

SolidStateBattery

Weekly Intelligence Report

2026-07-19 | 44 articles | 9 countries
troy-technical.jp

This Week's Keyword

China's SSB Surge

Rapid commercialization & standardization

44

articles

Total Articles Analyzed

9

countries

Source Countries/Regions

500

Wh/kg

CATL SSB Target

20

GWh

BYD Production Line

All 44 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	Toyota SSB Patent Lead	Patent Analysis						Toyota leads SSB patents (3,511 families), with LGES/Samsung SDI emerging, intensifying global IP race.
#02	SSB Cell Design Patents	Patent Analysis						TYFAST & Uchicago Argonne dominate SSB cell design patents; inorganic electrolytes/cathodes are open frontiers.
#03	Composite Polymer Electrolyte	Research						CPE interlayer boosts NASICON SSB interfacial stability and long-term cycling by suppressing side reactions.
#04	Umicore Electrolyte Patents	Patent Analysis						Umicore leads SSB electrolyte patents, but ceramics sector has sparse IP, offering entry opportunities.
#05	Halide Cathode Materials	Research						Halide cathode materials with multi-electron reactions promise high energy density for ASSLBs, enabling single-phase architecture.
#06	Chinese Gel Electrolyte	Research						Chinese scientists developed organic-inorganic gel electrolyte for solid-state EV batteries, resolving capacity degradation.
#07	BMW/Samsung SDI Targets	Corporate Strategy						BMW tests Solid Power SSB in i7; Samsung SDI targets 900 Wh/L mass production by late 2027.
#08	Max Planck Dendrite Mech	Research						Max Planck Institute uncovered hydrostatic stress as the mechanism for lithium dendrite fracture in solid-state batteries.
#09	MIT Dendrite Solution	Research						MIT researchers boosted SSB performance by 300% by addressing grain boundary dendrite formation in solid electrolytes.
#10	Quantum Leap Composite	Corporate Announcement						Quantum Leap Innovations announced a novel composite electrolyte breakthrough for solid-state battery durability.
#11	Chinese DES-SPE	Research						Xiamen/Zhejiang Universities achieved high-safety 4.5V Li-metal batteries with DES-based solid polymer electrolyte.
#12	Na-Ion Glass Electrolyte	Research						Direct growth of Na-ion conducting glass solid electrolyte reduces interfacial resistance for room-temp Na-S pouch cells.

#	Article Title	Type	Tech Novelty	Market Proximity	Market Impact	Data Reliability	US/EU Relevance	Summary
#13	Li3YCl6 Coatings	Research						Ultrathin Li3YCl6 coatings improve NMC811 cathode cycling performance in ASSBs with sulfide electrolytes.
#14	Talent Semi-Solid	New Product						Talent New Energy mass-produces semi-solid batteries for electric motorcycles with Yadea, driving "green future".
#15	Rail Transit Safety	Comparison						Review compares thermal safety of battery chemistries for rail transit, highlighting solid-state battery safety.
#16	Superionic Conduction	Research						Osaka University/AIST unravel 'superionic conduction' mechanism, where ions flow like liquid through solid crystals.
#17	Succinic Anhydride	Research						Succinic Anhydride additive suppresses dendrite growth in Li-metal anodes, improving SSB cycle life.
#18	Argonne MgO Coating	Research						Argonne Lab unveils 1-nanometer MgO coating for sulfide solid electrolyte stability, boosting SSB performance.
#19	Li-Al-Si-Zn Anode	Research						Li-Al-Si-Zn alloy anode achieves ultra-rapid charging (72s at 50C) and extended life (2050 cycles) in ASSBs.
#20	Max Planck/China Prod	Trend Article						Max Planck uncovers dendrite fracture mechanism; Chinese firms accelerate solid-state battery production.
#21	China SSB Standards/Prod	Corporate Strategy						China unifies SSB definition (<5% liquid), CATL targets 500Wh/kg, BYD plans 20GWh line, Gotion 400Wh/kg by late 2026.
#22	Thiourea Coating	Research						Thiourea coating boosts lithium-rich cathode capacity retention to 97% after 600 cycles in solid-state batteries.
#23	EU/APAC Automakers	Market Overview						European & Asia-Pacific automakers accelerate SSB deployment, targeting doubled EV range and 40+ min drone flights.
#24	MG Semi-Solid PHEVs	New Product						MG (SAIC) to launch PHEVs with 'SolidCore' semi-solid-state batteries in 2027, enhancing efficiency in extreme temps.
#25	Honda Dendrite/Mfg	Corporate Strategy						Honda develops novel dendrite suppression (plastic barrier) and roll-press manufacturing for solid-state batteries.
#26	Spin-Coated CPE	Research						Spin-coated asymmetric ultrathin salt-rich CPE achieves 82.5% capacity retention after 500 cycles in Li-metal batteries.
#27	Samsung SDI 2027 Prod	Corporate Strategy						Samsung SDI announces 2027 SSB mass production, targeting robotics, AAM, and drone markets for initial penetration.
#28	Tattu Drone Battery	New Product						Tattu unveils semi-solid-state battery for industrial drones: 350 Wh/Kg, 1200+ cycles, enhanced safety.
#29	Gotion Semi-Solid Trucks	New Product						Gotion High-Tech's semi-solid-state battery passes extreme tests, 4 overseas plants begin production; 10GWh for SANY trucks.
#30	China SSB Standard/Factories	Policy/Corporate Strategy						China defines 'all-solid-state' (<5% liquid); Doctex commissions GWh factory, Dongfeng advances 0.2 GWh for EV integration.
#31	QuantumScape/Honda	Corporate Strategy						QuantumScape partners with Honda on solid-state batteries, initiates pilot production in San Jose for EVs.

#	Article Title	Type	Tech Novelty	Market Proximity	Market Impact	Data Reliability	US/EU Relevance	Summary
#32	China CASIP Program	Government Strategy	●●●●○ ○	●●●●● ○	●●●●● ●	●●●●○ ○	●●●●● ●	China nationalizes SSB development (CASIP), CATL targets 500Wh/kg, CAS unveils 451.5Wh/kg prototype with \$830M investment.
#33	SHENGYA Drone Batteries	Market Overview	●●○○○ ○	●●●●○ ○	●●●●○ ○	●●○○○ ○	●●●●○ ○	SHENGYA reports solid-state/semi-solid drone batteries improve extreme temperature performance, enhancing flight time/safety.
#34	Toyota 40-Year Life	Corporate Strategy	●●●●● ○	●●●●○ ○	●●●●● ●	●●○○○ ○	●●●●● ●	Toyota targets 40-year EV battery life with solid-state technology: over 8,000-10,000 cycles and 1,000km range goal.
#35	Factorial/Tulip Drones	Corporate Announcement	●●●●○ ○	●●●●● ○	●●●●○ ○	●●●●○ ○	●●●●● ●	Factorial Energy and Tulip Tech partner for next-gen solid-state drone batteries, boosting flight range over 30%.
#36	SwRI/SMU Interface Deg	Research	●●●●● ○	●○○○○ ○	●●●●○ ○	●●●●● ○	●●●●● ●	SwRI and SMU launch joint research to address solid-state battery interface degradation for long-life designs.
#37	Dongfeng 50k EV Deliveries	Corporate Strategy	●●●●○ ○	●●●●● ○	●●●●● ○	●●●●○ ○	●●●●● ●	China's Dongfeng Motor plans 50,000 solid-state battery EV deliveries by 2027, achieving 350 Wh/kg.
#38	Conductive CPE Interlayer	Research	●●●●● ○	●●○○○ ○	●●●●○ ○	●●●●● ●	●●●●○ ○	Conductive and stable CPE interlayer solves NASICON SSB challenges, enabling over 300 hours stable cycling.
#39	China Standard/Doctex GWh	Policy/Corporate Strategy	●●●●○ ○	●●●●● ○	●●●●● ●	●●●●○ ○	●●●●● ●	China's new SSB standard spurs Doctex GWh facility in Tianjin; Saike Power and Dongfeng follow suit.
#40	SwRI/SMU Interfacial Eng	Research	●●●●● ○	●○○○○ ○	●●●●○ ○	●●●●● ○	●●●●● ●	SwRI and SMU pioneer interfacial engineering for SSB life extension with ultrathin film on Li-metal anode.
#41	SSB Mfg Advances	Market Overview	●●○○○ ○	●●●●● ○	●●●●● ○	●●○○○ ○	●●●●● ○	SSB manufacturing advances to pilot lines, automotive programs, and vehicle testing; QuantumScape/Honda strengthen collaboration.
#42	Samsung Halide Electrolyte	Patent	●●●●● ○	●●○○○ ○	●●●●○ ○	●●●●○ ○	●●●●● ○	Samsung patents novel halide solid-state electrolyte LiHfNaCl6 for safer, longer-lasting all-solid-state batteries.
#43	Toyota 2026 Launch	Market Forecast	●●●●○ ○	●●●●● ○	●●●●● ●	●●○○○ ○	●●●●● ●	Toyota solid-state EVs to launch in 2026, targeting 800km+ range and sub-10 minute charging.
#44	Neutron Diffraction	Research	●●●●● ●	●○○○○ ○	●●●●○ ○	●●●●● ●	●●●●● ○	Neutron diffraction traces lithium motion in solid-state batteries in real-time, guiding electrode design.

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

Three Questions That Demand Your Decision This Week

❶ Is your EV strategy robust against China's rapid SSB commercialization?

China's new national standard for solid-state batteries (SSBs) and GWh-scale factory commissions by Doctex and Dongfeng (350 Wh/kg cells) signal imminent mass production by 2027. CATL targets 500 Wh/kg samples. This aggressive push could redefine EV performance and market share.

❷ Have your R&D; teams integrated the latest dendrite suppression breakthroughs?

