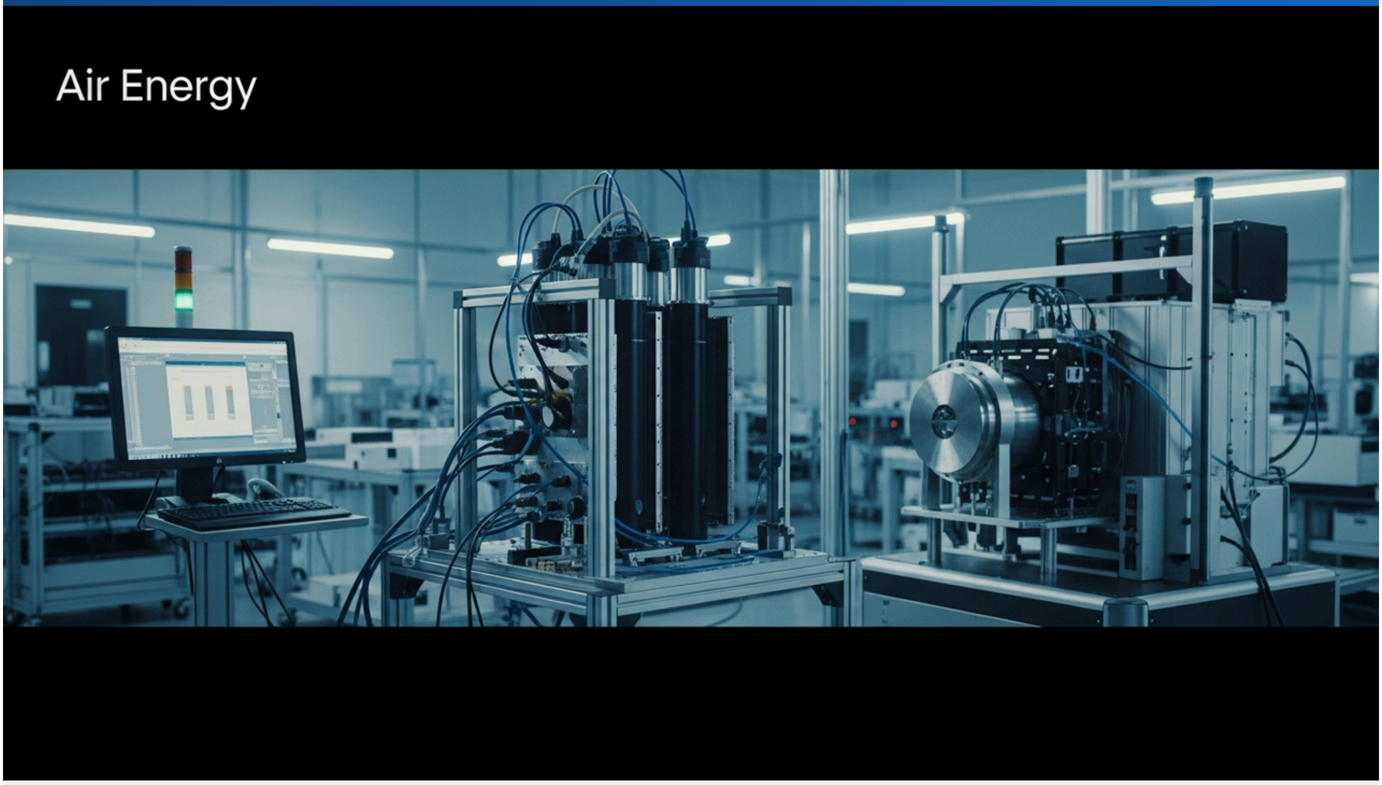
This grant acquisition marks a significant milestone for BTRY in establishing its leadership in thin-film solid-state battery manufacturing within Europe. The production target of millions of units annually indicates robust progress towards mass production, positioning BTRY as a potential key supplier to a wide range of small electronic device markets in the future. The commercialization of this technology will offer new degrees of freedom in designing compact devices, facilitating the emergence of more powerful and safer next-generation IoT applications and medical instruments. Broader applications in various sectors are also anticipated in the long term.

Source: https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQGWbiVTrbL7SMdzHylC4IsvrfjRaugT-438FapP-02P-39Nu9VkmzGu_3e8X3VSgFzPHdVLODR2PA2cmplolIVbYyiFxezNmnvSupP2TvDv9iuEHySJE2MEIFcBd4Q4Gj_hd2V
VolL7AD3BYwpVzsAhcthPYT5tlG86G5CGMFWkYM_hvs_t3IAbRVifLFdP_ZvEoNkAGwa3RY=

Collected: July 03, 2026 | Automated Research System (Gemini API)

#19 US Air Energy Advances Pilot Production of 2000Wh/kg All-Solid-State Lithium-Air Batteries for Electric Aircraft

Published July 03, 2026 en.Wedoany.com USA



OVERVIEW

US startup Air Energy is actively pursuing pilot production of all-solid-state lithium-air batteries with an ultra-high energy density of 2000Wh/kg. This groundbreaking technology targets large electric aircraft, promising significant impact on aerospace electrification. The company has secured seed funding with US Department of Energy (DOE) support, planning to optimize manufacturing processes and accelerate pilot production.

IN DEPTH

Key Findings

Air Energy, an innovative US-based battery startup, has transitioned to the pilot production phase for its all-solid-state lithium-air batteries, which boast an impressive energy density of 2000Wh/kg. This ultra-high energy density battery technology is specifically targeting the large electric aircraft market, holding the potential to fundamentally transform the performance and sustainability of the aviation sector.

Technical Details

Lithium-air batteries are known for offering theoretically among the highest energy densities, but their practical application has been hampered by challenges in stability, cycle life, and manufacturing. Air Energy aims to circumvent these issues by developing an all-solid-state configuration, which resolves safety concerns associated with conventional liquid electrolytes while maximizing the inherent energy density potential of lithium-air chemistry. The 2000Wh/kg energy density is approximately five times that of current state-of-the-art lithium-ion batteries, enabling a dramatic increase in the range and payload capacity of electric aircraft. The company, backed by strong support from the U.S. Department of Energy (DOE), has completed its seed funding round and is now focused on optimizing its manufacturing processes and accelerating pilot production, a critical step in scaling from lab-scale to commercial production.

Background & Context

The aviation industry is seeking to electrify in response to climate change, with the primary barriers being battery energy density and weight. Existing lithium-ion batteries cannot provide sufficient energy density for long-range flights of large aircraft. Next-generation technologies, such as lithium-air batteries, are considered the only viable path to overcome this challenge. Air Energy's progress could significantly open up markets for electric aircraft, particularly eVTOL (electric vertical takeoff and landing) vehicles and regional jets, thereby becoming a crucial factor in accelerating the decarbonization of the aerospace sector.

Strategic Significance & Outlook

Should Air Energy successfully execute its pilot production and scale up its technology, it would establish itself as a key battery supplier in the electric aviation market. The DOE's support aligns with the broader US strategic goal of strengthening its domestic battery supply chain. The future focus will be on leveraging data from pilot production to establish product reliability, cost-effectiveness, and ultimately, commercial-scale manufacturing feasibility. If this technology becomes commercially viable, it is expected to have ripple effects not only in aerospace but also in other applications requiring high energy density, such such as long-range drones and high-performance robotics.

Source: https://en.wedoany.com/shortnews/345869.html

Collected: July 03, 2026 | Automated Research System (Gemini API)

#20 UK's Ilika Secures £4.56M to Accelerate Solid-State Battery Commercialization, Strengthening Medical, EV, and Defense Markets

Published July 03, 2026 TipRanks.com UK

OVERVIEW

British solid-state battery developer Ilika has raised £4.56 million (approximately $5.7M USD) to accelerate the commercialization of its Stereax and Goliath product lines. This funding will be allocated to capital expenditures aimed at strengthening the company's position in medical implant, electric vehicle (EV), and defense applications. Ilika has already begun shipping 10Ah solid-state battery prototype samples to automotive and industrial customers, demonstrating concrete progress towards commercialization.

IN DEPTH

Key Findings

Ilika, a UK-based developer of solid-state battery technology, has successfully completed a funding round, securing £4.56 million (approximately $5.7 million USD). This significant capital injection is earmarked for capital expenditures to accelerate the commercialization of its two key product lines, Stereax and Goliath. The investment aims to further enhance Ilika's competitive standing across a wide range of high-value applications in medical implants, electric vehicles (EVs), and defense sectors.

Technical Details

Ilika specializes in developing solid-state batteries based on its proprietary thin-film technology, offering two distinct product lines: Stereax for miniaturized medical devices and Goliath for larger-scale EV and industrial applications. Stereax batteries are suitable for medical implants and wearable devices requiring low power consumption and long lifespans, where safety and reliability are paramount. Goliath, on the other hand, is designed to meet the high energy density and fast-charging demands of EV and defense applications. The company has already commenced shipping 10Ah solid-state battery prototype samples to automotive and industrial customers, providing tangible evidence of its technology's steady transition from laboratory-level to practical implementation. These prototypes will undergo customer evaluation, aiming for eventual adoption in future mass-produced models.

Background & Context

Solid-state batteries are at the forefront of global R&D competition as a next-generation power source poised to address the safety, energy density, and cycle life limitations of existing lithium-ion batteries. The UK government is strategically supporting domestic battery technology development, and the investment in Ilika is part of this broader initiative. In the medical field, compact and highly safe power sources are critical, while the defense sector demands reliability and performance under extreme conditions. The EV market faces urgent challenges in extending range and reducing charging times, which Ilika's technology aims to resolve.

Strategic Significance & Outlook

This funding and capital investment will strengthen Ilika's foundation for expanding its commercial production capacity and securing market share in high-growth sectors. The adoption of its technology across diverse fields such as medical, EV, and defense will diversify the company's revenue streams and enhance its stability. Notably, the shipment of prototype samples to customers not only demonstrates the technology's credibility but also heightens expectations for early commercial agreements. Moving forward, Ilika is expected to focus on establishing mass production techniques and improving cost efficiency, aiming for leadership in the global solid-state battery market.

Source: https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQG_xgvA9ExR1xZyEk4EeEx3aELfC6TXKSUpGV_tk5Cd5aROULCidxMCgiqstXE1Pq9DmlOUUzanexDJ8-Loy11z0U9XQa3tNlZRNF4Yox8_j5fAIj1sOjzIbHYRimxNu0OoFp3eRVf1MmLYQu9AqqzJbHk=

Collected: July 03, 2026 | Automated Research System (Gemini API)

#21 LiNa Energy Raises £29.2M to Advance Solid-State Sodium Battery Development for Renewable Energy Storage and EV Markets

Published July 02, 2026   Funding Spotter   UK

OVERVIEW

Lancaster-based LiNa Energy has secured £29.2 million in its latest funding round to develop groundbreaking all-solid-state sodium battery systems for the renewable energy storage and electric vehicle (EV) markets. This substantial investment will significantly accelerate the company's technology development and commercialization efforts. LiNa Energy aims to deliver sustainable, high-performance energy storage solutions.

IN DEPTH

Key Findings

LiNa Energy, based in Lancaster, UK, has successfully raised £29.2 million (approximately $36.6 million USD at current exchange rates) in its latest funding round. This significant capital infusion is dedicated to developing its innovative all-solid-state sodium battery systems, targeting the rapidly growing renewable energy storage and electric vehicle (EV) markets. The substantial funding is expected to dramatically accelerate the company's research and development efforts and pave the way for commercialization.

Technical Details

The all-solid-state sodium batteries developed by LiNa Energy utilize sodium, which is more abundant and less expensive than lithium, thereby reducing supply chain risks and enhancing sustainability. The company's technology aims to achieve high energy density and superior cycle life while improving safety by suppressing dendrite formation through the use of solid electrolytes. These characteristics make solid-state sodium batteries particularly advantageous for renewable energy storage systems, which demand long-term stable operation and high safety. In the EV market, sodium batteries are garnering significant attention as a next-generation battery option due to their cost-effectiveness and potential for reduced environmental impact.

Background & Context

Amid global challenges related to climate change and energy transition, the demand for reliable, affordable, and sustainable energy storage technologies is surging. While lithium-ion batteries remain dominant, concerns regarding lithium resource scarcity, price volatility, and supply chain vulnerabilities are growing. Sodium-ion batteries are seen as a promising alternative to lithium, with all-solid-state configurations expected to further enhance performance and safety. LiNa Energy's recent funding round highlights the UK's innovation capabilities in this strategically important field and aims to contribute to the global clean energy transition.

Strategic Significance & Outlook

With this £29.2 million funding, LiNa Energy can scale up its R&D, moving from prototype development to validation trials and ultimately to establishing mass production techniques for its all-solid-state sodium battery systems. By aiming for integration into renewable energy grids and compatibility with diverse EV platforms, the company seeks to capture broad market opportunities. Successful commercialization of LiNa Energy's technology would significantly contribute to reducing energy storage costs and improving resource sustainability, offering new options to the global energy market and the automotive industry.

Source: https://www.fundingspotter.com/news/lina-energy-2026

Collected: July 03, 2026 | Automated Research System (Gemini API)

#22 SMM H1 2026 Review: China's New National Standard Defines Solid-State Batteries, Predicts Semi-Solid Mass Production & Cost Parity by 2027

Published July 02, 2026   SMM   China

OVERVIEW

According to SMM's H1 2026 review, China has officially issued the new national standard GB/T for solid-state batteries in EVs, strictly defining 'all-solid-state batteries' as having liquid content below 0.5% and banning terms like 'semi-solid' or 'quasi-solid' in marketing. Meanwhile, Samsung SDI, BMW, QuantumScape, Solid Power, LG Energy Solution, SK On, Toyota, and Nissan are advancing pilot lines and evaluations. Chinese companies show significant progress in pilot production of semi-solid and solid-state batteries, with semi-solid batteries projected to reach mass production scale and cost parity with liquid batteries by 2027.