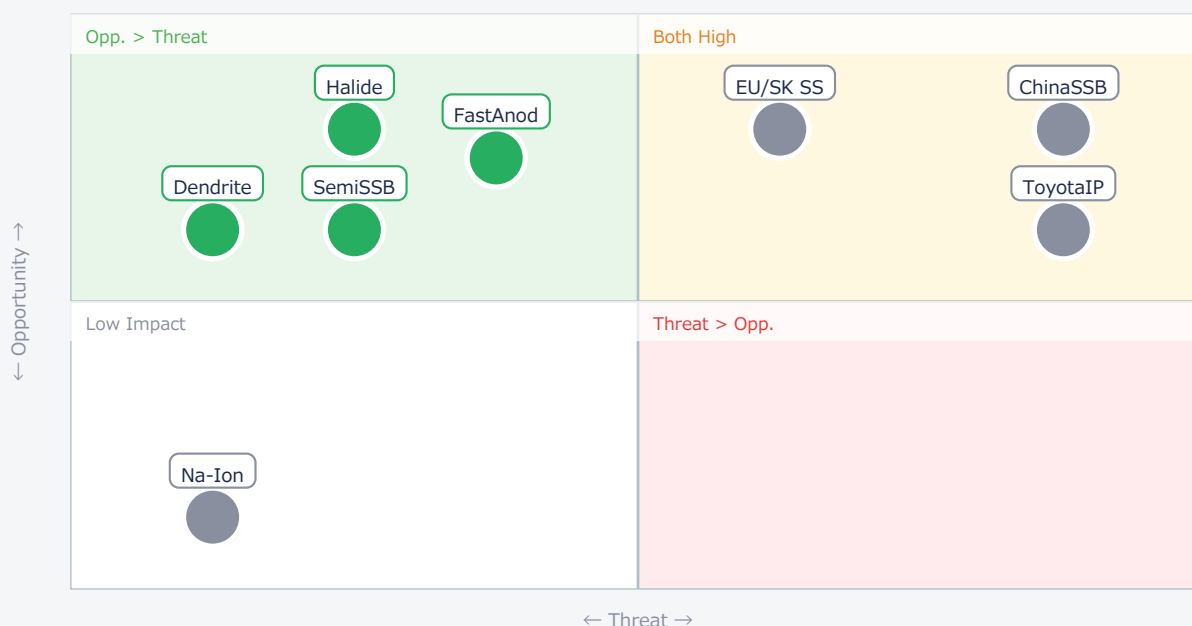
Max Planck Institute identified hydrostatic stress as the key dendrite fracture mechanism, while MIT boosted performance by 300% by addressing grain boundaries. Argonne Lab unveiled a 1nm MgO coating for sulfide electrolytes. These fundamental insights are critical for SSB safety and longevity.

❸ Which Asian competitor gains the most from the evolving SSB IP landscape?

Toyota maintains a dominant lead in SSB patents (3,511 families), with LGES and Samsung SDI rapidly catching up. Umicore leads electrolyte patents, but cell design is concentrated with TYFAST and Uchicago Argonne. Understanding this landscape is crucial for future collaborations and market positioning.

Opportunities vs. Threats for US/European Companies

Opportunity vs. Threat Matrix for US/European Companies



Item	Quadrant	↑ Opportunity	↓ Threat
● ChinaSSB	Critical	Access advanced cells	Rapid market share loss
● EU/SK SS	Critical	Partner for market entry	Direct market competition
● ToyotaIP	Critical	Licensing/Partnership	IP infringement risk
● Dendrite	Opp.	Enhance SSB safety/life	Lagging in core tech
● Halide	Opp.	Next-gen material	Missed innovation
● SemiSSB	Opp.	New market segments	Niche market loss
● FastAnod	Opp.	Differentiate EV range	Competitor advantage

● Na-Ion	Ref.	Resource diversification	Limited
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Deep Dive ① — China's SSB Standard & GWh Factories

#30 | 2026/07/13 | Asia Financial | Tech Novelty●●●○○ Proximity●●●●○ Market Impact●●●●● Data Reliability●●●○○ US/EU Relevance●●●●●

China has enacted a national standard defining 'all-solid-state' batteries as having <5% liquid electrolyte after a 120°C vacuum test. Doctex has commissioned a GWh-scale factory producing 350 Wh/kg cells for immediate EV deployment.

Dongfeng Motor is also advancing a 0.2 GWh plant for oxide-polymer hybrid cells, targeting vehicle integration in H2 2026. This aggressive standardization and production push aims to solidify China's global leadership in SSB technology.

► Strategic Analyst's Perspective

Strategic Analyst's Perspective: The rapid pace of China's SSB commercialization, backed by national standards and GWh-scale production, is highly realistic for semi-solid and early-stage solid-state cells. However, achieving true all-solid-state at scale still faces cost and long-term reliability barriers. [Opportunity] for US/EU OEMs to explore sourcing advanced, cost-effective SSB components from China, or for materials suppliers to partner with Chinese firms. [Threat] of rapid market share erosion for US/EU OEMs and battery manufacturers if they lag in SSB integration. Next actions: [Strategy] Conduct a comprehensive competitive analysis of Chinese SSB roadmaps by end-Q3. [Procurement] Initiate due diligence on potential Chinese SSB suppliers for future supply chain diversification by end-Q4.

Deep Dive ② — Max Planck Uncovers Dendrite Mechanism

#08 | 2026/07/11 | The Robotics Media | Tech Novelty●●●●● Proximity●○○○○ Market Impact●●●●○ Data Reliability●●●●● US/EU Relevance●●●●●

Researchers at Max Planck Institute for Sustainable Materials have identified hydrostatic stress within soft lithium dendrites as the primary cause of ceramic electrolyte fracture in solid-state batteries.

Published in Nature, this breakthrough provides a fundamental basis for designing effective countermeasures against dendrite formation, a critical barrier to commercialization. This shifts focus from electrolyte strength to dendrite growth behavior.

► Strategic Analyst's Perspective

Strategic Analyst's Perspective: This peer-reviewed discovery is a significant academic breakthrough, offering a realistic, fundamental understanding of dendrite failure. The technical barrier remains translating this mechanism into scalable, cost-effective material and cell design solutions. [Opportunity] for US/EU materials and component suppliers to develop novel electrolytes or interlayers that manage hydrostatic stress. [Threat] for OEMs and battery manufacturers if competitors (especially those with strong R&D; links) integrate solutions based on this insight faster. Next actions: [R&D;] Task materials science teams to evaluate implications for current electrolyte development programs by end-Q3. [Business Dev] Explore potential research collaborations with Max Planck or similar institutions for licensing opportunities by end-Q4.

Deep Dive ③ — BMW & Samsung SDI SSB Targets

#07 | 2026/07/14 | Febatt | Tech Novelty●●●○○ Proximity●●●●○ Market Impact●●●●● Data Reliability●●●○○ US/EU Relevance●●●●●

BMW has begun testing i7 vehicles with large solid-state cells from Solid Power. Concurrently, Samsung SDI targets mass production of its 'SolidStack' ASSBs by late 2027, aiming for 900 Wh/L.

These developments signal imminent commercialization, though challenges like interfacial resistance, dendrite control, pressure management, manufacturing scalability, and cost persist. Early adoption is expected in high-performance, cost-insensitive sectors like robotics and AAM.

► Strategic Analyst's Perspective

Strategic Analyst's Perspective: BMW's real-world testing and Samsung SDI's aggressive 2027 mass production target (900 Wh/L) are highly ambitious but indicate serious intent from major players. The 900 Wh/L target is at the high end of current projections and will be challenging to achieve at scale. [Opportunity] for US/EU OEMs to accelerate their own SSB integration roadmaps through partnerships or internal development to match these performance benchmarks. [Threat] of falling behind in EV range and safety, leading to competitive disadvantage if these targets are met by Asian and European rivals. Next actions: [Executive] Review current SSB development timelines and investment levels against competitor announcements by end-Q3. [R&D;] Benchmark internal SSB performance against 900 Wh/L target and identify gaps by end-Q4.

Other Notable Articles

Toyota Maintains Dominant Lead in Solid-State Battery Patents Amidst Surging Competition from LGES and Samsung SDI (Patsnap)
Tech Novelty●●○○○ Proximity●●●●● Market Impact●●●●○

Toyota's extensive patent portfolio across SSB components indicates a strong strategic position and potential for future licensing.

Halide Cathode Materials Poised to Revolutionize All-Solid-State Lithium Batteries through Multi-Electron Reactions (National Science Review (Oxford Academic))
Tech Novelty●●●●● Proximity●○○○○ Market Impact●●●●○

Halide cathodes offer high ion/electron conductivity and multi-electron reactions, promising significant energy density gains for ASSLBs.

ACS Paper: Li-Al-Si-Zn Alloy Anode Achieves Ultra-Rapid Charging and Extended Life in All-Solid-State Batteries, Retaining 80% Capacity After 2050 Cycles (ACS Sustainable Chemistry & Engineering)
Tech Novelty●●●●● Proximity●●○○○ Market Impact●●●●○

This novel alloy anode enables ultra-rapid charging (72s at 50C) and exceptional durability (2050 cycles), critical for EV adoption.

Osaka University, AIST Unravels 'Superionic Conduction' Mechanism: Ions Flow Like Liquid Through Solid Crystal (Asia Research News)
Tech Novelty●●●●● Proximity●○○○○ Market Impact●●●○○

Fundamental understanding of superionic conduction provides new design principles for high ionic conductivity in next-gen solid electrolytes.

Tattu Unveils Revolutionary Semi-Solid State Battery for Industrial Drones: 350 Wh/Kg, 1200+ Cycles, Enhanced Safety and Flight Time via Dual Electrolyte Innovation (Tattu)
Tech Novelty●●●○○ Proximity●●●●○ Market Impact●●●○○

Tattu's semi-solid battery for drones (350 Wh/Kg, 1200+ cycles) demonstrates near-term commercial viability for niche applications.

Recommended Actions This Week

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

■ Immediate (this week)

- [Strategy] Assess China's new SSB definition and GWh production timelines to understand competitive landscape shifts.
- [R&D;] Review Max Planck and MIT dendrite research findings for potential impact on current solid electrolyte development programs.

■ Short-term (1 month)

- [Procurement] Begin preliminary evaluation of potential Chinese SSB component suppliers for future supply chain diversification.
- [Business Dev] Explore partnerships with academic institutions or startups focused on dendrite suppression technologies.
- [R&D;] Benchmark internal SSB performance targets against Samsung SDI's 900 Wh/L goal and Toyota's 40-year lifespan claims.

■ Medium-long term (quarter+)

- [Executive] Develop a comprehensive long-term SSB intellectual property strategy, considering Asian patent dominance.
- [Strategy] Re-evaluate EV and drone product roadmaps, integrating realistic SSB performance and cost projections.
- [R&D;] Invest in advanced characterization techniques (e.g., neutron diffraction) for real-time SSB interface analysis.

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SolidStateBattery — Selected Articles

Date: 2026-07-19

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- #27 Samsung SDI Announces 2027 Solid-State Battery Mass Production Plan, Targeting Robotics, AAM, and Drone Markets for Initial Penetration
- #28 Tattu Unveils Revolutionary Semi-Solid State Battery for Industrial Drones: 350 Wh/Kg, 1200+ Cycles, Enhanced Safety and Flight Time via Dual Electrolyte Innovation
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- #31 QuantumScape Partners with Honda on Solid-State Batteries, Initiates Pilot Production in San Jose to Enhance EV Range and Safety
- #32 China Nationalizes Solid-State Battery Development with CASIP Program: CATL Targets 500Wh/kg Samples, Chinese Academy of Sciences Unveils 451.5Wh/kg Prototype with Over \$830M Investment

#33 SHENGYA Reports Solid-State and Semi-Solid Drone Batteries Improve Extreme Temperature Performance, Enhancing Industrial UAV Flight Time and Safety

#34 Toyota Targets 40-Year EV Battery Life with Solid-State Technology: Over 8,000-10,000 Cycles and 1,000km Range Goal

#35 Factorial Energy and Tulip Tech Partner for Next-Gen Solid-State Drone Batteries, Boosting Flight Range Over 30%

#36 SwRI and SMU Launch Joint Research to Address Solid-State Battery Interface Degradation, Pursuing Long-Life, High-Efficiency Designs

#37 China's Dongfeng Motor Plans 50,000 Solid-State Battery EV Deliveries by 2027, Achieving 350 Wh/kg Energy Density

#38 Conductive and Stable CPE Interlayer Solves NASICON Solid-State Battery Challenges, Enabling Over 300 Hours Stable Cycling and 90% Capacity Retention

#39 China's New Solid-State Battery Standard Spurs Doctex Gigawatt Facility in Tianjin, Saike Power and Dongfeng Follow Suit

#40 SwRI and SMU Pioneer Interfacial Engineering for Solid-State Battery Life Extension: Ultrathin Film on Lithium Metal Anode Boosts Reliability and Safety

#41 Solid-State Battery Manufacturing Advances to Pilot Lines, Automotive Programs, and Vehicle Testing: QuantumScape and Honda Strengthen Collaboration

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#43 EV Charging Forecast: Toyota Solid-State EVs to Launch in 2026, Targeting 800km+ Range and Sub-10 Minute Charging

#44 Neutron Diffraction Traces Lithium Motion in Solid-State Batteries in Real-Time: Guiding Electrode Design and Ion Conductivity Optimization

#01 Toyota Maintains Dominant Lead in Solid-State Battery Patents Amidst Surging Competition from LGES and Samsung SDI

Published July 10, 2026 Patsnap International



OVERVIEW

Patsnap's 2026 analysis reveals Toyota Motor Corporation holds a commanding lead in solid-state battery patents, with 3,511 patent families covering both electrolyte cell systems and electrode active materials. This dominance signifies Toyota's comprehensive technological foundation and strategic intent across the entire solid-state battery spectrum. LG Energy Solution and Samsung SDI are emerging as strong contenders, intensifying the competitive landscape and highlighting a global race towards next-generation energy storage.

Key Findings

A recent analysis by Patsnap reveals that Toyota Motor Corporation has established an overwhelming leadership position in the 2026 solid-state battery patent landscape, holding an impressive 3,511 patent families. This extensive portfolio spans critical areas, including electrolyte cell systems and electrode active materials, underscoring Toyota's profound commitment and innovation in this transformative technology. The report also highlights a rapidly escalating competitive environment, with major battery manufacturers like LG Energy Solution and Samsung SDI aggressively pursuing their own patent strategies as challengers.

Technical / Clinical Details

The patent activity signifies a pivotal phase for solid-state battery development, where intellectual property is becoming a critical battleground for future market share. Toyota's strategy appears to be holistic, covering not just individual components but the integrated design and functionality of the entire solid-state cell. This contrasts with a more specialized approach sometimes seen in other players, who might focus on particular material science breakthroughs. The depth of Toyota's patent coverage suggests a mature R&D pipeline aimed at comprehensive system optimization. Meanwhile, LG Energy Solution and Samsung SDI are leveraging their extensive experience in conventional lithium-ion battery production, adapting their expertise to address the unique challenges of solid-state interfaces and electrolyte materials.

Background & Context

Solid-state batteries are widely recognized as a game-changer for electric vehicles (EVs) and grid-scale energy storage, promising significantly higher energy density, enhanced safety, and longer cycle life compared to conventional lithium-ion counterparts. The intensified patent race among global players reflects the anticipation of imminent commercialization and mass adoption of this technology. Toyota's early and expansive lead, particularly for an automotive OEM, indicates a strong strategic imperative to control core battery technology, which is increasingly vital for EV performance and differentiation. This also sets the stage for potential future collaborations and licensing opportunities, shaping the broader industry ecosystem.

Strategic Significance & Outlook

The vigorous patent competition is expected to profoundly influence the future trajectory of solid-state battery development and market dynamics. Intellectual property will be a key determinant of competitive advantage, particularly as the industry moves towards standardization and large-scale manufacturing. Innovations addressing persistent challenges such as interfacial resistance, dendrite formation, and cost-effective production methods are especially valued within these patent portfolios. Toyota's broad patent foundation could provide a significant advantage in dictating future supply chain architectures and partnership frameworks, thereby influencing global technology roadmaps. The sustained research and patenting efforts from both automotive and dedicated battery manufacturers suggest a robust pipeline of advancements, with potential for breakthrough innovations through synergistic collaborations between industry and academia.

Source: <https://www.patsnap.com/resources/blog/rd-blog/solid-state-battery-patent-landscape-2/>

Collected: July 17, 2026 | Automated Research System (Gemini API)

#02 Solid-State Battery Cell Design Patent Landscape Reveals Early Concentration with TYFAST and Uchicago Argonne LLC Dominance

Published July 13, 2026 Patsnap International



OVERVIEW

Patsnap's 2026 analysis of solid-state battery cell design patents indicates an early and highly concentrated landscape, with TYFAST and Uchicago Argonne LLC holding nearly all patent families. The majority of these filings focus on cell-level electrolyte integration techniques, crucial for performance. However, intellectual property coverage remains relatively sparse for inorganic electrolytes and cathode materials, pointing to these areas as future frontiers for significant innovation.

Key Findings

A comprehensive patent landscape analysis by Patsnap for 2026 reveals an exceptionally concentrated intellectual property portfolio in solid-state battery cell design. The report indicates that merely two entities, TYFAST and Uchicago Argonne LLC, collectively own virtually all existing patent families in this nascent but critical technological domain. This highly concentrated ownership in the early stages of development suggests a focused and potentially dominant technological trajectory established by these two players.

Technical / Clinical Details

The technical focus of the identified patent applications predominantly revolves around the intricate challenges of electrolyte integration at the cell level. This emphasis is logical, as the seamless and stable integration of solid electrolytes with electrodes is paramount for minimizing interfacial resistance and ensuring efficient ion transport within solid-state batteries. These are fundamental hurdles that must be overcome to achieve high performance and reliability. However, the analysis also points to a notable gap: intellectual property coverage for inorganic chemical electrolytes and advanced cathode materials is comparatively low. This deficit suggests that significant opportunities remain for innovation and patenting in fundamental material science, which could subsequently influence future cell design paradigms.

Background & Context

Solid-state batteries are poised to revolutionize energy storage solutions, particularly for electric vehicles (EVs) and grid applications, by offering superior safety, higher energy density, and extended cycle life. The design of the battery cell is a critical determinant of how effectively these material-level advantages translate into system-level performance. The current patent concentration highlights an early race to define the architectural standards and core integration methodologies for these next-generation batteries. While this could lead to high barriers to entry, it also incentivizes focused research and development efforts to either compete within established frameworks or to disrupt the landscape with novel approaches in underserved areas like advanced inorganic materials.

Strategic Significance & Outlook

The future trajectory of solid-state battery commercialization will heavily depend on how these foundational cell design patents evolve and whether new breakthroughs emerge in the less-covered material sectors. The current dominance by TYFAST and Uchicago Argonne LLC positions them strongly to influence early market standards and supply chains. However, the relatively open field in inorganic electrolyte and cathode material IP represents a significant strategic opportunity for new entrants—including academic institutions and specialized startups—to introduce disruptive technologies. This dynamic environment suggests that while core cell design may be concentrated, the broader innovation ecosystem for solid-state batteries remains vibrant, with the potential for substantial shifts driven by advancements in fundamental material science.

Source: <https://www.patsnap.com/resources/blog/rd-blog/solid-state-battery-cell-design-patent-landscape/>

Collected: July 17, 2026 | Automated Research System (Gemini API)

#03 Advanced Composite Polymer Electrolyte Boosts Interfacial Stability and Long-Term Cycling in NASICON-Based Solid-State Lithium Batteries

Published July 09, 2026 ACS Applied Energy Materials USA



OVERVIEW

Research demonstrates a high-ion-conductive composite polymer electrolyte (CPE) interlayer significantly enhances interfacial stability in NASICON-based solid-state lithium batteries, enabling long-term cycling in symmetric cells. This CPE layer effectively prevents direct contact between the LAGP electrolyte and lithium metal, suppressing undesirable side reactions. Incorporating LLZTO and succinonitrile into the CPE optimizes Li^+ mobility while inhibiting anion transport, presenting a critical breakthrough for overcoming interfacial degradation challenges in solid-state batteries.

Key Findings

A significant advancement in solid-state lithium battery technology has been reported, focusing on NASICON-based solid electrolytes (LAGP). Researchers have successfully introduced a highly ion-conductive composite polymer electrolyte (CPE) as an interlayer to drastically improve interfacial stability. This innovative CPE layer effectively prevents direct contact between the LAGP and the lithium metal anode, leading to superior long-term cycling performance and sustained stability in symmetric cells. This breakthrough addresses a major bottleneck in the practical implementation of all-solid-state batteries by mitigating critical interfacial degradation issues.

Technical / Clinical Details

The developed CPE interlayer system leverages a strategic combination of LLZTO (a garnet-type oxide solid electrolyte) and succinonitrile. This particular composition is engineered to achieve a dual benefit: it markedly enhances the mobility of lithium ions (Li^+) while simultaneously suppressing the undesirable transport of anions. This precise control over ion dynamics at the interface minimizes detrimental side reactions and promotes the formation of a stable solid electrolyte interphase (SEI). The reduction in interfacial resistance and the substantial improvement in stability are directly correlated with enhanced battery energy efficiency and an extended operational lifespan. This mechanism offers a robust solution for boosting the practical performance metrics of solid-state batteries.

Background & Context

Solid-state lithium batteries are heralded as the next frontier in energy storage, promising higher energy densities, inherent safety (due to the absence of flammable liquid electrolytes), and longer cycle life compared to conventional lithium-ion batteries. However, the path to commercialization has been impeded by challenges, primarily high interfacial resistance and insufficient chemical and electrochemical stability between the solid electrolyte and electrodes. Lithium metal anodes, while offering high theoretical capacity, are particularly problematic due to dendrite formation and side reactions at the interface. While NASICON-type electrolytes offer comparative stability, challenges with direct lithium metal contact persisted. This research provides a promising solution to this long-standing issue.