IN DEPTH

Key Findings

The SMM H1 2026 review highlights a significant advancement in solid-state battery technology development: the official issuance by the Chinese government of the 'National Standard (GB/T) for Terminology and Classification of Solid-State Batteries for EVs.' This new standard rigorously defines 'all-solid-state batteries' as containing less than 0.5% liquid electrolyte, prohibiting ambiguous terms like 'semi-solid' or 'quasi-solid' in the market. The objective is to enhance technological transparency and market integrity within the industry.

Technical Details

The review indicates that major battery manufacturers and automotive OEMs worldwide are accelerating the establishment of pilot production lines and evaluation processes for solid-state batteries. Leading entities include Samsung SDI, BMW, QuantumScape, Solid Power, LG Energy Solution, SK On, Toyota, and Nissan. Within China, substantial progress is noted in the pilot production of both semi-solid and solid-state batteries. Notably, semi-solid batteries are projected to achieve mass production scale by 2027, reaching cost competitiveness comparable to existing liquid lithium-ion batteries. This represents a crucial technological and commercial milestone preceding the full-scale transition to all-solid-state batteries.

Background & Context

Solid-state batteries are considered key to the EV revolution, promising superior energy density, safety, and extended cycle life compared to conventional lithium-ion batteries. The Chinese government's enactment of a national standard aims to prevent consumer confusion and elevate overall industry quality standards by providing clear technical definitions. This move also reflects China's strategic intent to establish global leadership in this domain. The early commercialization of semi-solid batteries is positioned as a practical approach to achieve incremental EV performance improvements without waiting for the full implementation of all-solid-state technology, which faces more complex technical hurdles.

Strategic Significance & Outlook

China's new national standard is expected to profoundly influence the development of the solid-state battery market, enabling companies to proceed with R&D based on clearer technical objectives and regulatory requirements. The anticipated mass production and cost competitiveness of semi-solid batteries by 2027 could further boost EV market expansion and accelerate the adoption of high-performance batteries. In the long term, these developments are expected to pave the way for the full commercialization of solid-state batteries, contributing to the evolution of energy storage technologies as a whole. China's standardization and commercialization efforts in this sector are likely to encourage similar trends in other countries within the global battery technology race.

Source: https://news.metal.com/en/newscontent/103984967-smm-solid-state-battery-h1-2026-review-from-proof-of-concept-to-pre-production-sprint

Collected: July 03, 2026 | Automated Research System (Gemini API)

#23 Electropages July 2026 Review: Syensqo & Axens Form Argylium for Sulfide SSE Industrialization; Ilika Ships 10Ah Samples; Donut Lab's 400Wh/kg SSB to Power Verge Motorcycles

Published July 01, 2026 Electropages UK

OVERVIEW

The Electropages July 2026 review highlights several advances in solid-state battery commercialization. Syensqo and Axens formed Argylium to industrialize sulfide solid-state electrolytes. UK's Ilika commenced shipping 10Ah solid-state battery prototype samples to automotive and industrial clients. Donut Lab unveiled a 400Wh/kg solid-state battery at CES 2026, slated for Verge Motorcycles in Q1 2026. Major OEMs like Stellantis, Mercedes-Benz, and BMW are actively testing semi-solid and solid-state cells from Factorial Energy and Solid Power.

IN DEPTH

Key Findings

The July 2026 Electropages review indicates an acceleration of concrete initiatives towards the commercialization of solid-state battery (SSB) technology. Notably, Syensqo and Axens have established Argylium, a joint venture aimed at industrializing sulfide solid-state electrolytes. Concurrently, UK-based Ilika has begun shipping 10Ah solid-state battery prototype samples to automotive and industrial customers. Furthermore, at CES 2026, Donut Lab unveiled a 400Wh/kg high-energy-density solid-state battery, scheduled for integration into Verge Motorcycles in the first quarter of 2026.

Technical Details

The formation of Argylium represents a critical milestone in scaling up the production of sulfide solid-state electrolytes. Sulfide-based electrolytes are considered essential for achieving high-performance SSBs for EVs due to their high ionic conductivity. Ilika's shipment of 10Ah cells signifies progress in its Goliath product line and is a crucial step for automakers to evaluate SSBs at a vehicle-relevant scale. Donut Lab's reported 400Wh/kg energy density and 5-minute full charging capability significantly surpass current lithium-ion battery performance, demonstrating its potential for high-performance electric mobility applications like Verge Motorcycles. The active testing of semi-solid cells from Factorial Energy by Stellantis and Mercedes-Benz, and solid-state prismatic cells from Solid Power by BMW, indicates a strong engagement from major OEMs in adopting next-generation battery technologies.

Background & Context

The burgeoning electric vehicle (EV) market demands continuous improvements in battery performance, safety, cost-effectiveness, and supply chain sustainability. Solid-state batteries are widely anticipated as the ultimate solution to these challenges, attracting substantial investments from governments and corporations worldwide. With the limitations of existing liquid lithium-ion batteries becoming apparent, sulfide solid-state electrolytes and semi-solid technologies are gaining prominence as realistic approaches for early commercialization. These developments clearly illustrate that advancements in battery technology are driving the broader transformation of the automotive industry.

Strategic Significance & Outlook

The industrialization efforts by Argylium for sulfide solid-state electrolytes, Ilika's 10Ah cell shipments, Donut Lab's EV integration plans, and evaluations by major automakers collectively indicate that solid-state batteries are steadily transitioning from the 'proof-of-concept' stage to the 'pre-production' phase. Key challenges ahead include further reducing manufacturing costs, ensuring quality and stability in large-scale production, and improving compatibility with existing manufacturing infrastructure. Successful navigation of these challenges is expected to lead to the widespread adoption of solid-state batteries in the EV market and other energy storage sectors from the late 2020s into the 2030s, yielding extensive industrial and environmental benefits.

Source: https://engineerlive.com/latest-developments-moving-solid-state-batteries-closer-commercial-reality/

Collected: July 03, 2026 | Automated Research System (Gemini API)

#24 Samsung SDI Solid-State Batteries Receive Positive Global Client Feedback on Safety and Energy Density, Targeting Late 2027 Mass Production

Published July 01, 2026   Korea JoongAng Daily   South Korea

OVERVIEW

Samsung SDI's solid-state battery samples have garnered favorable feedback from global clients regarding both safety and energy density, according to a company executive. The firm aims for mass production by late 2027 for electric vehicles (EVs), robots, and mobile devices. This indicates that solid-state battery technology is reaching critical commercialization milestones.

IN DEPTH

Key Findings

Samsung SDI has announced that its prototype samples of all-solid-state batteries (ASBs) have received highly positive evaluations from leading global customers across key performance indicators: safety and energy density. The company is targeting mass production of this technology by late 2027 for diverse applications, including electric vehicles (EVs), robotics, and mobile devices.

Technical Details

Samsung SDI is developing solid-state battery technology based on sulfide solid electrolytes, incorporating proprietary techniques to suppress lithium metal anode dendrite growth and establish stable interfaces. The positive customer feedback suggests that these batteries not only achieve high energy density (specific numbers are undisclosed but expected to significantly surpass current lithium-ion batteries) but also meet the stringent safety standards required for EVs and other high-power applications. The target of late 2027 for mass production implies that the company is overcoming challenges related to manufacturing scalability and cost efficiency.

Background & Context

All-solid-state batteries are attracting global attention as a next-generation technology capable of overcoming the primary weaknesses of current lithium-ion batteries: safety (thermal runaway risk) and energy density limitations. Automakers, in particular, are strongly advocating for the early adoption of solid-state batteries to meet the needs for extended EV range and reduced charging times. Announcements of mass production targets by major battery manufacturers like Samsung SDI significantly influence overall market technology trends and the competitive landscape. Furthermore, applications in robotics and mobile devices reflect the growing demand for compact, high-reliability power solutions.

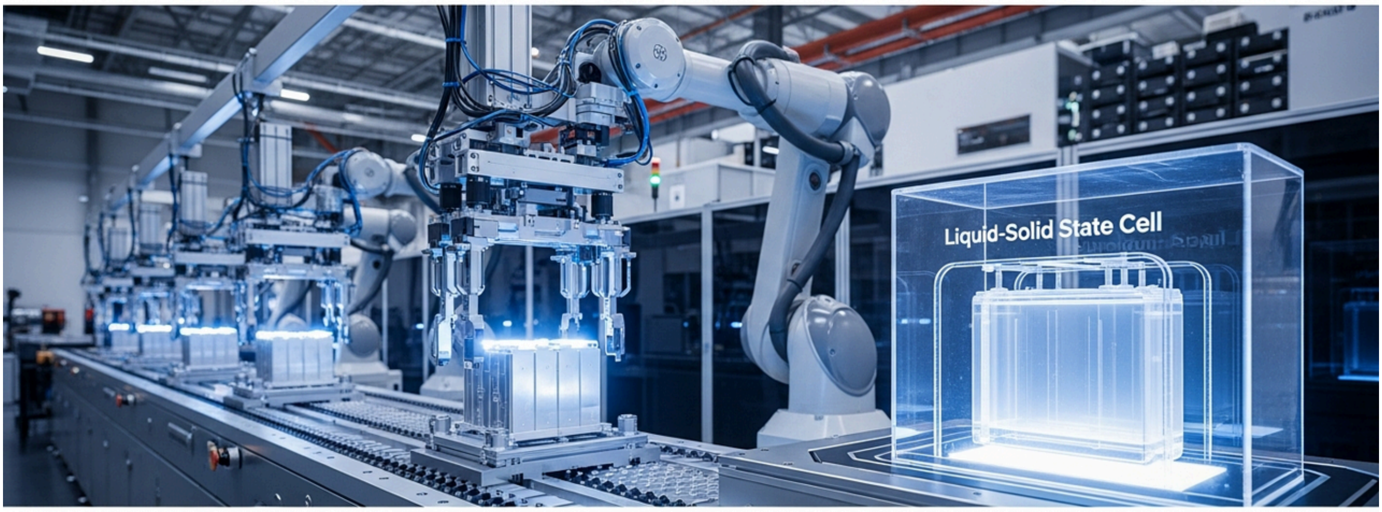
Strategic Significance & Outlook

If Samsung SDI can commence mass production of solid-state batteries in late 2027, the company is poised to establish early leadership in the global ASB market. The commercialization of this technology is expected to dramatically enhance EV safety and performance, encouraging broader consumer adoption. It will also contribute to advancements in robotics and the development of more powerful, longer-lasting mobile devices. Future focus will be on further cost reduction post-mass production, establishing a robust supply chain, and ensuring the capacity to meet global demand.

Source: https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQFiaW7brKoriKTupmqUlRCWtrjvpEJVy_XZUq2PDuRCenj6t8FEibIH2k5UwOMbjJ1FjrDW3-FvJivbHwZkQo3G6DMgY9BJqr0oRdosnRGCO0i4iFi3N7qFJexlwy9osyyG_htuik71dPDV8q-_TZNYy2q78-8RjKCM8LYFF1jND4dG1pQ==

#25 Nio Supplier TIES Unveils New 'Liquid-Solid Cells' Adhering to China's New Standard, Claims Existing Factories Adaptable with <10% Modification

Published June 26, 2026 ArenaEV China



OVERVIEW

Nio's battery supplier, Tianmu Lake Institute of Advanced Energy Storage Technologies (TIES), announced new 314Ah and 588Ah 'liquid-solid cells.' Utilizing a proprietary 'in-situ solidification' manufacturing process, TIES claims existing lithium-ion battery factories can be converted to semi-solid battery production with less than 10% modification. This complies with China's new national standard (effective July 1, 2026), defining liquid content between 5% and 20% as liquid-solid, offering a groundbreaking approach to overcome manufacturing cost and scale-up challenges.

IN DEPTH

Key Findings

Tianmu Lake Institute of Advanced Energy Storage Technologies (TIES), a key battery supplier for Nio, has unveiled new high-capacity 'liquid-solid cells' in 314Ah and 588Ah formats. The company claims its proprietary 'in-situ solidification' manufacturing process allows existing lithium-ion battery production lines to be converted to semi-solid battery manufacturing with less than 10% modification to equipment. This innovative approach promises to alleviate significant bottlenecks in manufacturing costs and scaling up production.

Technical Details

TIES's 'in-situ solidification' process capitalizes on a mechanism where the liquid electrolyte solidifies within the battery cell, enabling existing lithium-ion battery factory equipment to adapt to semi-solid battery production without substantial capital investment. This method is significantly more efficient and economical than constructing entirely new dedicated manufacturing lines. The newly announced liquid-solid cells comply with China's new national standard, which came into effect on July 1, 2026. This standard defines 'liquid-solid batteries' as those with a liquid content ranging from 5% to 20%, placing TIES's products squarely within this category. This technology aims to enhance safety and energy density compared to conventional liquid electrolyte batteries, serving as a critical transitional technology until the full commercialization of all-solid-state batteries.