Strategic Significance & Outlook

The implications of this research extend beyond NASICON-based systems, highlighting the critical importance of interfacial engineering across various solid-state electrolyte platforms. The CPE interlayer technology could evolve into a generalized strategy for enhancing the safety, energy density, and cycle life of solid-state batteries. Future work will involve scaling up the manufacturing processes for this CPE layer, improving its cost-effectiveness, and conducting rigorous performance evaluations in more complex full-cell configurations. Successful commercialization of this technology would accelerate the adoption of solid-state batteries in diverse applications, including electric vehicles, renewable energy storage, and advanced portable electronic devices, thereby significantly impacting the global energy landscape.

Source: <https://pubs.acs.org/doi/10.1021/acsaem.6c01337>

Collected: July 17, 2026 | Automated Research System (Gemini API)

#04 Umicore Leads Solid-State Battery Electrolyte Patent Race, Revealing Significant Entry Opportunities in Ceramics Sector

Published July 13, 2026 Patsnap International

The Umicore logo is displayed in a bold, white, sans-serif font. The 'U' is stylized with a horizontal bar extending to the left, creating a unique graphic element.

Umicore leading all-solid-state battery electrolyte patent race, with opportunities emerging in the file ceramics 2026

OVERVIEW

Patsnap's 2026 report indicates Umicore leads the solid-state battery electrolyte patent landscape, though no single entity dominates all technology routes. Umicore, Microsoft Technology Licensing, and QuantumSpace Battery hold top positions. Critically, the sparse patenting activity in the ceramics sector, despite the central role of oxide and sulfide ceramic electrolytes, presents a substantial opportunity for new entrants and research collaborations to drive innovation in this vital area.

Key Findings

According to a recent analysis by Patsnap, the patent landscape for solid-state battery electrolytes in 2026 is characterized by a clear growth trajectory, with Umicore establishing a leading position. However, the report emphasizes that no single company comprehensively dominates all technological routes within this highly competitive field. Key players in patent filings include Umicore, Microsoft Technology Licensing, and QuantumSpace Battery, indicating their forefront involvement in advancing electrolyte material development.

Technical / Clinical Details

Solid electrolytes are the core components determining the performance of all-solid-state batteries. The report highlights a relatively low number of patent applications in the ceramics sector. This is a crucial observation, given that ceramic electrolytes, such as oxide-based and sulfide-based materials, are considered indispensable for achieving high ion conductivity and stability in next-generation batteries. This sparsity suggests that significant technological challenges and unexplored innovation areas persist in ceramic material science. Consequently, it presents a substantial opportunity for universities and national research institutions, particularly through industry-academia collaborations, to enter this field and generate new, foundational patents.

Background & Context

Solid-state batteries are garnering significant attention across various sectors, including automotive, aerospace, and consumer electronics, as they promise to resolve the safety and energy density limitations of current lithium-ion batteries. Solid electrolytes play a central role in mitigating dendrite formation, enhancing thermal stability, and enabling high-voltage operation. The patent landscape reflects the strategic R&D investments by companies aiming to gain a competitive edge, with particular emphasis on material science and manufacturing process innovations. The emergence of players from diverse industries, like Microsoft Technology Licensing, also hints at the potential for battery technology to become integrated into broader digital ecosystems.

Strategic Significance & Outlook

The solid-state battery electrolyte market is projected for robust future growth, with ceramic electrolytes expected to be key to the next wave of breakthroughs. Leading companies like Umicore will likely continue to strengthen their patent portfolios to consolidate market leadership. Simultaneously, research institutions and startups have a significant opportunity to challenge existing market dynamics by pioneering novel technologies in the less-patented ceramic electrolyte domain. Continuous R&D investment and strategic partnerships in this field are crucial for accelerating the commercialization of solid-state batteries and contributing to the realization of a sustainable energy society on a global scale.

Source: <https://www.patsnap.com/resources/blog/rd-blog/solid-state-battery-electrolyte-patent-landscape/>

Collected: July 17, 2026 | Automated Research System (Gemini API)

#05 Halide Cathode Materials Poised to Revolutionize All-Solid-State Lithium Batteries through Multi-Electron Reactions

Published July 16, 2026 National Science Review (Oxford Academic) International



OVERVIEW

Halide cathode active materials are emerging as a transformative platform for all-solid-state lithium batteries (ASSLBs), offering high ion/electron conductivity and multi-electron reaction capabilities. These materials also enable single-phase electrode architectures, eliminating inert components and boosting energy density. A new review highlights the evolution of these materials and recent breakthroughs in single-phase interfacial engineering and multi-electron reaction mechanisms, charting a new direction for ASSLB development.

Key Findings

Halide cathode active materials are garnering significant attention as a disruptive platform poised to dramatically enhance the performance of all-solid-state lithium batteries (ASSLBs). These materials are not only characterized by high ionic and electronic conductivity but also by their remarkable capability for multi-electron reactions, meaning multiple lithium ions can participate in the electrochemical process simultaneously. Furthermore, they offer the potential for a 'single-phase electrode architecture,' which eliminates the need for inert binders and conductive additives, thereby promising higher energy density and simplified manufacturing. This review paper comprehensively details the evolution of these halide cathode active materials and the latest breakthroughs in their application.

Technical / Clinical Details

Halide cathode active materials are capable of forming high lithium-ion conductive pathways within their crystalline structures, facilitating excellent interfacial contact with solid electrolytes. The ability of transition metal elements within these materials to adopt multiple oxidation states enables multi-electron reactions, which can store and release significantly more electrons compared to conventional cathode materials that typically undergo one-electron reactions. This leads to a substantial increase in theoretical capacity per unit mass. The review also emphasizes the critical role of single-phase interfacial engineering in integrating these materials into ASSLBs, providing design principles to minimize interfacial resistance between the electrode and solid electrolyte, ensuring stable battery operation, and contributing to improvements in both energy density and cycle life.

Background & Context

All-solid-state lithium batteries are considered a game-changer for extending the range and enhancing the safety of electric vehicles (EVs). However, existing cathode materials have faced challenges with compatibility with solid electrolytes, which generally have lower ion conductivity than liquid electrolytes, and limitations in achieving higher capacities. The advent of halide cathode materials offers a potential fundamental solution to these challenges. The achievement of high energy density through multi-electron reactions, in particular, opens new horizons for battery technology. This progress in research and development signals a new paradigm shift in material design, keenly anticipated by the industry to accelerate the practical application of ASSLBs.

Strategic Significance & Outlook

While research into halide cathode active materials is still in its early stages, their future potential is considered extremely high. Moving forward, key challenges will include optimizing material composition, improving the scalability of manufacturing processes, and rigorously verifying long-term stability and safety. The realization of single-phase electrode architectures would also lead to reduced manufacturing costs, further accelerating the adoption of all-solid-state batteries. In the future, these innovative materials are expected to enable applications not only in electric vehicles but also in aerospace, drones, medical devices, and any other field requiring high energy density and safety, thus becoming central to next-generation energy storage systems globally.

Source: <https://academic.oup.com/nsr/advance-article/doi/10.1093/nsr/nwag438/8735813?searchresult=1>

#06 Chinese Scientists Develop Organic-Inorganic Gel Electrolyte Resolving Capacity Degradation in Solid-State EV Batteries

Published July 16, 2026 OkDiario China



OVERVIEW

Researchers at the Dalian Institute of Chemical Physics, Chinese Academy of Sciences, have developed a novel organic-inorganic gel electrolyte that solves the critical capacity degradation issue in solid-state batteries. This new material enhances safety and energy density, promising significantly faster charging for electric vehicles (EVs). This breakthrough is a crucial step towards safer, higher-performing EVs, aligning with Dongfeng Motor's goal to mass-produce and integrate 350 Wh/kg solid-state batteries into vehicles by late 2026.

Key Findings

A research team from the Dalian Institute of Chemical Physics, Chinese Academy of Sciences, has made a significant breakthrough by developing an innovative organic-inorganic gel electrolyte. This new material effectively addresses the critical problem of capacity degradation, a major hurdle in the commercialization of all-solid-state batteries. The newly developed gel electrolyte offers superior safety characteristics and higher energy density compared to existing solid-state electrolytes, with substantial potential to improve the fast-charging capabilities of electric vehicles (EVs). This technological advancement is seen as a pivotal step towards realizing safer and higher-performing EVs.

Technical / Clinical Details

The developed organic-inorganic gel electrolyte ingeniously combines the best attributes of both solid and liquid states, achieving the high safety of solid electrolytes alongside the excellent electrode contact and ion conductivity typically associated with liquid electrolytes. This dual nature effectively suppresses the formation of lithium dendrites in solid-state batteries utilizing lithium metal anodes, leading to stable long-term cycling performance. The technology directly overcomes previous challenges of high interfacial resistance and insufficient ion transport in conventional solid electrolytes. It forms a foundational technology capable of achieving high energy density targets of 350 Wh/kg, representing a crucial innovation for balancing both safety and performance in next-generation battery systems.

Background & Context

All-solid-state batteries are at the forefront of global R&D competition, envisioned as the 'dream battery' due to their lower fire risk and higher energy density compared to conventional lithium-ion batteries. They promise to significantly extend the range and enhance the safety of electric vehicles. However, challenges such as interfacial stability between solid electrolytes and electrodes, as well as manufacturing complexity, have hindered commercialization. China, as a global leader in the EV market, is intensely focused on developing solid-state battery technology at a national level, and this research further strengthens its technological advantage. The fact that major automakers like Dongfeng Motor are targeting mass production and vehicle integration of solid-state batteries with this technology by late 2026 indicates that practical application is rapidly approaching.

Strategic Significance & Outlook

The development of this organic-inorganic gel electrolyte holds immense significance for accelerating the commercialization of solid-state batteries, particularly for the EV market. Future efforts will concentrate on cost reduction of materials, establishing scalable mass production techniques, and verifying long-term reliability under various operating conditions. If successful, this technology is expected to be adopted in a wide range of high-power and high-safety applications beyond EVs, including drones, robotics, and stationary energy storage systems. China's potential leadership in this technology could significantly alter the competitive landscape of the global battery market and, by extension, the entire energy industry, driving forward the transition to more sustainable and efficient energy solutions.

Source: <https://okdiario.com/techy/en/chinese-scientists-built-a-gel-electrolyte-for-solid-state-batteries-that-solves-the-one-flaw-holding-electric-cars-back/6353/>

#07 BMW Begins i7 Testing with Solid Power's All-Solid-State Cells; Samsung SDI Targets 900 Wh/L Production by Late 2027

Published July 14, 2026 Febatt International



OVERVIEW

Solid-state battery technology is advancing to demonstration and pilot phases, with BMW announcing the operation of i7 test vehicles equipped with large solid-state cells from Solid Power in May 2025. Concurrently, Samsung SDI aims for mass production of its 'SolidStack' all-solid-state batteries by late 2027, targeting an ambitious energy density of 900 Wh/L. While these developments signal imminent commercialization, critical challenges persist, including interfacial resistance, dendrite control, pressure management, manufacturing scalability, pack certification, and cost.

Key Findings

Solid-state battery technology has reached critical demonstration and pilot stages in 2026, with concrete roadmaps emerging for commercialization, particularly for commercial fleets. BMW announced in May 2025 the initiation of operations for an i7 test vehicle integrating large all-solid-state cells supplied by Solid Power. This marks a significant milestone as an automotive manufacturer evaluates solid-state batteries in real-world vehicle conditions. Further accelerating this trend, Samsung SDI has set an ambitious goal for mass production of its 'SolidStack' all-solid-state batteries by late 2027, targeting an impressive volumetric energy density of 900 Wh/L. These announcements collectively signal a clear transition of solid-state batteries from a 'dream technology' to a tangible commercial product.

Technical / Clinical Details

BMW's deployment of test vehicles is crucial for assessing the real-world performance, safety, and durability of solid-state batteries under actual driving conditions. Solid Power's cells are designed to provide the high power and robustness required for automotive applications. Samsung SDI's target of 900 Wh/L in energy density represents a substantial leap beyond current liquid electrolyte lithium-ion batteries, promising significantly extended range for electric vehicles. This high energy density is likely achievable through the integration of lithium metal anodes with advanced sulfide or oxide solid electrolytes. However, maintaining this high energy density while suppressing dendrite formation, minimizing interfacial resistance between electrodes and electrolytes, and ensuring stability under high pressure remain significant technical challenges that are central to their development efforts.

Background & Context

The rapid expansion of the electric vehicle market has made battery performance improvement an urgent priority. Solid-state batteries, by eliminating flammable liquid electrolytes, offer superior safety and the potential for higher energy densities, positioning them as the leading contender for next-generation battery technology. The move by automotive OEMs like BMW to test vehicles with solid-state batteries, alongside leading battery manufacturers like Samsung SDI announcing specific mass production and performance targets, indicates a collective industry commitment to commercialize solid-state technology. This will intensify pressure on supply chain establishment, manufacturing process evolution, and cost reduction across the board.

Strategic Significance & Outlook

The initiatives from BMW and Samsung SDI are powerful drivers that will accelerate the commercialization of solid-state batteries. However, the path to mass production still entails overcoming several significant hurdles. Specifically, further reducing interfacial resistance between solid electrolytes and electrodes, achieving complete control over lithium dendrite formation, establishing reliable internal pressure management techniques, ensuring manufacturing scalability for large-scale production lines, optimizing pack certification processes for vehicle applications, and crucially, improving cost competitiveness are paramount. If these challenges are successfully addressed, solid-state batteries are expected to enter the EV market in earnest by the late 2020s, bringing about a profound transformation in the electric vehicle industry globally.

Source: <https://www.febatt.com/solid-state-battery-fleet-future/>

#08 Max Planck Institute Uncovers Mechanism of Lithium Dendrite Failure in Solid-State Batteries, Published in Nature

Published July 11, 2026 The Robotics Media Germany



OVERVIEW

An interdisciplinary team at the Max Planck Institute for Sustainable Materials (MPI-SusMat) has identified and published in Nature the mechanism behind lithium dendrite-induced failure in solid-state batteries, a major commercialization barrier. They revealed that hydrostatic stress within soft lithium dendrites is the primary cause of ceramic electrolyte fracture. This pivotal discovery provides a fundamental basis for designing effective countermeasures against dendrite formation, significantly advancing the path to commercial solid-state batteries.

Key Findings

An interdisciplinary team at the Max Planck Institute for Sustainable Materials (MPI-SusMat) has made a monumental discovery, identifying the mechanism by which lithium dendrites cause failure in all-solid-state batteries—a critical barrier to their long-term stability and safety. Their groundbreaking research, published in *Nature*, for the first time demonstrated that the primary cause of soft lithium dendrites fracturing rigid ceramic solid electrolytes is the hydrostatic stress accumulated within the dendrites themselves. This fundamental elucidation of the mechanism provides a crucial foundation for designing effective mitigation strategies to suppress dendrite formation and accelerate the commercialization of solid-state battery technology.

Technical / Clinical Details

The research team employed a combination of advanced imaging techniques and sophisticated computational simulations to meticulously analyze the stress distribution within the electrolyte as lithium dendrites grew. They conclusively showed that as dendrites penetrate the ceramic electrolyte, exceptionally high localized hydrostatic stress develops at the dendrite tips. This stress was identified as the direct cause of structural damage to the ceramic material, ultimately leading to crack propagation. This finding shifts the focus from merely considering the mechanical strength of the electrolyte, highlighting the critical importance of the dendrite growth behavior itself and the internal stresses it induces. The team has already begun exploring several concrete mitigation strategies, including developing more robust ceramic electrolytes, introducing microscopic voids to redirect crack propagation, and applying protective coatings designed to inhibit dendrite formation.

Background & Context

All-solid-state batteries are widely hailed as the next-generation power source, promising significantly higher energy density and superior safety compared to existing lithium-ion batteries. However, when using lithium metal anodes, the formation of 'dendrites'—needle-like lithium growths during charge-discharge cycles—that penetrate the solid electrolyte has been the foremost obstacle to practical implementation. These dendrites can cause short circuits, capacity degradation, and even thermal runaway and fire hazards. The Max Planck Institute's discovery provides the fundamental scientific understanding necessary to develop definitive solutions for this long-standing challenge, thereby poised to significantly boost the widespread adoption of solid-state batteries.

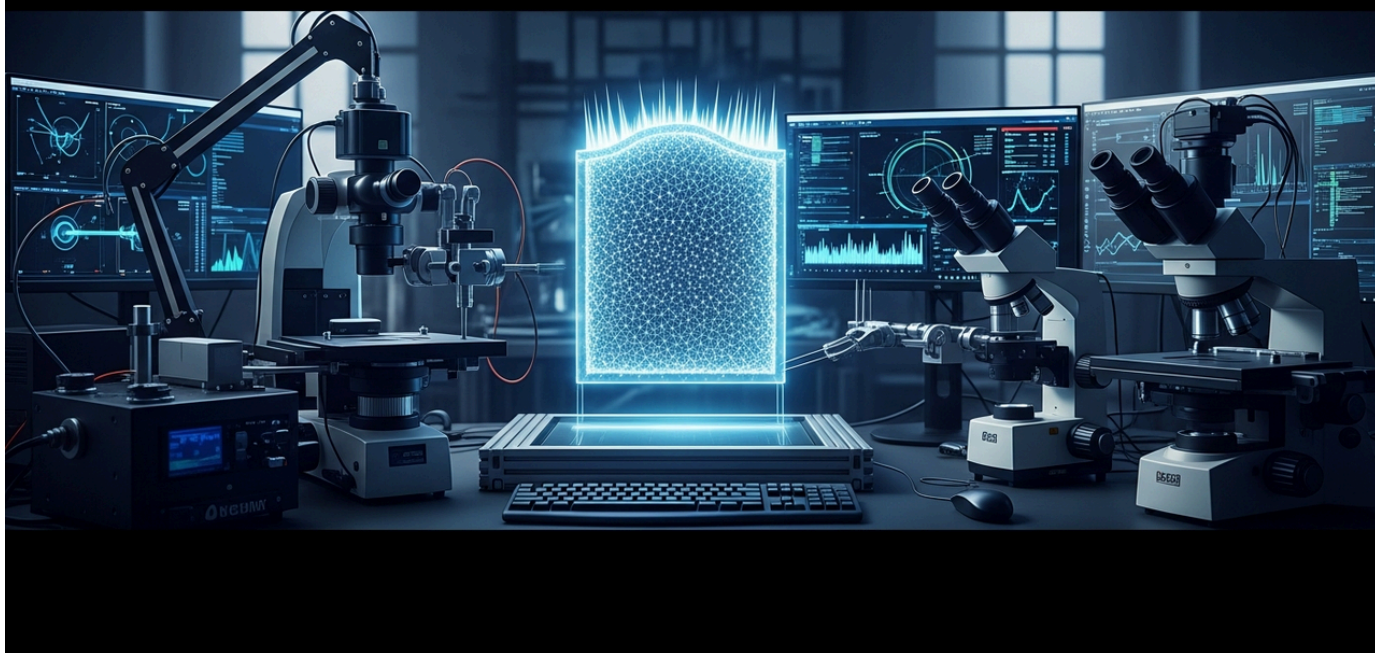
Strategic Significance & Outlook

This research has profound implications for deepening our understanding of the dendrite problem in solid-state batteries and for accelerating the development of effective solutions. The new perspective on hydrostatic stress within dendrites offers invaluable guidance for material designers and battery engineers to devise more effective dendrite suppression strategies. Moving forward, research is expected to intensify on novel solid electrolyte materials, electrode interface designs, and optimized manufacturing processes aimed at physically or chemically controlling dendrite growth. If this breakthrough translates into commercial success, it promises to dramatically enhance the safety and performance of all-solid-state batteries across a multitude of applications, including electric vehicles, renewable energy storage, and portable electronic devices, representing a global shift in energy technology.

Source: <https://theroboticsmedia.com/article/max-planck-solid-state-battery-lithium-dendrite-nature-july-2026>

#09 MIT Researchers Boost Solid-State Battery Performance by 300% by Addressing Grain Boundary Dendrite Formation

Published July 13, 2026 InsideEVs via TechCrunch Disrupt USA



OVERVIEW

MIT researchers discovered that grain boundaries within solid electrolytes are critical structural weaknesses triggering lithium dendrite growth in solid-state batteries. Their breakthrough method improves battery performance by up to 300% by effectively managing these weaknesses. This research demonstrates that significant performance gains can be achieved not only through new battery chemistry but also by refining processing and construction methods of existing materials, marking a major step towards practical solid-state batteries.