Background & Context

The transition to all-solid-state batteries represents the ultimate goal for providing high energy density and superior safety to EVs, but manufacturing complexity and high costs remain significant barriers. China is committed to establishing global leadership in the EV and battery industries, and semi-solid batteries are viewed as a crucial, pragmatic intermediate step toward achieving this objective. TIES's technology, by leveraging existing infrastructure, enables the rapid market introduction of semi-solid batteries and ensures cost competitiveness, thereby bolstering the overall competitiveness of China's battery industry. The enactment of national standards in China plays a vital role in preventing market confusion and fostering healthy technological development.

Strategic Significance & Outlook

TIES's 'liquid-solid cells' and 'in-situ solidification' process are poised to significantly impact the acceleration of semi-solid battery mass production and the expansion of high-performance battery supply in the EV market. The ability to convert existing factories substantially reduces investment risks, incentivizing more companies to enter semi-solid battery manufacturing. This is expected to drive improvements in EV performance and enhance price competitiveness, potentially further accelerating consumer adoption of EVs. China's new national standard could also influence future global battery technology classification and regulations, making TIES's technological trajectory a key area to watch.

Source: https://www.arenaev.com/battery_maker_ties_unveils_new_cells_to_leapfrog_solidstate_bottlenecks-news-6013.php

Collected: July 03, 2026 | Automated Research System (Gemini API)

#26 Donut Lab's 400Wh/kg Solid-State Battery Achieves 5-Minute EV Charge, Slated for Verge Motorcycles in Q1 2026

Published Published June 27, 2026 The Robotics Media フィンランド

OVERVIEW

Finnish firm Donut Lab has announced a production-ready all-solid-state battery for electric vehicles (EVs) that boasts a gravimetric energy density of 400 Wh/kg and a full charge time of just 5 minutes. This advanced battery is slated for integration into Verge Motorcycles by Q1 2026 and claims an exceptional 99% capacity retention after 100,000 cycles, addressing key challenges in EV adoption and offering superior durability.

IN DEPTH

Background

Widespread adoption of electric vehicles (EVs) hinges on overcoming critical challenges such as range anxiety, extended charging times, and battery safety concerns. All-solid-state batteries represent the most promising next-generation technology poised to address these limitations, attracting intense development efforts from companies and research institutions globally. Donut Lab's innovation is significant as it simultaneously tackles two major hurdles—ultra-fast charging and high energy density—positioning it as a strong differentiator in the competitive EV market. The early integration with Verge Motorcycles serves as a crucial validation, indicating that the technology has matured to a practical application stage and bolstering market confidence.

Key Findings

Finnish battery technology firm Donut Lab has announced a significant breakthrough: the successful development of a mass-producible all-solid-state battery designed for electric vehicles (EVs). This advanced battery achieves a gravimetric energy density of 400 Wh/kg and boasts an ultra-fast full charge time of just 5 minutes. The technology is set for practical application, with its integration into Verge Motorcycles, an electric motorcycle manufacturer, scheduled for the first quarter of 2026.

Technical Details

At the core of Donut Lab's innovation is its all-solid-state battery architecture, which replaces traditional flammable liquid electrolytes with a safer, more stable solid electrolyte. This fundamental change is key to simultaneously achieving both high energy density and rapid charging. The reported 400 Wh/kg gravimetric energy density represents a substantial improvement, approximately 1.5 to 2 times higher than leading current-generation lithium-ion batteries, promising a significant extension in EV range. The most remarkable technical achievement is the 5-minute full charge capability, which Donut Lab attributes to proprietary technology that optimizes lithium-ion migration pathways within the solid electrolyte and effectively reduces interfacial resistance. Furthermore, the company asserts an impressive 99% capacity retention after 100,000 charge-discharge cycles. This exceptional durability and reliability are crucial for the economic viability of electric mobility, especially for high-performance and commercial EV applications, by substantially reducing long-term operational costs.

Strategic Significance & Outlook

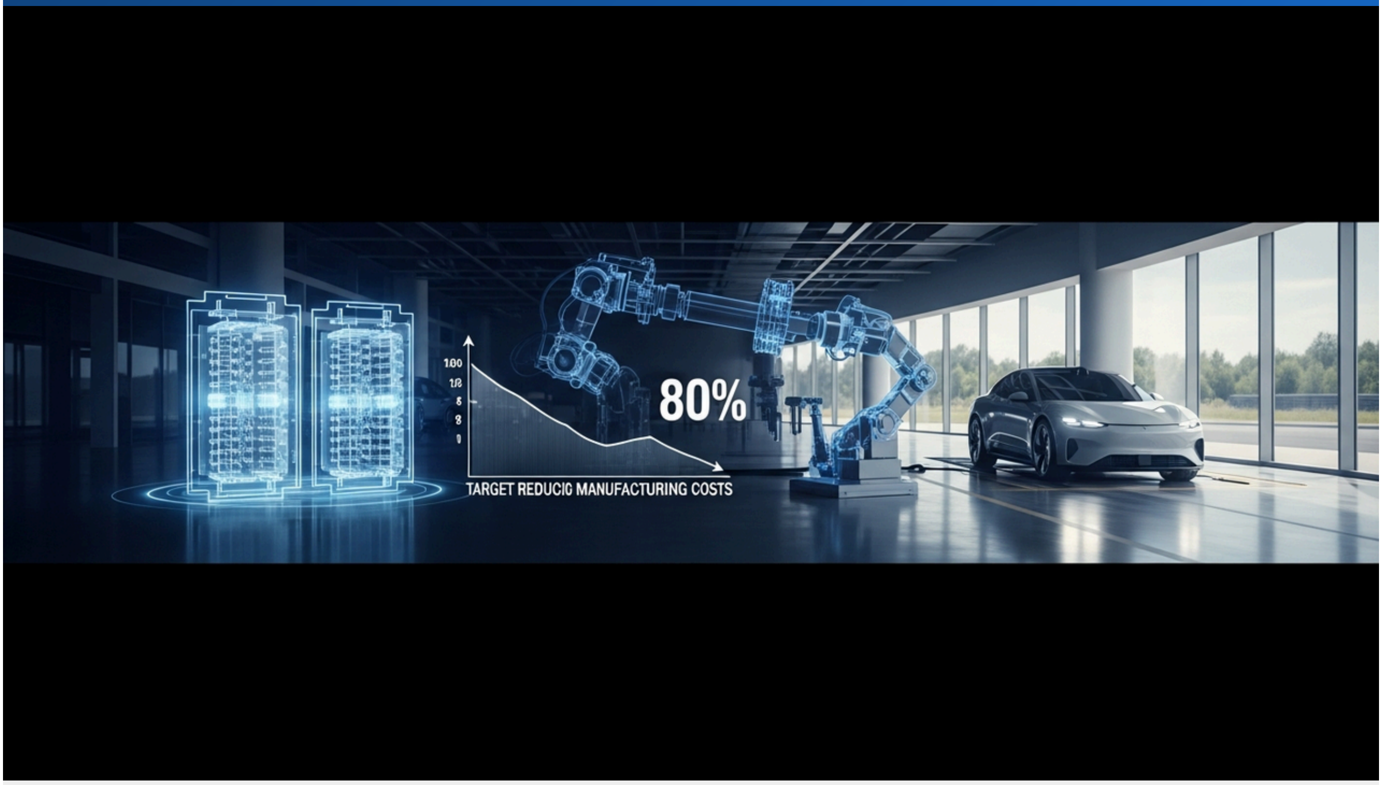
The successful integration of Donut Lab's all-solid-state battery into Verge Motorcycles will establish a significant benchmark within the high-performance electric mobility sector. Future growth and market penetration will hinge on the company's ability to forge broader partnerships with automotive manufacturers, scale up manufacturing operations, and further drive down production costs. With its unique combination of ultra-fast charging and extended lifespan, these batteries are poised for widespread adoption beyond EVs, including diverse applications such as drones, robotics, and stationary energy storage systems. Donut Lab's technological innovation not only elevates Finland's position in the next-generation battery market but also holds substantial promise for accelerating the global energy transition.

Source: https://theroboticsmedia.com/article/donut-lab-solid-state-battery-five-minute-charge-verge

Collected: July 03, 2026 | Automated Research System (Gemini API)

#27 Factorial Energy Begins On-Road EV Solid-State Battery Testing with Stellantis, Targets 80% Manufacturing CAPEX Reduction

Published June 30, 2026 Tracxn USA



OVERVIEW

Factorial Energy, in partnership with automotive giant Stellantis, commenced on-road testing of its solid-state batteries for electric vehicles (EVs) in June 2026. The company has shipped thousands of automotive-scale solid-state battery cells to global OEM partners, claiming its FEST® (Factorial Electrolyte System Technology) batteries can reduce capital expenditure by up to 80% due to compatibility with existing lithium-ion manufacturing infrastructure. This signifies a major advancement in solid-state battery commercialization.

IN DEPTH

Key Findings

Factorial Energy, under a strategic partnership with automotive giant Stellantis, commenced on-road testing of its all-solid-state batteries for electric vehicles (EVs) in June 2026. The company has already shipped thousands of automotive-scale solid-state battery cells to global OEM partners. Factorial Energy announced that its proprietary FEST® (Factorial Electrolyte System Technology) batteries have the potential to reduce capital expenditure by up to 80% by being compatible with existing lithium-ion battery manufacturing infrastructure, marking a significant advancement in the commercialization of solid-state batteries.

Technical Details

Factorial Energy's FEST® technology features a solid electrolyte separator that replaces liquid electrolytes, thereby suppressing lithium dendrite growth and significantly improving battery safety and performance. This technology is particularly well-suited for combination with high-voltage cathodes and lithium metal anodes, enabling high energy density and extended cycle life. A notable advantage is that FEST® batteries can be integrated into existing lithium-ion battery production lines with minimal modifications. This significantly reduces the enormous initial investment typically required for new dedicated factories, streamlining manufacturing costs and timelines, and thus greatly paving the way for large-scale production of solid-state batteries. On-road testing by Stellantis will validate battery performance, safety, and durability under real-world driving conditions, serving as the final evaluation phase before commercialization.

Background & Context

With the rapid growth of the electric vehicle market, battery performance, safety, and manufacturing costs have become key competitive factors. Solid-state batteries are expected to fundamentally solve these challenges, but their complex manufacturing processes and high costs have been major barriers to commercialization. Factorial Energy's technology, by leveraging existing manufacturing infrastructure, holds the potential to overcome these barriers. Partnerships with major automakers like Stellantis reinforce market confidence in the technology's reliability and commercial viability, representing a critical move to accelerate the adoption of solid-state batteries in the global EV industry.

Strategic Significance & Outlook

The successful on-road testing with Stellantis will be a crucial step for Factorial Energy to establish leadership in the solid-state battery market. The strength of FEST® technology, which can reduce capital expenditure by up to 80%, will provide a significant cost advantage over competitors, enabling faster market entry and broader adoption. If test results are positive, further orders and partnerships from other OEM partners beyond Stellantis are anticipated. This technology has the potential to balance EV cost reduction with performance improvements, significantly boosting the widespread adoption of solid-state batteries and accelerating the electrification of the automotive industry.

Source: https://tracxn.com/d/companies/factorialenergy/__VOVfLG9Jd3zQNkD-0BdmZC32S5ePvdQESss-37q4fdU

#28 Samsung Chairman Lee Jae-yong Pledges Investment in Ulsan for Next-Generation Solid-State Battery and BESS Regional Plants

Published June 29, 2026 Seoul Economic Daily South Korea

OVERVIEW

Samsung Electronics Chairman Lee Jae-yong has pledged investment in regional plants for Samsung SDI's next-generation solid-state batteries and Battery Energy Storage Systems (BESS), centered in Ulsan. This move supports the South Korean government's 'Three Mega Projects for Leap Forward' and aims to strengthen Korea's global battery market leadership and secure its supply chain. Large-scale investment is expected to accelerate the commercialization of new technologies.

IN DEPTH

Key Findings

Lee Jae-yong, Chairman of Samsung Electronics, announced a commitment to substantial investment in regional plants for Samsung SDI's next-generation all-solid-state batteries and Battery Energy Storage Systems (BESS), primarily in the Ulsan region. This initiative is part of Samsung's support for the South Korean government's 'Three Mega Projects for Leap Forward.' This investment marks a critical strategic step to establish technological superiority and strengthen global leadership for South Korea's battery industry.

Technical Details

The next-generation all-solid-state batteries referenced by Chairman Lee represent high-energy-density, high-safety battery technology currently under development. These batteries are anticipated for applications in electric vehicles (EVs) and stationary energy storage systems (BESS). BESS is an essential technology for expanding renewable energy integration and stabilizing power grids, and its performance and safety could be dramatically enhanced through solid-state conversion. Investment in regional plants signifies a strengthening of manufacturing infrastructure to rapidly transition R&D outcomes into commercial production, contributing to supply chain efficiency and improved cost competitiveness. This will further solidify the domestic battery ecosystem in South Korea.

Background & Context

The global shift towards electrification and accelerated adoption of renewable energy sources has led to an exponential increase in demand for high-performance and safe batteries. South Korea is one of the world's leading players in the battery industry, fiercely competing with China, Japan, and Western nations in the development of next-generation battery technologies. Chairman Lee Jae-yong's commitment aligns perfectly with the South Korean government's 'Three Mega Projects for Leap Forward' (covering batteries, semiconductors, and bio-industries), positioning it as part of a national strategy for fostering critical industries. Ulsan, as one of South Korea's major industrial hubs, is expected to benefit from economic revitalization through this investment.

Strategic Significance & Outlook

The investment by the Samsung Group in Ulsan is expected to significantly accelerate the commercialization of Samsung SDI's solid-state battery technology. In conjunction with the mass production target of late 2027 (as reported in other articles), this new factory will become a core base for supplying innovative battery solutions to the EV, robotics, mobile device, and BESS markets. This initiative is anticipated to solidify South Korea's position as a global leader in next-generation battery technology and lay a crucial foundation for significantly contributing to the world's energy transition. Details regarding the construction schedule and production capacity will be closely watched.

Source: https://en.sedaily.com/news/2026/06/29/breaking-news-lee-says-samsung-to-invest-in-solid-state

#29 Research Unravels Anode Compatibility Challenges in Sulfide Solid-State Electrolytes, Achieves 401.1 Wh/kg High-Energy Density Pouch Cell

Published July 02, 2026 ResearchGate Unknown

OVERVIEW

Research highlights significant challenges regarding the chemical and electrochemical instability of sulfide solid-state electrolytes (SSEs) when in contact with reductive anodes. Concurrently, another study demonstrates a pouch cell using a $LiNi_{0.8}Mn_{0.1}Co_{0.1}O_2$ cathode and solid polymer electrolyte achieved a very high energy density of 401.1 Wh/kg. These findings provide crucial insights for improving the performance and stability of all-solid-state batteries.

IN DEPTH

Key Findings

A detailed discussion was presented on a critical challenge impacting all-solid-state battery (SSB) performance: the compatibility issues between sulfide solid-state electrolytes (SSEs) and reductive anodes. The research noted that while Li-M-X based superionic conductors exhibit excellent Li^+ conductivity, cathode compatibility, and mechanical deformability, they tend to become chemically and electrochemically unstable upon contact with reductive anodes. Simultaneously, a separate study focused on high energy density achieved a remarkable gravimetric energy density of 401.1 Wh/kg in a pouch cell utilizing a LiNi0.8Mn0.1Co0.1O2 cathode combined with a solid polymer electrolyte.

Technical Details

Sulfide SSEs are promising candidates for all-solid-state batteries due to their high ionic conductivity, but they are prone to side reactions at the interface with reductive anodes like lithium metal or silicon, leading to increased interfacial resistance and capacity degradation. Specifically, Li-M-X (compounds based on lithium with metals and halides) SSEs are effective in suppressing lithium dendrite growth but face issues with chemical interactions at the anode. In contrast, the pouch cell that achieved 401.1 Wh/kg combined a nickel-rich layered oxide cathode (LiNi0.8Mn0.1Co0.1O2) with a solid polymer electrolyte, surpassing conventional liquid electrolyte systems in energy density. This approach suggests that the flexibility of polymer electrolytes may contribute to improved interfacial stability, pointing to a vital direction for developing SSBs that balance high energy density and safety.

Background & Context

All-solid-state batteries are the subject of global research and development as next-generation batteries capable of extending EV range and enhancing safety. Achieving high energy density necessitates the use of lithium metal anodes and high-nickel cathodes, both of which commonly face challenges of instability at the interface with electrolytes. Research into the anode compatibility of sulfide SSEs provides fundamental insights to resolve this core problem, while the success of high-energy-density pouch cells using polymer electrolytes could represent a concrete breakthrough towards practical application. These advancements directly translate to performance improvements in EVs and portable electronic devices, significantly impacting the market.

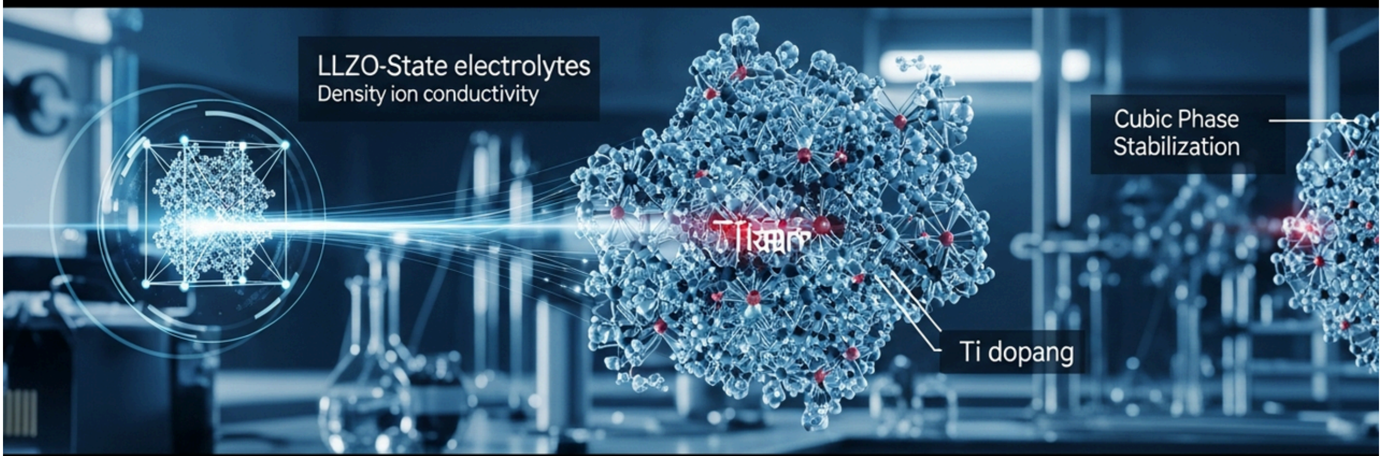
Strategic Significance & Outlook

Solving the anode compatibility issue for sulfide SSEs will remain a critical area, focusing on interface layer design and the exploration of new materials. Particularly, technologies that create stable interfaces with lithium metal anodes are key to realizing ultimate high-energy-density SSBs. Meanwhile, the solid polymer electrolyte pouch cell achieving 401.1 Wh/kg, given its energy density and flexible form factor, is anticipated for early adoption not only in EVs but also in sectors requiring miniaturization and light weight, such as drones and wearable devices. These research outcomes are expected to accelerate the path toward commercializing all-solid-state batteries and contribute significantly to the advancement of next-generation battery technologies.

Source: https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQGhLQ-4psZzaThe2aWxP0FycewWvk6MxhrWmsMp-3JRytOce2D-Vo4fLkYH1PCN9_4XvGoXR-cdBBDQY9_Td9z9Cz57tVUed4OINXVdrmpj0haWqIAOykAAWlpObengOy7P7CShWvtrQjnD_GYAeUTEzYdEeIaDCCDc2LD5E-E3J285B4nn8Vb9A==

#30 Ti-Doping Improves Densification and Ionic Conductivity of LLZO Solid Electrolytes, Stabilizing Cubic Phase

Published July 01, 2026 arXiv Unknown



OVERVIEW

Research explored titanium (Ti) doping in garnet-type Li7La3Zr2O12 (LLZO) solid electrolytes to enhance lithium-ion transport and structural stability. Ti-doping was found to improve the bulk density of LLZO and promote the stabilization of the cubic phase, which is essential for high performance. This discovery offers guidance for material design to further boost all-solid-state battery performance.

IN DEPTH

Key Findings

In research aimed at improving the performance of the garnet-type solid electrolyte $Li_7La_3Zr_2O_{12}$ (LLZO), the impact of titanium (Ti) doping on lithium-ion transport properties and structural stability was thoroughly investigated. The study revealed that Ti-doping not only enhances the bulk density of LLZO but also promotes the formation of a cubic phase, which is critical for achieving high ionic conductivity and stability.

Technical Details

LLZO is considered a promising material for solid electrolytes in all-solid-state batteries, but its cubic phase is metastable, posing challenges in manufacturing process control. This study demonstrated that introducing Ti ions into the LLZO crystal structure improves lattice stability, resulting in denser sintered bodies. Enhanced bulk density leads to improved physical contact between the solid electrolyte and electrodes, which reduces interfacial resistance. Furthermore, Ti-doping was found to increase room-temperature Li-ion conductivity (though specific numerical values were not provided), directly contributing to improved battery performance. This approach suggests a more efficient method for LLZO electrolyte fabrication, addressing challenges associated with conventional high-temperature sintering processes.

Background & Context

All-solid-state batteries are gaining attention as a next-generation battery technology that can improve the range, safety, and charging speed of electric vehicles (EVs). The core solid electrolyte must possess high ionic conductivity, chemical stability, and mechanical strength. Garnet-type LLZO is a strong candidate meeting these requirements, but manufacturing difficulties have been a barrier to commercialization. The reported improvements in density and cubic phase stabilization through Ti-doping offer a practical solution to this manufacturing challenge, paving the way for the mass production of high-performance LLZO solid electrolytes.

Strategic Significance & Outlook

The improvement in LLZO properties through Ti-doping represents a significant step towards enhancing all-solid-state battery performance. Future research is expected to focus on optimizing Ti doping levels and exploring the effects of co-doping with other elements. A key aspect will also be how this technology is integrated into manufacturing processes to enable cost-effective mass production. Ultimately, these research findings are anticipated to contribute to the realization of highly reliable, high-energy-density, and long-lifespan all-solid-state batteries, accelerating innovation across various sectors including the EV market, portable electronic devices, and stationary energy storage systems.

Source: https://arxiv.org/abs/2606.31669

Collected: July 03, 2026 | Automated Research System (Gemini API)

#31 Disordered Lithium Sublattice in Garnet-Type LLZO Achieves 10^{-3} S/cm Room-Temperature Ionic Conductivity

Published June 30, 2026 European Journal of Chemistry Unknown

OVERVIEW

First-principles calculations (DFT and AIMD) demonstrated that intentional disordering of the lithium sublattice in the cubic phase of garnet-type Li7La3Zr2O12 (LLZO) solid electrolyte significantly enhances Li-ion mobility. This led to achieving a high ionic conductivity of approximately 10^{-3} S/cm at room temperature, underscoring the importance of structural disorder and vacancy design for high-performance garnet-type solid electrolytes. This is a crucial discovery that accelerates the efficiency and practical application of all-solid-state batteries.

IN DEPTH

Key Findings

A recent study, leveraging first-principles calculations (Density Functional Theory: DFT and Ab Initio Molecular Dynamics: AIMD), revealed that intentionally disordering the lithium sublattice within the cubic phase of the garnet-type solid electrolyte Li7La3Zr2O12 (LLZO) dramatically enhances lithium-ion mobility. This breakthrough achieved an exceptionally high ionic conductivity of approximately 10^{-3} S/cm at room temperature, offering new design guidelines for realizing high-performance all-solid-state batteries.

Technical Details

LLZO is a promising material for solid electrolytes in all-solid-state batteries due to its high Li-ion conductivity and stability. In this research, by employing DFT and AIMD simulations, it was discovered that a disordered distribution of lithium ions within the LLZO crystal structure (a disordered lithium sublattice), rather than an ordered arrangement at specific sites, diversifies Li-ion migration pathways and lowers activation energy barriers. This enabled the achievement of ionic conductivity levels around 10^{-3} S/cm at room temperature, significantly surpassing conventional LLZO performance. This level is comparable to liquid electrolytes, directly translating to improved fast-charging capabilities and higher power output for SSBs. The study demonstrates how atomic-level structural design, beyond mere material synthesis, profoundly impacts battery performance.

Background & Context

All-solid-state batteries are anticipated as a next-generation technology to fundamentally improve the safety, range, and charging speed of electric vehicles (EVs) and portable electronic devices. The performance of the core solid electrolyte, particularly its ionic conductivity, is one of the most critical factors determining overall battery performance. While LLZO has been extensively studied, further increasing its room-temperature ionic conductivity was key to practical application. This research, based on theoretical calculations, demonstrates the potential for dramatic performance improvements by controlling the material's microstructure, serving as a prime example of how the fusion of materials science and battery engineering can lead to new breakthroughs.

Strategic Significance & Outlook

The design principle of lithium sublattice disordering is applicable not only to LLZO but also to the optimization of other garnet-type or related solid electrolyte materials, significantly opening new avenues for future high-performance solid electrolyte development. This research outcome validates the effectiveness of 'materials informatics,' where theoretical design guides experimental synthesis, drastically increasing the efficiency of new material discovery. In the future, new solid electrolytes developed based on this design principle are expected to accelerate the commercialization of safer and higher-performance all-solid-state batteries, bringing revolutionary impacts to the EV and energy storage system markets.

Source: https://www.eurjchem.com/index.php/eurjchem/article/view/2759

#32 Korean Team Triples Sulfide All-Solid-State Battery Lifespan, Achieves 2500 Hours Stable Operation with Elastic Ion-Conducting Polymer

Published June 28, 2026 BigGo Finance South Korea

OVERVIEW

A joint research team from Korea Research Institute of Chemical Technology, Yonsei University, and Sungkyunkwan University developed a groundbreaking technology to resolve crack issues in sulfide all-solid-state batteries. By applying an "elastic ion-conductive polymer" within the sulfide solid electrolyte, they successfully extended stable charge-discharge operation to over 2500 hours, tripling the battery lifespan compared to conventional designs. This technology significantly improved capacity retention after 200 cycles from 22% to 75%.

IN DEPTH

Key Findings

A joint research team comprising the Korea Research Institute of Chemical Technology, Yonsei University, and Sungkyunkwan University has developed an innovative solution to the critical problem of solid electrolyte cracking, a major cause of performance degradation in sulfide all-solid-state batteries. By integrating an 'elastic ion-conductive polymer' within the sulfide solid electrolyte, they successfully extended stable charge-discharge cycling to over 2500 hours, thereby tripling the battery lifespan compared to conventional designs. This technology dramatically improved capacity retention after 200 cycles, from 22% to an impressive 75%.