Key Findings

Researchers at the Massachusetts Institute of Technology (MIT) have developed a groundbreaking technique that boosts the performance of all-solid-state batteries by up to 300%. Their pivotal study precisely identified that grain boundaries within solid electrolytes represent structural weaknesses that act as primary initiation points for lithium dendrite growth. Based on this crucial discovery, the team engineered methods to effectively manage and suppress these weaknesses, leading to a dramatic improvement in battery performance. This achievement underscores that significant advancements can stem not only from inventing new battery chemistries but also from optimizing the processing and structural engineering of existing materials.

Technical / Clinical Details

The MIT researchers employed advanced characterization techniques, including scanning electron microscopy (SEM) and X-ray tomography, to pinpoint that lithium dendrites preferentially grow along the grain boundaries of solid electrolytes. These boundaries, characterized by atomic disorder, were found to facilitate lithium ion diffusion pathways and also act as stress concentration points during dendrite formation. By meticulously controlling the microstructure of these grain boundaries, the research team successfully suppressed dendrite growth, resulting in significantly enhanced battery cycle life, safety, and power density. Specifically, a remarkable increase of up to 300% in battery lifespan has been reported. This approach emphasizes precise control over the manufacturing process of electrolyte materials to improve their structural integrity and, consequently, their electrochemical performance.

Background & Context

All-solid-state batteries are highly anticipated as a next-generation battery technology for electric vehicles (EVs) and stationary energy storage systems, primarily due to their promise of higher energy density, superior safety, and extended cycle life. However, a major impediment to their practical application, especially when using lithium metal anodes, has been the formation of lithium dendrites during charging. These dendrites can penetrate the solid electrolyte, leading to short circuits and capacity degradation. While much previous research has focused on discovering novel solid electrolyte materials, the MIT study offers a fresh perspective by demonstrating the critical importance of microstructural engineering of existing materials, potentially redefining research priorities in the field.

Strategic Significance & Outlook

This breakthrough from MIT holds the potential to substantially shorten the path to commercialization for all-solid-state batteries. The grain boundary control approach, being relatively universal, could be applicable to various types of solid electrolytes. The next steps will involve scaling up this technology for mass production, reducing manufacturing costs, and evaluating long-term reliability under real-world EV operating conditions. Widespread application of this research is expected to accelerate the adoption of safer, higher-performance, and longer-lasting solid-state batteries, thereby significantly contributing to the proliferation of electric vehicles, the expansion of renewable energy integration, and the realization of a sustainable society. The synergy between materials science and process engineering will undoubtedly be key to shaping the future of battery technology.

Source: <https://www.thecooldown.com/green-tech/mit-researchers-solid-state-battery-performance/>

Collected: July 17, 2026 | Automated Research System (Gemini API)

#10 Quantum Leap Innovations Announces Breakthrough in Solid-State Battery Durability with Novel Composite Electrolyte

Published July 12, 2026 InTheBatt International



Quantum Leap Breakthrough through Solid State composite durability Development

OVERVIEW

Quantum Leap Innovations' research team announced a significant breakthrough in solid-state battery durability, successfully developing a novel composite electrolyte. Integrating specific ceramic and polymer components, their proprietary electrolyte simultaneously improves electrode interfacial stability and conductivity. This technology overcomes long-standing challenges of interfacial degradation and limited cycle life, accelerating the transition to safe and efficient next-generation batteries for EVs and grid storage.

Key Findings

The research team at Quantum Leap Innovations has announced a pivotal breakthrough in the development of composite electrolytes, dramatically enhancing the durability of all-solid-state batteries. This novel composite electrolyte successfully integrates specific ceramic and polymer components, a strategic combination that simultaneously boosts both the stability and ionic conductivity at the electrode interface. This innovative technology addresses long-standing challenges of electrode interfacial degradation and limited cycle life, which have been major impediments to the practical application of solid-state batteries. The company anticipates that this will significantly accelerate the transition towards safer and more efficient next-generation battery solutions.

Technical / Clinical Details

The newly developed composite electrolyte ingeniously combines the high ionic conductivity and mechanical strength inherent to ceramic materials with the flexibility and excellent electrode contact provided by polymer components. By optimizing the ratio and structural configuration of these constituents, the research team achieved a substantial reduction in interfacial resistance between the solid electrolyte and the active electrode material, ensuring smooth and efficient lithium-ion transport. This design effectively suppresses side reactions and the formation of dendrites during charge-discharge cycles, leading to enhanced long-term stability and durability of the battery. While specific quantitative improvements were not publicly disclosed, significant enhancements in cycle life and efficiency compared to existing solid electrolytes are expected, representing a crucial advance for high-energy-density solid-state lithium metal batteries.

Background & Context

All-solid-state batteries are garnering immense interest as the next-generation energy storage solution for electric vehicles (EVs), promising extended driving ranges, faster charging times, and superior safety due to the elimination of flammable liquid electrolytes. However, challenges at the solid electrolyte-electrode interface, including high resistance, instability, and dendrite formation, have been persistent bottlenecks for commercialization. Quantum Leap Innovations' announcement presents a promising solution to these long-standing issues, marking a significant milestone that could accelerate the market introduction of solid-state batteries. This breakthrough is particularly relevant for applications demanding high durability and safety, such as electric vehicles and renewable energy grid storage.

Strategic Significance & Outlook

This breakthrough in composite electrolyte technology represents a major leap forward in the roadmap for commercializing solid-state batteries. Future efforts will likely focus on scaling up material manufacturing, optimizing cost efficiency, and conducting comprehensive performance evaluations across various battery systems. Successful mass production of this technology would further accelerate the adoption of electric vehicles and contribute to the establishment of stable power grids supporting renewable energy integration, playing an indispensable role in achieving a sustainable society. The advent of solid-state batteries offering combined safety, high efficiency, and extended lifespan is poised to trigger a profound transformation across the entire energy industry, establishing new benchmarks for global energy storage solutions.

Source: <https://inthebatt.com/solid-state-battery-durability-breakthrough/>

#11 Xiamen and Zhejiang Universities Achieve High-Safety 4.5V Lithium Metal Batteries with DES-Based Solid Polymer Electrolyte

Published July 13, 2026 IEST Instrument China



OVERVIEW

Researchers from Xiamen University and Zhejiang University successfully developed and evaluated a Deep Eutectic Solvent (DES)-based solid polymer electrolyte (SPE), DES-ETPTA, demonstrating superior thermal stability. This DES-ETPTA system simultaneously achieves suppressed thermal gas evolution, stabilized lithium metal interfaces, reduced flammability, and extended operating voltage up to 4.5 V. This breakthrough offers a reliable pathway for high-safety, high-voltage lithium metal batteries, significantly advancing next-generation energy storage.

Key Findings

A collaborative research team from Xiamen University and Zhejiang University has announced a pivotal breakthrough, detailing the exceptional thermal stability of an innovative Deep Eutectic Solvent (DES)-based solid polymer electrolyte (SPE) named DES-ETPTA. This DES-ETPTA electrolyte system successfully achieves a suite of critical performance enhancements: significantly suppressed thermal gas evolution, improved stabilization of the lithium metal anode interface, a substantial reduction in flammability, and stable operation at extended high voltages up to 4.5 V. This discovery provides an extremely reliable technological foundation for the practical realization of high-safety, high-voltage lithium metal batteries, marking a major contribution to next-generation energy storage systems.

Technical / Clinical Details

The DES-ETPTA solid polymer electrolyte was engineered to overcome the limitations of conventional solid electrolytes by combining the unique properties of deep eutectic solvents with the polymer structure of ETPTA (ethoxylated trimethylolpropane triacrylate). DES are notable for their low volatility, non-flammability, and high ionic conductivity. Their complexation with ETPTA enhances the overall mechanical strength and thermal stability of the electrolyte, effectively suppressing undesirable side reactions at the interface between lithium metal and the electrolyte. Crucially, the ability to operate at a high potential window (up to 4.5 V) is vital for maximizing battery energy density. This system's dramatic reduction in gas evolution during thermal decomposition significantly boosts safety, even under abnormal conditions.

Background & Context

Lithium metal batteries are widely anticipated as the successor to current lithium-ion batteries due to their significantly higher theoretical capacity and energy density, making them highly attractive for next-generation electric vehicles (EVs) and large-scale energy storage systems (ESS). However, the safety concern posed by lithium dendrite formation on the lithium metal anode during charging, leading to short circuits and potential fires, has been a major barrier to their commercialization. DES-based SPEs represent a promising approach to simultaneously suppress dendrite formation while achieving high ionic conductivity and safety. This research aligns perfectly with China's national strategy to develop high-safety, high-performance batteries for its burgeoning EV market.

Strategic Significance & Outlook

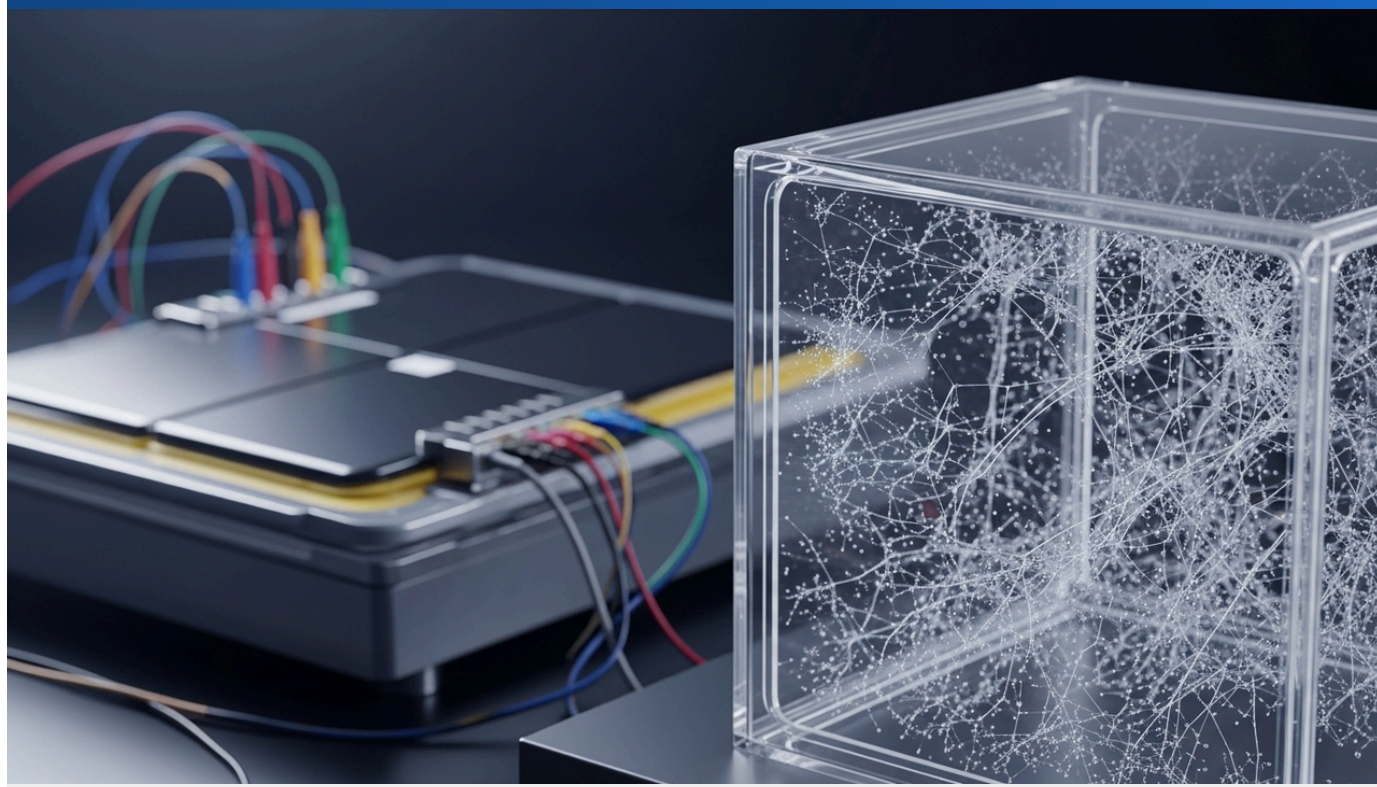
The development of the DES-ETPTA electrolyte system holds immense potential for accelerating the commercialization of lithium metal batteries that combine high energy density with inherent safety. Future efforts will focus on optimizing the manufacturing process for mass production, improving cost efficiency, and conducting comprehensive long-term reliability evaluations under various operating conditions. If successfully commercialized, this technology is expected to not only dramatically enhance the range and safety of electric vehicles but also find applications in fields demanding stringent safety standards and high performance, such as aerospace, medical devices, and drones. This innovation is poised to establish new standards in battery technology and significantly contribute to the realization of a sustainable energy society globally.