Technical Details

Sulfide all-solid-state batteries are promising candidates for next-generation batteries due to their high ionic conductivity and energy density. However, they face a significant challenge: volume changes during charge-discharge cycles often induce microscopic cracks in the solid electrolyte, leading to increased interfacial resistance, accelerated dendrite formation, and reduced battery life. The research team developed a specialized polymer that is both flexible and ionically conductive to act as a stress-relaxation material between the solid electrolyte and electrodes. This 'elastic ion-conductive polymer' effectively suppresses crack formation in the electrolyte and maintains excellent contact with the electrodes, enabling stable lithium-ion transport over extended periods. The demonstration of over 2500 hours of stable operation and 75% capacity retention after 200 cycles clearly indicates the practical durability of this approach.

Background & Context

All-solid-state batteries are at the center of intense global development competition as the 'ultimate battery' to achieve extended range, rapid charging, and improved safety for electric vehicles (EVs). Sulfide solid electrolytes are among the most promising materials, but their mechanical fragility has been a major barrier to practical application. This breakthrough by the Korean research team resolves a critical challenge in manufacturing processes and material design, potentially significantly accelerating the commercialization of all-solid-state batteries. High-durability batteries, in particular, directly contribute to reducing the lifecycle costs of EVs, offering substantial benefits to both consumers and automakers.

Strategic Significance & Outlook

These research findings represent a crucial step towards the practical implementation of sulfide all-solid-state batteries and will likely serve as a key design guideline for future development. Subsequent efforts will focus on further optimizing the elastic ion-conductive polymer and verifying its applicability to large-scale production. If successfully commercialized, this technology is expected to be adopted in a wide range of applications demanding high safety and long lifespan, including EVs, drones, robots, and stationary energy storage systems. This will further solidify South Korea's position as a global leader in next-generation battery technology.

Source: https://finance.biggo.com/news/b85d4a18-4225-4051-8f2e-538f6b098d30

#33 CATL's Sulfide All-Solid-State Battery Achieves Liquid Electrolyte-Level Ionic Conductivity at Room Temperature, Stable from -40°C to 100°C with 6C Charging

Published June 27, 2026 YouTube China

OVERVIEW

CATL's sulfide all-solid-state battery (argyrodite Li_6PS_5Cl) has reportedly achieved ionic conductivity comparable to liquid electrolytes (10-25 mS/cm) at room temperature. This battery is also stated to operate stably across a wide temperature range from -40°C to 100°C and supports 6C fast charging. This technical achievement significantly enhances the rapid charging performance and reliability of solid-state batteries across diverse environmental conditions.

IN DEPTH

Key Findings

Contemporary Amperex Technology Co. Limited (CATL), the world's largest battery manufacturer, has reportedly achieved groundbreaking performance with its sulfide all-solid-state battery, utilizing an argyrodite-type solid electrolyte (Li_6PS_5Cl). This battery demonstrated exceptionally high ionic conductivity (10-25 mS/cm) at room temperature, comparable to conventional liquid electrolytes. Furthermore, it is capable of stable operation across a broad temperature range, from -40°C to 100°C, and supports ultra-fast 6C charging.

Technical Details

Argyrodite-type sulfide solid electrolytes, specifically Li_6PS_5Cl, are considered one of the most promising candidates for all-solid-state batteries due to their high Li-ion conductivity. CATL's breakthrough indicates that through optimized material synthesis and interface design, room-temperature ionic conductivity has been elevated to liquid electrolyte levels. Simultaneously, the battery maintains stable performance under extreme environmental conditions, from very low to high temperatures. The support for 6C charging (charging at six times the battery's capacity current) is particularly significant, as it dramatically reduces EV charging times, greatly enhancing user convenience. This capability will address range anxiety for long-distance travel and serve as a powerful driver for EV adoption. Moreover, being all-solid-state, it eliminates the fire risks associated with liquid electrolytes, significantly improving safety.

Background & Context

All-solid-state batteries are the subject of intense global development competition as a next-generation technology poised to resolve the 'ultimate battery' challenges of extended range, faster charging, and enhanced safety for electric vehicles (EVs). Sulfide-based solid electrolytes are particularly anticipated for practical application in EVs due to their high ionic conductivity and relatively good mechanical properties. CATL, as one of the world's leading companies in this field, has demonstrated with this announcement that technical hurdles are being steadily overcome on the path to solid-state battery commercialization. This development is expected to have a substantial impact on the global battery and automotive industries.

Strategic Significance & Outlook

This advancement in CATL's sulfide all-solid-state battery holds the potential to bring about significant transformations in the EV market. Achieving liquid electrolyte-level ionic conductivity at room temperature, broad temperature stability, and 6C charging capability clearly indicates that solid-state batteries are transitioning from a 'dream battery' to a tangible reality. The future focus will shift to cost reduction in the mass production of this technology, along with ensuring quality and reliability at scale. If these challenges are met, CATL could establish a dominant position in the solid-state battery market, redefining EV performance and user experience. Applications in other high-power and high-safety demanding sectors, such as aerospace and advanced mobile devices, are also anticipated.

Source: https://www.youtube.com/watch?v=QEyQlGXvA6U

#34 Imperial College London & University of Adelaide Achieve 85%+ Fast Charging in 6 Minutes for Li-Ion Batteries via Interfacial Catalysis

Published July 02, 2026 Electronics360 - GlobalSpec UK

OVERVIEW

Researchers from Imperial College London and the University of Adelaide have developed a new battery chemistry, unveiling a fast-charging lithium-ion battery capable of maintaining over 85% charge in just 6 minutes. This pouch cell achieves an energy density of 240.4 Wh/kg, with the core technology utilizing interfacial anionic reduction catalysis to form a LiF-rich solid electrolyte interphase (SEI). This breakthrough has the potential to dramatically reduce electric vehicle charging times.

IN DEPTH

Key Findings

A collaborative research team from Imperial College London and the University of Adelaide has developed a novel battery chemistry, achieving a breakthrough that dramatically reduces the charging time for electric vehicle (EV) batteries. Their announced lithium-ion pouch cell can charge over 85% of its capacity in just 6 minutes while maintaining a high energy density of 240.4 Wh/kg. This rapid charging capability was realized through a technique that utilizes specific interfacial anionic reduction catalysis to form a stable, LiF-rich solid electrolyte interphase (SEI).

Technical Details

In conventional lithium-ion batteries, fast charging often accelerates uneven lithium deposition (dendrite formation) and electrode degradation, compromising safety and lifespan. In this study, based on a new battery chemistry, the researchers introduced interfacial anionic reduction catalysis to form a stable SEI layer rich in lithium fluoride (LiF) on the electrode surface. This LiF-rich SEI layer facilitates uniform lithium-ion migration and suppresses dendrite growth. As a result, the battery can be charged safely and efficiently to over 85% capacity in a short 6-minute period, while successfully maintaining a practical energy density of 240.4 Wh/kg. This performance is superior to many existing high-performance lithium-ion batteries.

Background & Context

For accelerating EV adoption, charging times comparable to gasoline refueling (a few minutes) is one of the most critical demands from consumers. Current EVs often require 20 minutes to an hour even with fast chargers, which is a major barrier to wider EV uptake. The achievement of 85% charge in 6 minutes reported in this study holds immense significance for solving this 'charging time' challenge. Furthermore, the formation of a LiF-rich SEI layer may also offer insights into addressing interfacial stability issues in next-generation all-solid-state batteries, contributing to the overall advancement of lithium-ion battery technology.

Strategic Significance & Outlook

This rapid charging technology is expected to have a significant impact on a wide range of applications requiring short charging times, beyond electric vehicles, including drones, robotics, and portable electronic devices. Future research will focus on scaling up this technology and verifying its cost-efficiency and long-term reliability for mass production. If this breakthrough is successfully commercialized, it is anticipated to alleviate the burden on EV charging infrastructure and enhance user experience, thereby significantly accelerating the transition to a sustainable mobility society. Insights into solid electrolyte interface control could also be applied to future all-solid-state battery development.

Source: https://electronics360.globalspec.com/article/23824/faster-charging-for-ev-batteries

Collected: July 03, 2026 | Automated Research System (Gemini API)

#35 $LiBF_4$ Doping Stabilizes Sulfohalide Electrolyte Interfaces, Enabling Over 800 Hours of Stable Lithium Metal Battery Operation

Published July 01, 2026 Molecules Unknown

OVERVIEW

A technology has been developed to suppress lithium dendrite growth and stabilize electrode interfaces by incorporating $LiBF_4$ into a sulfohalide (Li_3SCl) framework. This LSC@BF solid electrolyte maintained a high ionic conductivity of 4.32×10^{-4} S cm^{-1} at room temperature, enabling stable lithium plating/stripping for over 800 hours. This achievement is a significant contribution to improving the safety and lifespan of high-energy-density lithium metal batteries.

IN DEPTH

Key Findings

A novel technology has been developed to significantly enhance the stability of the electrolyte/lithium metal anode interface for high-energy-density lithium metal batteries. This was achieved by incorporating lithium tetrafluoroborate ($LiBF_4$) into the framework of a sulfohalide (Li_3SCl) solid electrolyte. The new LSC@BF solid electrolyte maintained a high ionic conductivity of 4.32×10^{-4} S cm^{-1} at room temperature while enabling stable lithium plating and stripping for over 800 hours.

Technical Details

Lithium metal anodes theoretically offer the highest energy density compared to current lithium-ion batteries, but they face a major challenge: the formation of lithium dendrites during charge-discharge cycles, which can lead to internal short circuits and premature battery degradation. In this study, by compounding $LiBF_4$ with the Li_3SCl solid electrolyte, a mechanism was established to form a LiF-rich solid electrolyte interphase (SEI) layer in-situ at the anode interface. This LiF-rich SEI layer effectively suppresses lithium dendrite growth by providing uniform diffusion pathways for lithium ions. Furthermore, improved chemical and electrochemical stability at the interface reduces interfacial resistance and extends battery cycle life. The high ionic conductivity at room temperature ensures high performance in practical operating temperature ranges.

Background & Context

High-energy-density batteries are essential for improving the performance of electric vehicles (EVs) and portable electronic devices. Lithium metal anodes are a primary target for next-generation batteries because they offer significantly higher energy density than graphite anodes. However, safety and lifespan issues due to dendrite formation have long hindered their practical application. Sulfohalide solid electrolytes are promising candidates for solid electrolytes in all-solid-state batteries due to their high ionic conductivity and stability. This research represents a significant contribution to solving one of the biggest barriers to their practical use: the interfacial stability issue with lithium metal anodes.

Strategic Significance & Outlook

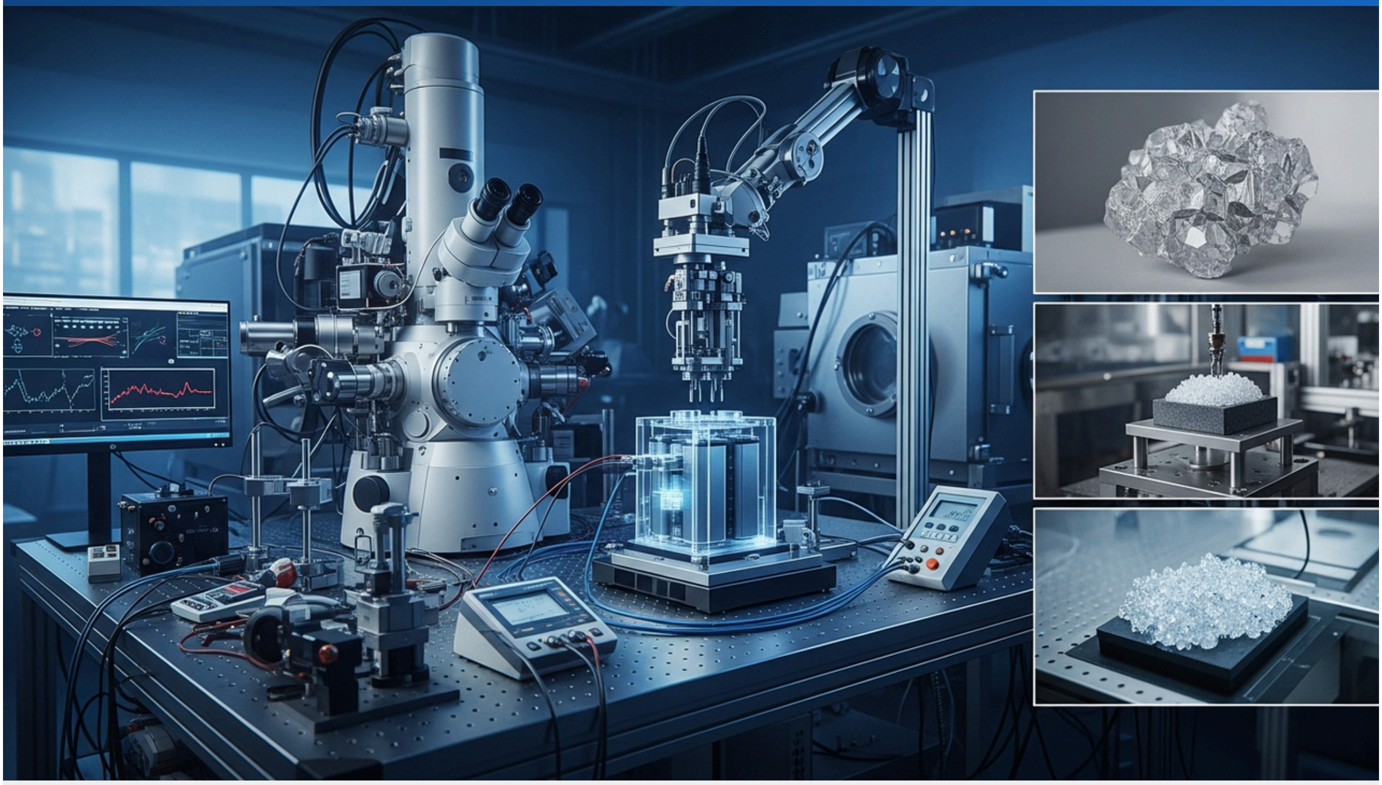
The development of $LiBF_4$-incorporated sulfohalide solid electrolytes is a crucial step towards the commercialization of high-energy-density lithium metal batteries. Over 800 hours of stable lithium plating/stripping cycles demonstrate the potential to meet the long-term reliability requirements for EV applications. Future research will focus on further optimizing this technology, validating its manufacturing scalability, and reducing costs. If this breakthrough is successfully commercialized, it is expected to dramatically extend EV range, improve safety and lifespan, and thus significantly accelerate the transition to sustainable mobility.

Source: https://www.mdpi.com/1420-3049/31/13/2313

Collected: July 03, 2026 | Automated Research System (Gemini API)

#36 Sulfide All-Solid-State Batteries Achieve 1.54 mS/cm Ionic Conductivity, 120 mAh/g Initial Capacity, and 97% Retention over 50 Cycles via Three-Stage Pressure Optimization

Published June 29, 2026 IEST Instrument Unknown



OVERVIEW

Research by Yan et al. (Journal of Colloid and Interface Science, 2026) presented a three-stage pressure optimization protocol for assembling sulfide all-solid-state batteries: electrolyte pre-pressing (375 MPa), final compression after composite cathode addition (625 MPa), and operating pressure during cycling (125 MPa). This achieved an ionic conductivity of 1.54 mS/cm, initial capacity of 120 mAh/g, and 97% capacity retention over 50 cycles for LPSCl and LGPS electrolytes, significantly mitigating microcracks and delamination.

IN DEPTH

Key Findings

Groundbreaking research by Yan et al. (Journal of Colloid and Interface Science, 2026) has established a three-stage pressure optimization protocol for the manufacturing process of sulfide all-solid-state batteries. This protocol, comprising electrolyte pre-pressing (375 MPa), final compression after composite cathode addition (625 MPa), and operating pressure during cycling (125 MPa), successfully achieved high ionic conductivity of 1.54 mS/cm, an excellent initial capacity of 120 mAh/g, and a remarkable 97% capacity retention after 50 cycles for LPSCl and LGPS solid electrolytes. This technology significantly mitigates the issues of microcracks and delamination at the electrode-electrolyte interface.

Technical Details

Sulfide all-solid-state batteries hold promise for high energy density and fast charging, but inadequate physical contact between electrodes and solid electrolytes has historically led to increased interfacial resistance and reduced cycle life. Volume changes during charge and discharge cycles, in particular, induce mechanical stress at interfaces, prone to creating microcracks and delamination. The three-stage pressure optimization protocol proposed in this study is meticulously designed to address this problem. First, the solid electrolyte layer's density is optimized with a pre-pressing of 375 MPa. Next, after introducing the composite cathode material, a final compression of 625 MPa maximizes adhesion between the electrodes and electrolyte. Finally, during actual battery operation, a lower operating pressure of 125 MPa is maintained to ensure ion conduction while avoiding excessive mechanical stress. This precise pressure management enabled batteries using LPSCl (lithium phosphorus sulfide chloride) and LGPS (lithium germanium phosphorus sulfide) electrolytes to achieve both excellent ionic conductivity and stable cycle performance.

Background & Context

All-solid-state batteries are the subject of intense global research and development as next-generation battery technology that fundamentally improves the safety, range, and charging speed of electric vehicles (EVs). However, solid-solid interface challenges have been one of the main barriers to their commercialization. Ensuring good physical and electrochemical contact at the electrode-electrolyte interface is essential for realizing high-performance all-solid-state batteries. The pressure optimization approach presented in this research offers a practical solution to this complex manufacturing challenge and represents a significant step towards the mass production of sulfide all-solid-state batteries.

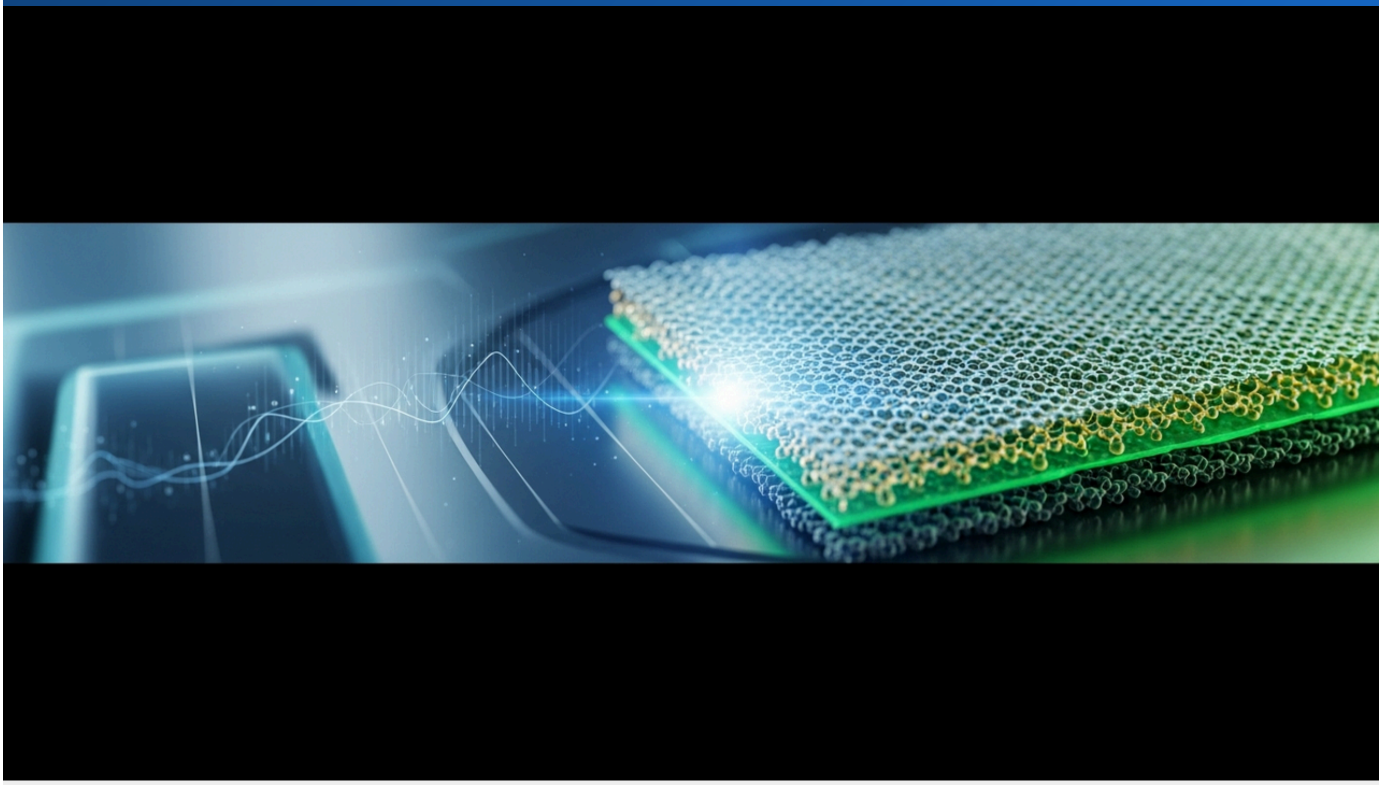
Strategic Significance & Outlook

This three-stage pressure optimization protocol has the potential to become a standard method in the manufacturing of sulfide all-solid-state batteries. The results, demonstrating 1.54 mS/cm ionic conductivity and 97% capacity retention over 50 cycles, suggest practical-level performance and durability, making them promising for EV and other high-power applications. Future research will focus on applying this protocol to longer cycle durations and different material systems to verify its versatility and durability. If this technology can be adapted for large-scale production, it is expected to significantly contribute to cost reduction and performance improvement of all-solid-state batteries, potentially revolutionizing the global energy storage market.

Source: https://iestbattery.com/sulfide-solid-state-batteries-stepwise-pressure/

#37 rGO Enhances Surface Stability of LATP Composite Solid Electrolytes, Achieving 125 mAh/g in Li-LFP Full Cells

Published June 26, 2026 ACS Publications Unknown



OVERVIEW

Coating Li1.3Al0.3Ti1.7(PO4)3 (LATP) solid electrolytes with reduced graphene oxide (rGO) significantly enhanced the surface stability of the composite solid electrolyte. This technology effectively prevents Ti^{4+} reduction upon contact with lithium metal anodes. Consequently, an ionic conductivity of 6.02×10^{-5} S cm^{-1} at 25°C and stable lithium plating/stripping for over 1000 hours were achieved, leading to a capacity of 125 mAh/g at a 0.3C rate in Li-LFP full cells. This marks a crucial advance in high-stability all-solid-state battery development.

IN DEPTH

Key Findings

A groundbreaking technology has been developed to significantly improve the surface stability of composite solid electrolytes. By effectively coating Li1.3Al0.3Ti1.7(PO4)3 (LATP) solid electrolytes with reduced graphene oxide (rGO), researchers successfully suppressed the reduction of Ti^{4+} ions in LATP that occurs upon contact with lithium metal anodes. This improved composite solid electrolyte maintained an ionic conductivity of 6.02×10^{-5} S cm^{-1} at 25°C, enabled stable lithium plating/stripping cycling for over 1000 hours, and achieved a capacity of 125 mAh/g at a 0.3C rate in a Li-LFP (lithium iron phosphate) full cell.

Technical Details

LATP is considered a promising oxide-based solid electrolyte candidate for all-solid-state batteries due to its high Li-ion conductivity and air stability. However, when in direct contact with a lithium metal anode, Ti^{4+} at the interface tends to be reduced, compromising LATP's stability and increasing interfacial resistance. The research team effectively inhibited this side reaction by uniformly coating the LATP particle surfaces with rGO. The rGO, being electrically conductive yet chemically stable, forms a protective layer between the LATP and the lithium metal anode. This protective layer not only prevents Ti^{4+} reduction but also promotes uniform lithium-ion transport and suppresses dendrite growth. As a result, stable lithium cycling for over 1000 hours was achieved while maintaining practical ionic conductivity at room temperature. The 125 mAh/g capacity achieved in the Li-LFP full cell demonstrates the practical battery performance contributed by this technology.

Background & Context

All-solid-state batteries are anticipated as next-generation batteries that will significantly improve the safety, energy density, and lifespan of electric vehicles (EVs) and portable electronic devices. The introduction of lithium metal anodes is key to dramatically increasing energy density, but ensuring interfacial stability with solid electrolytes remains the biggest challenge. While LATP is a promising solid electrolyte, its insufficient interfacial stability has been a barrier to practical application. This rGO coating technology offers a practical approach to solve this interfacial problem, holding significant implications for accelerating the commercialization of oxide-based all-solid-state batteries.

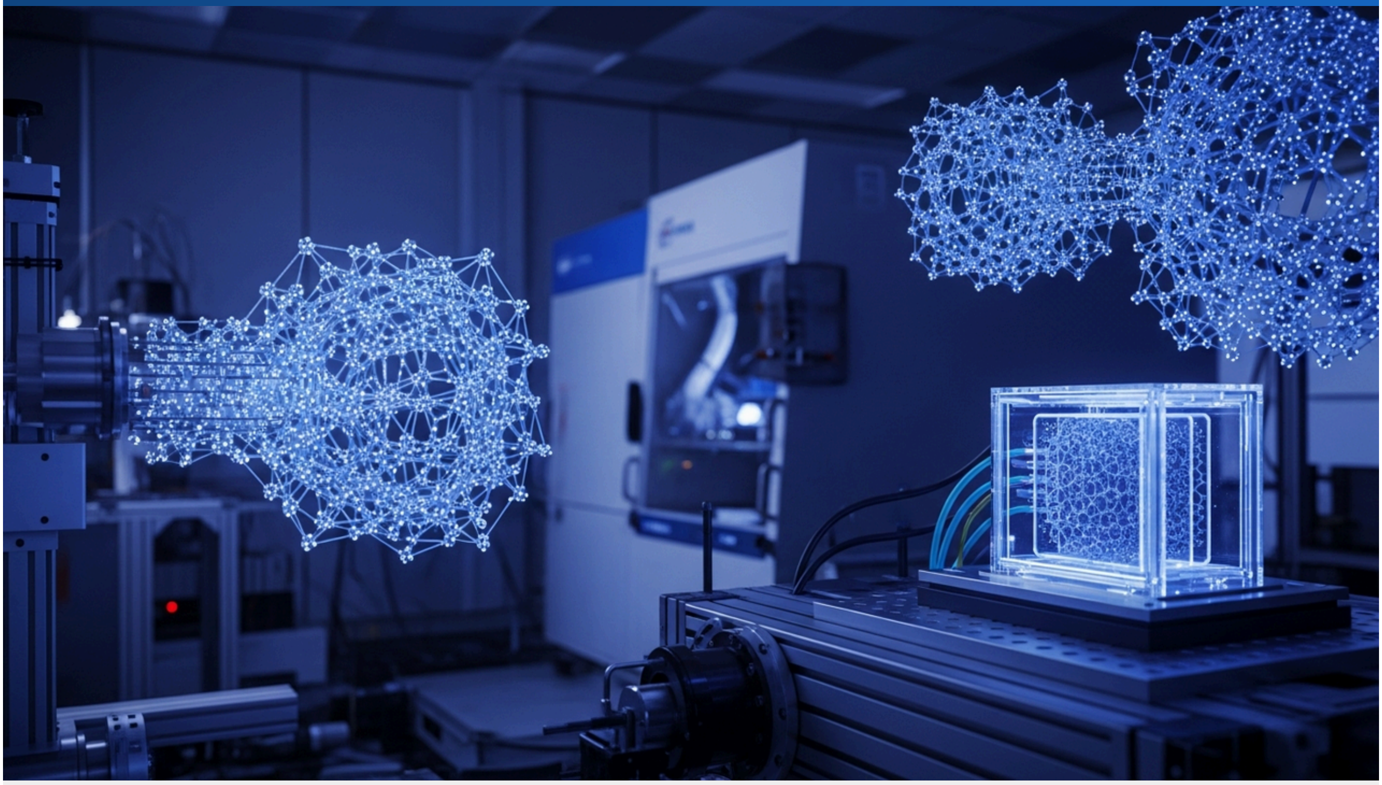
Strategic Significance & Outlook

The enhanced surface stability of LATP composite solid electrolytes via rGO coating is a crucial step towards the commercialization of high-energy-density all-solid-state batteries. Future work will focus on optimizing the rGO coating layer, establishing large-scale production techniques, and evaluating compatibility with various electrode materials. If this technology succeeds, it is expected to contribute to extending EV range, enhancing electronic device performance, and improving the reliability of renewable energy storage systems, thereby accelerating the transition to a sustainable energy society. Specifically, it significantly boosts the feasibility of all-solid-state batteries utilizing oxide-based solid electrolytes.