Source: <https://iestbattery.com/des-solid-polymer-electrolyte-in-situ-gas-evolutio/>

Collected: July 17, 2026 | Automated Research System (Gemini API)

#12 Direct Growth of Na-Ion Conducting Glass Solid Electrolyte Achieves Significant 6.2 Ω Interfacial Resistance Reduction for Room-Temperature Sodium-Sulfur Pouch Cells

Published July 11, 2026 ResearchGate International



OVERVIEW

To overcome high interfacial resistance in solid-state batteries, researchers developed a novel solid-liquid growth method to directly grow a Na⁺ conducting solid electrolyte on a sodium metal anode. This technique successfully reduced interfacial resistance to approximately 6.2 Ω in sodium-sulfur pouch cells utilizing Na₃O₁₅Si₆Y solid glass electrolyte. This breakthrough significantly contributes to realizing safe, efficient, room-temperature sodium-sulfur pouch cells, accelerating next-generation battery development beyond lithium.

Key Findings

In a significant effort to overcome high interfacial resistance—a primary challenge hindering the practical application of all-solid-state batteries—innovative research has led to a breakthrough. This study reports the successful development of a novel solid-liquid growth method for directly growing a Na⁺ conducting solid electrolyte, specifically Na₃O₁₅Si₆Y glass electrolyte, onto a sodium metal anode. This technique dramatically reduced the interfacial resistance to an exceptionally low value of approximately 6.2 Ω. This groundbreaking achievement marks a crucial step towards realizing safe and efficient room-temperature operating sodium-sulfur pouch cells, paving the way for a new class of energy storage systems.

Technical / Clinical Details

The developed solid-liquid growth method eliminates the need for high-temperature sintering or complex multi-layer structures, enabling the direct and uniform growth of the Na₃O₁₅Si₆Y solid glass electrolyte on the sodium metal anode surface. This process optimizes the physical contact between the electrolyte and anode, thereby streamlining the ion transport pathways at the interface. Conventional processes often suffer from high resistance due to interfacial mismatch and side reactions between the solid electrolyte and electrode, severely degrading battery performance. The achieved ultra-low interfacial resistance of approximately 6.2 Ω is highly advantageous for improving the battery's fast charge/discharge capability and overall energy efficiency. Sodium-sulfur batteries offer the benefit of not being constrained by lithium resources, and this reduction in interfacial resistance significantly advances their practical implementation.

Background & Context

Sodium-ion batteries are gaining considerable attention as a promising alternative to lithium-ion batteries for next-generation energy storage. Sodium is more abundant and cheaper than lithium, making it an attractive option for building sustainable energy storage systems. However, similar to lithium metal anodes, using sodium metal anodes has presented challenges with dendrite formation and interfacial stability with solid electrolytes. Achieving stable operation and high energy density at room temperature has been particularly difficult. This research addresses this long-standing issue by providing a fundamental solution for interfacial resistance, thereby opening new avenues for the commercialization of sodium-sulfur batteries.

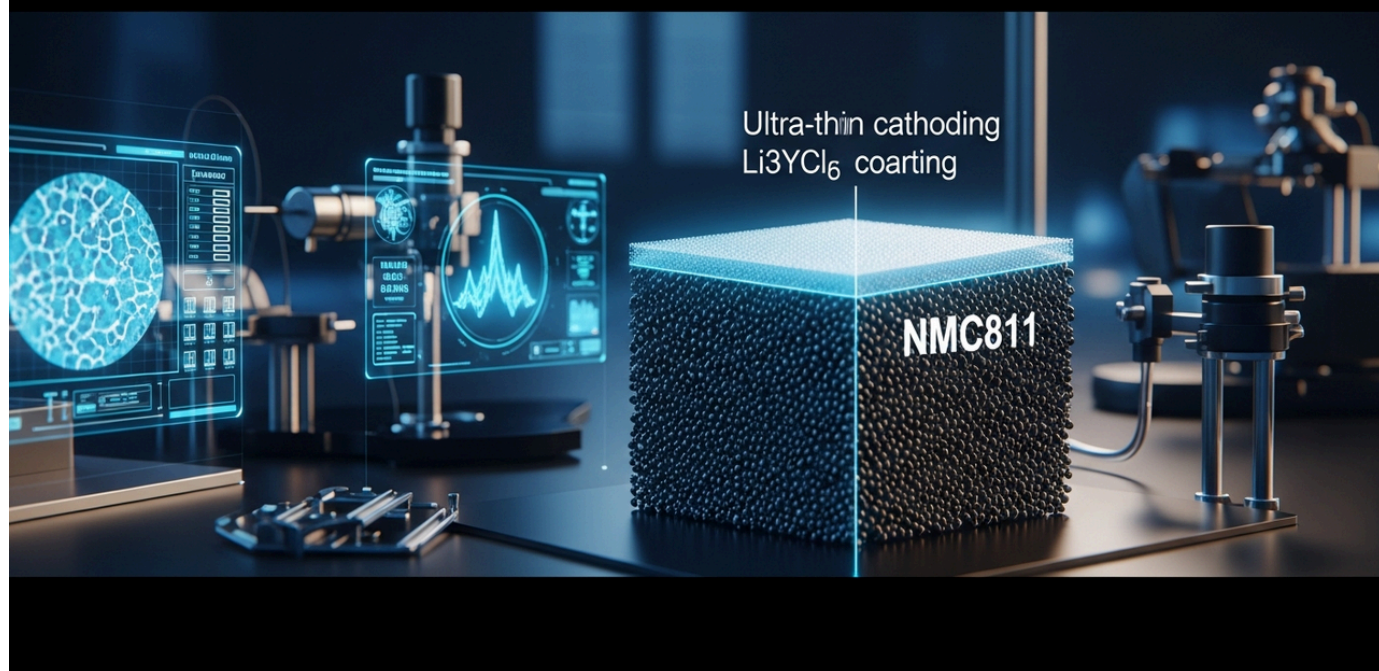
Strategic Significance & Outlook

The achievement of low interfacial resistance through this direct growth method holds potential applications not only for sodium-sulfur pouch cells but also for other all-solid-state sodium-ion battery systems. Future work will focus on scaling up this technology for mass production, improving cost efficiency, and conducting comprehensive evaluations of long-term cycle stability and safety. Sodium-sulfur batteries, with their high theoretical energy density and use of inexpensive materials, have the potential to create a significant market in stationary energy storage and electric vehicle sectors. This breakthrough is expected to substantially contribute to reducing lithium dependency and fostering the development of more sustainable energy storage technologies on a global scale.

Source: https://www.researchgate.net/publication/408650769_Direct_Growth_of_Na-Ion_Conducting_Na₃O₁₅Si₆Y_Solid_Glass_Electrolyte_With_Reduced_Interfacial_Resistance_for_Safer_Room_Temperature_Sodium-Sulfur_Pouch_Cells

#13 Ultrathin Li_3YCl_6 -Based Coatings Enable High-Areal-Capacity All-Solid-State Batteries with Improved NMC811 Cathode Cycling Performance

Published July 14, 2026 Chemistry of Materials (ACS Publications) USA



OVERVIEW

Researchers synthesized nanometer-thick Li_3YCl_6 -based coatings on NMC811 cathodes via liquid-phase deposition and low-temperature annealing to suppress interfacial side reactions with sulfide-based argyrodite electrolytes. This innovative coating achieved a reversible capacity of 200 mAh/g and significantly improved cycling performance in solid-state half-cells with a high areal loading of 4 mAh/cm², marking a crucial breakthrough for stable, high-energy-density all-solid-state batteries.

Key Findings

In a significant step towards realizing high-energy-density all-solid-state batteries, researchers have developed an innovative method to effectively suppress detrimental interfacial side reactions between nickel-rich layered cathodes (NMC811) and sulfide-based argyrodite solid electrolytes. Specifically, they successfully synthesized nanometer-thick Li_3YCl_6 -based coatings on NMC811 cathode materials using a combination of liquid-phase deposition and low-temperature annealing. This ultrathin coated dry cathode demonstrated a reversible capacity of 200 mAh/g with remarkably improved cycling performance in solid-state half-cells featuring a high areal loading of 4 mAh/cm². This represents a major advancement in the stability and high capacity potential for all-solid-state battery technology.

Technical / Clinical Details

Nickel-rich cathode materials like NMC811 are crucial for achieving high energy densities but often suffer from chemical instability and interfacial side reactions when in direct contact with sulfide solid electrolytes. The Li_3YCl_6 -based coating acts as a protective layer on the cathode surface, physically and chemically blocking these undesirable reactions. The combined liquid-phase deposition and low-temperature annealing process allows for the precise formation of a uniform, defect-free thin film on the nanometer scale. This enables improved interfacial stability without impeding efficient ion transport. This coating technology is critical for maximizing the inherent high capacity of cathode active materials under stable cycling conditions, while also meeting practical demands for high areal loading, essential for compact and powerful batteries.