Source: https://pubs.acs.org/doi/10.1021/acsami.6c05700

#38 Caltech Develops Cobalt-Free, Mechanically Robust LFP-Carbon 3D Electrodes, Eyes Future Solid-State Battery Integration

Published June 25, 2026 Electronics Online USA



OVERVIEW

Researchers at Caltech have developed 3D electrodes using cobalt-free, mechanically enhanced LFP and a carbon matrix. This new design improves current lithium-ion battery performance and aims for true all-solid-state batteries by integrating polymer or polymer-based electrolytes in the future. This marks a significant step towards developing more sustainable and safer batteries.

IN DEPTH

Key Findings

A research team at Caltech has developed a novel 3D electrode structure for lithium-ion batteries that completely eliminates the use of cobalt. This electrode, combining lithium iron phosphate (LFP) with a carbon matrix, achieves enhanced mechanical robustness and improved performance. This technology not only addresses existing challenges in lithium-ion batteries but also holds the potential to evolve into a true all-solid-state battery (SSB) by integrating polymer or polymer-based electrolytes in the future.

Technical Details

The developed 3D electrode features a porous, interconnected carbon network as its scaffold, with LFP active material uniformly distributed within. This architecture shortens lithium-ion diffusion pathways, enabling faster charge and discharge rates. LFP, being cobalt-free, contributes to resource sustainability and cost reduction. Furthermore, LFP's high thermal stability enhances overall battery safety. The 3D structure also improves the electrode's mechanical resilience against volume changes during cycling, ensuring long-term cycle stability. The research team envisions that this innovative electrode design, when combined with flexible polymer electrolytes in the future, will enable the construction of all-solid-state batteries completely free of liquid electrolytes. This is a crucial step towards further increasing battery safety and expanding design flexibility.

Background & Context

With the surging demand for lithium-ion batteries, key concerns include supply chain risks for rare metals like cobalt, high costs, and battery safety (risk of fire). LFP-based batteries, known for their cobalt-free composition and superior thermal stability, have garnered attention particularly for stationary energy storage and certain EVs, despite their lower energy density compared to NMC (nickel-manganese-cobalt) systems. This research addresses these challenges of LFP and simultaneously paves the way for next-generation all-solid-state batteries, significantly contributing to the development of sustainable battery technology.

Strategic Significance & Outlook

Caltech's 3D electrode technology not only directly contributes to improving the performance of current lithium-ion batteries but also serves as a vital foundational technology for the transition to all-solid-state batteries. Future efforts will focus on integration with polymer electrolytes, scaling up manufacturing processes, and validating cost-effectiveness. If successfully commercialized, this technology is expected to make safer, cheaper, and higher-performance batteries available for a wide range of applications, including EVs, portable electronic devices, and renewable energy storage systems. The pathway towards cobalt-free and all-solid-state batteries is an indispensable element in shaping the future of the battery industry.

Source: https://www.electronicsonline.net.au/content/power/article/architecting-a-better-lithium-ion-battery-586071080

Collected: July 03, 2026 | Automated Research System (Gemini API)

#39 Lactone Electrolytes for 4.5 V Sodium-Ion Batteries Show High-Voltage Advantages, Yet Face Ionic Conductivity and SEI Stability Challenges

Published June 29, 2026 ACS Energy Letters Unknown

OVERVIEW

Lactone electrolytes, widely used in solid polymer electrolytes for sodium-ion batteries, show clear advantages in high-voltage operation but are noted for low ionic conductivity and forming unstable solid electrolyte interphases (SEI). These challenges hinder performance improvement and practical application of sodium-ion batteries, necessitating solutions through future R&D.

IN DEPTH

Key Findings

Research on lactone electrolytes, widely utilized in solid polymer electrolytes for sodium-ion batteries (SIBs), confirmed their clear advantages in high-voltage operation. However, significant challenges such as low ionic conductivity and a propensity to form unstable solid electrolyte interphases (SEI) were simultaneously highlighted, indicating these issues as bottlenecks for performance enhancement and practical application.

Technical Details

Lactone compounds have garnered attention as solvents for polymer and liquid electrolytes in sodium-ion batteries due to their polarity and relatively high boiling points. They offer the specific advantage of excellent compatibility with high-voltage cathode materials, enabling high-voltage battery operation, which is expected to boost battery energy density. However, this study points out that the ionic conductivity of lactone electrolytes is not sufficiently high, constrained by the mobility of Na ions due to their molecular structure. Furthermore, these electrolytes tend to form unstable SEI layers at the sodium metal anode interface. An unstable SEI can promote dendrite growth, potentially compromising battery safety and cycle life. The research also suggests that ring-size dependency (the size of the molecular ring) influences ionic conductivity and interfacial reactions, emphasizing the importance of molecular design.

Background & Context

Driven by concerns over lithium resource scarcity, price volatility, and supply chain risks, active research and development are underway for sodium-ion batteries as a promising alternative to lithium-ion batteries. All-solid-state sodium-ion batteries, particularly those employing solid polymer electrolytes, are anticipated as next-generation batteries that balance safety and energy density. However, because sodium ions are larger than lithium ions, their movement within solid electrolytes is more challenging, making the achievement of high ionic conductivity a major hurdle. The challenges identified in lactone electrolytes suggest that optimization of material design and interface engineering are key to the practical application of all-solid-state sodium-ion batteries.

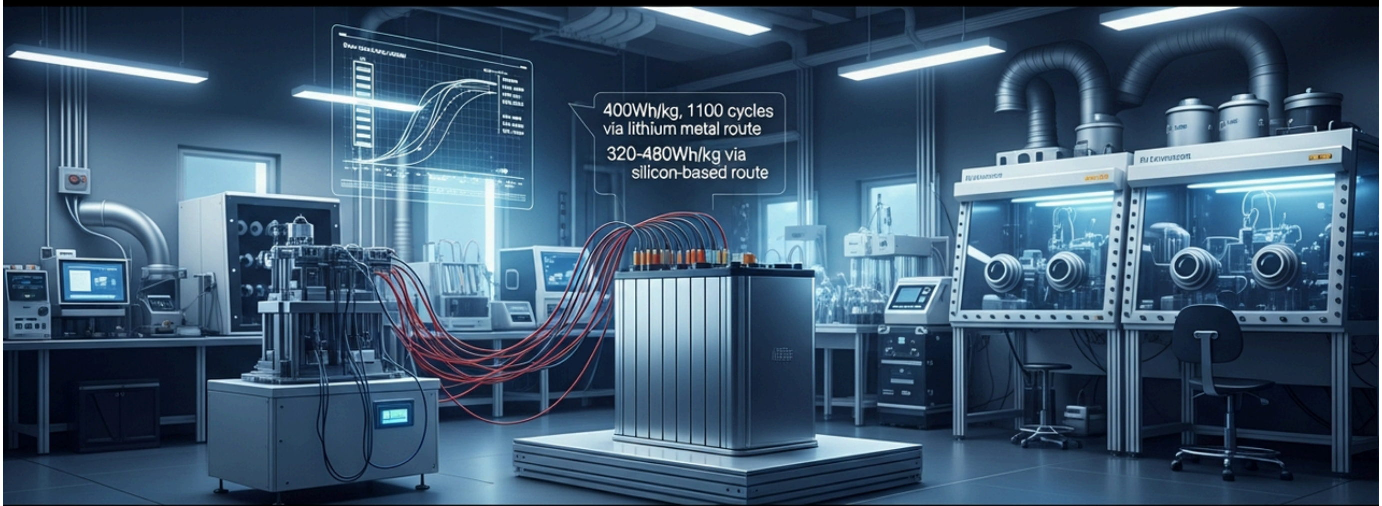
Strategic Significance & Outlook

To address the ionic conductivity and SEI stability challenges in lactone electrolytes, future research will focus on introducing new additives, developing composite electrolytes, and precise engineering of the electrolyte-electrode interface. Specifically, achieving high-performance all-solid-state sodium-ion batteries requires simultaneously enhancing ion transport efficiency and interfacial stability through molecular-level design. If these challenges are overcome, sodium-ion batteries are expected to play a significant role as a sustainable and cost-effective energy storage solution in stationary energy storage systems and certain EV markets.

Source: https://pubs.acs.org/doi/10.1021/acsenergylett.6c00918

#40 Ganfeng Lithium Achieves 400Wh/kg, 1100+ Cycles with Li-Metal Route, Offers 320-480Wh/kg Si-Anode Products with 1000+ Cycles

Published July 02, 2026 Unnamed source China



OVERVIEW

Ganfeng Lithium announced it is developing two main routes for all-solid-state battery technology. The lithium metal anode route has yielded cells achieving 400 Wh/kg energy density and over 1100 cycles, with small-batch production of 500 Wh/kg 10Ah cells already realized. The silicon-based anode route offers a product portfolio ranging from 320-480 Wh/kg, with 320 Wh/kg cells demonstrating over 1000 cycles. These achievements mark significant progress towards solid-state battery commercialization.

IN DEPTH

Key Findings

Ganfeng Lithium has announced strategic progress in its all-solid-state battery (ASSB) technology development, revealing its pursuit of two main technological routes. The first involves lithium metal anodes (LMA), which has led to the development of cells achieving an energy density of 400 Wh/kg and a lifespan exceeding 1100 cycles. Furthermore, 10Ah cells with 500 Wh/kg are already in small-batch production. The second route utilizes silicon-based anodes (Si-anode), offering a product portfolio with energy densities ranging from 320-480 Wh/kg, where 320 Wh/kg cells have demonstrated performance exceeding 1000 cycles.

Technical Details

Lithium metal anodes (LMA) theoretically boast the highest energy density, making them indispensable for realizing the ultimate ASSB. Ganfeng Lithium has achieved very high energy densities of 400 Wh/kg in this LMA route, and 500 Wh/kg (10Ah cell) at the prototype level, suggesting the potential for dramatically extended electric vehicle (EV) ranges. A lifespan of over 1100 cycles signifies a significant improvement in cycle stability, one of the primary challenges for LMA. On the other hand, silicon-based anodes, despite volume expansion issues, offer high compatibility with existing lithium-ion battery manufacturing, promising relatively early commercialization. Ganfeng Lithium's Si-anode route provides flexible energy densities of 320-480 Wh/kg, with 320 Wh/kg cells achieving over 1000 cycles, which mitigates concerns about silicon anode durability. The company's strategy is to pursue both routes in parallel to address diverse market needs.

Background & Context

All-solid-state batteries are at the forefront of intense global R&D competition as next-generation battery technology promising to fundamentally improve EV safety, energy density, and charging speed. China holds a leading position in EV and battery production, with companies like Ganfeng Lithium at the cutting edge of ASSB development. Lithium metal anodes and silicon anodes are key materials for achieving high energy density but face technical challenges such as dendrite formation and volume changes, respectively. Ganfeng Lithium's achievement of specific performance indicators and small-batch production in both routes represents significant progress in overcoming these challenges and has the potential to greatly impact the global battery supply chain.

Strategic Significance & Outlook

Ganfeng Lithium's progress in developing high-performance ASSBs via both lithium metal anode and silicon-based anode routes offers a strategic advantage in meeting diverse market demands. In particular, the initiation of small-batch production for 500 Wh/kg 10Ah cells is a concrete milestone towards commercialization, with applications anticipated across a wide range of sectors including EVs, drones, and advanced electronic devices. The future focus will shift to scaling up these technologies for mass production and establishing cost competitiveness. Ganfeng Lithium's advancements are expected to further intensify competition in the solid-state battery market and accelerate its ultimate widespread adoption.

Source: https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQGV9bXUXYhTIbMvTHivp37udPAAiO72ESJR_aAjvpVMqHc0HFTPsI1PJd__zK4m8TtBWrxUKHjKT0Zj7K068g=

Collected: July 03, 2026 | Automated Research System (Gemini API)

#41 QuantumScape's QSE-5 Solid-State Cell Achieves 301Wh/kg, 844Wh/L, Targets Extended Robotics Operation and Fast Charging

Published July 02, 2026 TopSecretStocks USA

OVERVIEW

QuantumScape's QSE-5 all-solid-state cell (B-sample prototype) has demonstrated high performance with a gravimetric energy density of 301 Wh/kg and a volumetric energy density of 844 Wh/L. This anode-free lithium metal design, featuring a solid ceramic separator, aims for extended operation (over 3.5-4 hours under high load, over 7-8 hours under light load) and fast charging for robotics applications. This marks a significant advance toward commercializing solid-state battery technology.

IN DEPTH

Key Findings

QuantumScape, a leader in solid-state battery technology, has demonstrated impressive performance with its QSE-5 cell, a B-sample prototype, achieving a gravimetric energy density of 301 Wh/kg and a volumetric energy density of 844 Wh/L. This high-performance cell, characterized by an anode-free lithium metal design and a solid ceramic separator, is specifically targeting extended operation (over 3.5-4 hours under high load, over 7-8 hours under light load) and fast-charging capabilities for robotics applications.

Technical Details

The QSE-5 cell incorporates QuantumScape's proprietary solid ceramic separator and an anode-free lithium metal design. The anode-free architecture means that lithium metal is formed in-situ as the anode during the battery's charging process, thereby maximizing battery energy density and reducing weight and volume. The solid ceramic separator physically suppresses dendrite formation, significantly improving safety—a major challenge for lithium metal anodes. The gravimetric energy density of 301 Wh/kg is crucial for extending EV range, while the volumetric energy density of 844 Wh/L is highly advantageous for robotics, drones, and mobile devices that require maximum energy packing in limited space. The target for extended operation means these robots can perform longer missions without interruption, and fast charging minimizes downtime.

Background & Context

All-solid-state batteries hold great promise not only for electric vehicles (EVs) but also for fields like robotics and aerospace, where safety, energy density, and rapid charging are paramount. QuantumScape has been at the forefront of R&D in this sector for many years. The robotics market is rapidly expanding across diverse areas such as logistics, manufacturing, and service robots, demanding increasingly high-performance and reliable batteries. Current lithium-ion batteries often impose significant limitations on robot weight and operating time, making a breakthrough from solid-state batteries essential.

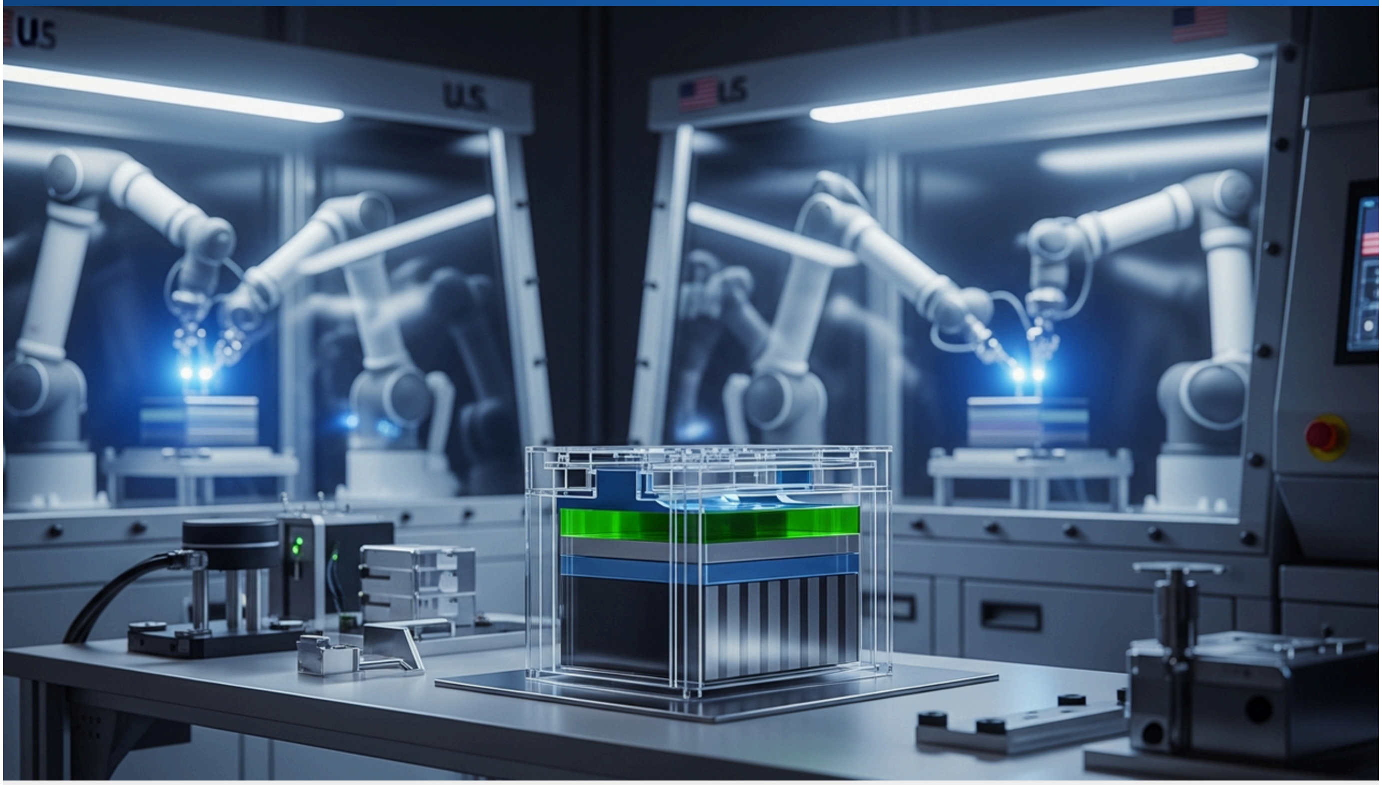
Strategic Significance & Outlook

The performance demonstration of QuantumScape's QSE-5 cell marks a significant milestone towards the commercialization of all-solid-state batteries. Its focus on robotics applications indicates the company's strategy of targeting specific high-value markets. Future efforts will concentrate on further testing and optimizing the QSE-5 cell, along with establishing mass production capabilities. The collaboration agreement with Honda (as noted in another article) also broadens its potential applications in the automotive sector. If the QSE-5 cell succeeds in the robotics market, its technology is expected to spill over into EVs and other high-performance electronic devices, significantly accelerating the adoption of all-solid-state batteries. This technology holds the potential to enhance robot autonomy and operational efficiency, bringing innovation to numerous industries.

Source: https://topsecretstocks.substack.com/p/quantumscape-winner-of-the-robotics

#42 US Department of Energy Awards $16M to Advance Solid-State Battery Manufacturing, Including Solid Power Partnership

Published June 26, 2026 Department of Energy USA



OVERVIEW

The US Department of Energy (DOE), through its FY23 AMMTO Battery Manufacturing Lab Call, provided a total of $16 million to address key barriers in large-scale domestic solid-state battery production. This funding supports the development of advanced tooling, precision manufacturing techniques, and process technologies required for pilot-scale mass production. Notably, national labs like ORNL, NREL, and SLAC, along with private firm Solid Power, are collaborating to accelerate solid-state battery commercialization through public-private partnerships.

IN DEPTH

Key Findings

The U.S. Department of Energy (DOE) has announced a substantial funding allocation of $16 million through its FY23 AMMTO Battery Manufacturing Lab Call program. This initiative aims to overcome critical barriers to large-scale domestic all-solid-state battery (ASSB) production. The funds will be strategically invested in developing advanced tooling, precision manufacturing techniques, and process technologies essential for pilot-scale mass production of ASSBs. Notably, this project involves a significant collaboration between national laboratories and the private sector, including Solid Power.

Technical Details

The DOE's funding is specifically directed towards three main project areas. The first focuses on developing technologies to enable a seamless transition from ASSB R&D to high-volume manufacturing. The second aims to enhance precision manufacturing techniques for large-format cell production, which is crucial for ensuring the performance uniformity and reliability of ASSBs. The third area concentrates on developing process technologies designed to improve ASSB productivity and validate scalability. Participating in these projects are leading U.S. national laboratories such as Oak Ridge National Laboratory (ORNL), National Renewable Energy Laboratory (NREL), and SLAC National Accelerator Laboratory, providing state-of-the-art research facilities and expertise. Furthermore, Solid Power, a pioneer in solid-state battery development, joins as a partner, contributing its specialized knowledge and commercialization perspective. This collaborative effort is expected to foster a consistent development cycle from fundamental research to applied science and eventual industrialization.

Background & Context

All-solid-state batteries are the subject of intense global competition as a next-generation battery technology that promises to extend electric vehicle (EV) range, enhance safety, and shorten charging times. The United States is actively pursuing strategies to strengthen its domestic manufacturing capabilities in this strategically critical technology sector, aiming to remain competitive with leading Asian nations like China, Japan, and South Korea. This substantial DOE funding is part of the 'Biden Administration's Battery Grand Challenge,' aimed at bolstering the domestic battery supply chain and improving global competitiveness. By focusing on resolving manufacturing process challenges, this initiative signals a shift from a predominantly materials-research-centric approach to one addressing practical bottlenecks for commercialization.

Strategic Significance & Outlook

The DOE's $16 million funding is expected to significantly accelerate the commercialization of all-solid-state battery technology within the U.S. The collaboration between national laboratories and private entities like Solid Power provides an effective model for rapid transfer of research outcomes to industry. Successful completion of these projects should lead to the domestic production of higher-performance, safer, and more cost-effective all-solid-state batteries, facilitating widespread adoption in applications such as EVs, renewable energy storage systems, and defense. Ultimately, this initiative will contribute significantly to the U.S.'s transition to a clean energy economy and the establishment of its global leadership in battery technology.

Source: https://www.energy.gov/cmei/ammto/fy-2023-strengthening-domestic-capabilities-battery-manufacturing-lab-call

#43 Uniaxial Press Critical for LLZO Solid Electrolyte Green Pellet Production, Lays Foundation for High-Performance Solid-State Batteries

Published June 28, 2026 Kintek Press Unknown

OVERVIEW

The crucial role of uniaxial pressing in manufacturing garnet-type $Li_7La_3Zr_2O_{12}$ (LLZO) solid electrolyte 'green pellets' has been emphasized. Uniaxial pressing is essential for establishing uniform density gradients and intimate particle contact, forming the foundation for achieving high ionic conductivity and excellent mechanical strength in subsequent high-temperature sintering. This is a vital initial manufacturing step for realizing high-performance all-solid-state batteries.

IN DEPTH

Key Findings

In the manufacturing process of garnet-type $Li_7La_3Zr_2O_{12}$ (LLZO) solid electrolytes, particularly during the pre-sintering 'green pellet' formation stage, uniaxial pressing has been highlighted as an absolutely critical step for achieving high-performance all-solid-state batteries. Uniaxial pressing is indispensable for establishing a uniform density gradient and intimate particle contact within the pellet, which lays the foundation for achieving high ionic conductivity and excellent mechanical strength in the final sintered body.

Technical Details

The performance of all-solid-state batteries heavily relies on how efficiently the solid electrolyte can transport lithium ions. LLZO is a promising candidate with high ionic conductivity, but its manufacturing requires high density and crystal quality. During the uniaxial pressing process, LLZO powder is compressed under specific pressure to form uniform 'green pellets.' This uniformity is crucial for the material to shrink homogeneously during the subsequent high-temperature sintering step, thereby forming an ideal microstructure. Non-uniform density can lead to warping or cracking during sintering, resulting in reduced ionic conductivity. Uniaxial pressing is often used as a preliminary step to more complex processes like Cold Isostatic Pressing (CIP), and combining with CIP can achieve even higher density and uniformity. Precise pressure management and optimal powder characteristics are key to maximizing the performance of the final solid electrolyte.

Background & Context

All-solid-state batteries are anticipated as next-generation battery technology that fundamentally improves the range, safety, and charging speed of electric vehicles (EVs), and mass production of high-performance solid electrolytes is essential for their commercialization. Ceramic solid electrolytes like LLZO offer excellent chemical stability and Li-ion conductivity, but challenges have included difficult control over the sintering process and high manufacturing costs. The optimization of green pellets through uniaxial pressing provides a practical solution to these manufacturing challenges, improving manufacturing efficiency and product quality, and representing a significant technological approach to enable cost reduction and large-scale production of all-solid-state batteries. This underscores the importance of manufacturing engineering alongside materials development.

Strategic Significance & Outlook

The optimization of uniaxial pressing technology will directly contribute to the mass production and performance stabilization of LLZO solid electrolytes. Future work is expected to focus on applying this technology to different solid electrolyte materials, manufacturing more complex electrolyte structures, and process innovations aimed at further reducing manufacturing costs. Advancements in this foundational technology are indispensable for all-solid-state batteries to surpass the limitations of current lithium-ion batteries and usher in a future where they are widely adopted across a broad range of applications, including EVs, portable electronic devices, and renewable energy storage systems. Optimization down to the fine details of the manufacturing process will be key to the commercial success of next-generation batteries.

Source: https://kinteksolution.com/faqs/what-is-the-function-of-a-uniaxial-press-in-the-preparation-of-li7la3zr2o12-electrolyte-green-pellets