Background & Context

All-solid-state batteries are anticipated to be a game-changing next-generation battery technology for electric vehicles (EVs), promising extended driving ranges and significantly enhanced safety. However, achieving high energy density necessitates stable interfacial construction between high-capacity cathode materials and high-performance solid electrolytes, which has long been a bottleneck. High-nickel cathodes like NMC, due to their inherent reactivity, have presented particular challenges in ensuring interfacial stability. This research addresses this issue through a sophisticated interfacial engineering approach, marking a substantial step forward for the practical realization of high-energy-density all-solid-state batteries, attracting widespread industry attention.

Strategic Significance & Outlook

This Li₃YCl₆-based coating technology potentially offers broad applicability, not only to NMC₈₁₁ cathodes but also to other high-capacity cathode materials and different solid electrolyte systems. Future efforts will focus on scaling up the manufacturing of this technology, reducing costs, and conducting comprehensive long-term reliability and safety evaluations in full-cell configurations. The achievement of stable cycling performance at high areal loading directly contributes to the miniaturization and lightweighting of EV battery packs, leading to improved driving range and cargo capacity. This breakthrough is expected to accelerate the commercialization of all-solid-state batteries, fostering further growth in the electric vehicle market and playing an indispensable role in the evolution of renewable energy storage systems.

Source: <https://pubs.acs.org/doi/10.1021/acs.chemmater.6c00993>

#14 Talent New Energy Drives 'Green Future' with Solid-State Batteries, Announces Mass Production of Semi-Solid Electric Motorcycles with Yadea

Published July 14, 2026 WIPO International



OVERVIEW

Talent New Energy (TNE) announced solid-state batteries (SSBs) are key to advanced applications like EVs and low-altitude economy. In March 2026, TNE partnered with Yadea Group to mass-produce high-end electric motorcycles featuring TNE's semi-solid-state batteries, marking a successful scale-up application in the two-wheeler segment. With over 800 patent applications globally, including 20 PCT international filings, TNE demonstrates significant technological leadership and a global strategy.

Key Findings

Talent New Energy (TNE) has emphasized that all-solid-state batteries (SSBs) are a pivotal technology indispensable for supporting the rapid growth of advanced application sectors such as electric vehicles (EVs), the low-altitude economy (drones, flying cars), and embodied intelligence (robotics). Notably, in March 2026, TNE announced a strategic partnership with Yadea Group to jointly launch high-end electric motorcycles equipped with TNE's mass-produced semi-solid-state batteries. This marks a significant milestone, showcasing the successful large-scale commercial application of TNE's battery technology in the two-wheeler market and demonstrating the reliability and performance capabilities of semi-solid-state battery technology.

Technical / Clinical Details

TNE's semi-solid-state battery technology is believed to offer higher energy density and enhanced safety compared to conventional lithium-ion batteries. By solidifying a portion of the liquid electrolyte, it reduces fire risks while maintaining good ionic conductivity. Its successful application in electric motorcycles suggests that the technology has reached a commercially viable level, capable of meeting the demands for high power, long lifespan, and stable operation in this segment. This success broadens its potential for application in other fields. TNE has filed over 800 patent applications worldwide, with approximately 20 being international PCT filings, underscoring the company's extensive R&D capabilities and robust intellectual property strategy in solid-state battery technology.

Background & Context

All-solid-state batteries are anticipated as the next-generation game-changer for extending EV driving ranges and enhancing safety. However, the mass production of truly all-solid-state batteries still faces numerous technical and cost challenges, making semi-solid-state batteries a crucial intermediary step. The partnership between TNE and Yadea Group demonstrates that semi-solid-state batteries have already reached a practical level, beginning to establish competitiveness in specific market segments. This development can be viewed as an integral part of China's strong national strategy to establish global leadership in battery technology and the EV sector.

Strategic Significance & Outlook

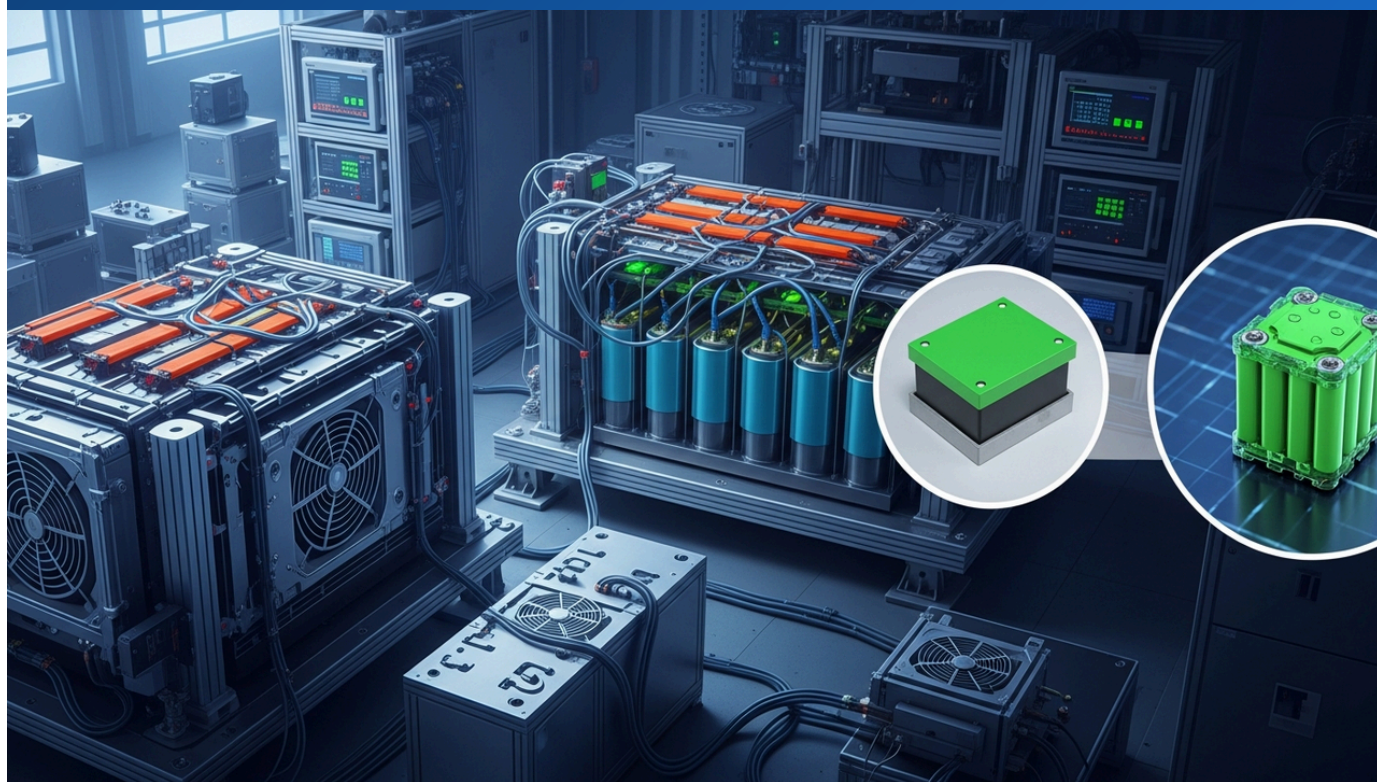
The announcement of mass production of electric motorcycles by TNE and Yadea Group indicates the potential for semi-solid-state battery technology to expand beyond EVs into other mobility sectors and broader energy storage solutions. TNE's extensive patent portfolio provides a strong foundation for the company to continue leading technological innovation in this field. Future focus areas will include further performance improvements for semi-solid-state batteries (energy density, cycle life, charging speed), cost reduction, and expansion into a wider array of applications. Ultimately, these technological advancements are expected to accelerate the commercialization of full solid-state batteries and play an indispensable role in realizing a 'green future' globally, setting new industry benchmarks.

Source: <https://www.wipo.int/en/web/ip-advantage/w/stories/talent-new-energy-solid-state-lithium-battery-empowers-a-green-future>

Collected: July 17, 2026 | Automated Research System (Gemini API)

#15 Thermal Safety Review for Rail Transit Traction Batteries Compares Chemistries, Highlights Solid-State Battery Safety

Published July 10, 2026 Energy & Fuels (ACS Publications) USA



OVERVIEW

A comprehensive review examines thermal safety in rail transit traction batteries, comparing mainstream chemistries like LFP, NCM/NMC, LTO, and supercapacitors with emerging sodium-ion (SIB) and all-solid-state lithium batteries (SSLB). The study provides crucial insights for safe battery selection and design in railway applications, offering guidelines for evaluating the safety of nascent technologies. This comparison clarifies intrinsic safety profiles and potential thermal behaviors across diverse battery systems.

Key Findings

A comprehensive review article has been published focusing on the thermal safety of traction batteries utilized in rail transit systems. This research meticulously compares and analyzes the thermal safety behaviors of both currently prevalent battery chemistries—including Lithium Iron Phosphate (LFP) batteries, Nickel-Cobalt-Manganese (NCM/NMC) lithium-ion batteries, Lithium Titanate (LTO) batteries, and supercapacitors—and emerging systems such as Sodium-Ion Batteries (SIB) and All-Solid-State Lithium Batteries (SSLB). This comparative study offers vital insights for the selection and safe design of next-generation batteries in the railway sector, providing essential guidelines for evaluating the safety aspects during technological adoption.

Technical / Clinical Details

The review article delves into the detailed mechanisms of thermal runaway, heat generation behavior, and associated risk profiles for each battery chemistry. LFP batteries are generally considered to have high thermal stability. In contrast, NCM/NMC batteries, while offering high energy density, tend to exhibit a relatively higher risk of thermal runaway. LTO batteries excel in fast charge/discharge capabilities but are limited by lower energy density. Supercapacitors offer exceptional safety but possess restricted energy storage capacity. Critically, for All-Solid-State Lithium Batteries (SSLB), their solid electrolyte significantly reduces the risk of fire compared to liquid electrolytes, thus inherently offering high safety. However, the review also notes that unexplored thermal behaviors, such as localized heating due to short circuits from dendrite formation, still exist. Sodium-ion batteries are also discussed, with their thermal runaway characteristics suggested to be potentially similar to those of LFP.

Background & Context

Rail transit, given its extensive power consumption and public nature, necessitates the implementation of highly efficient and exceptionally safe energy storage systems. The ongoing electrification and demand for energy efficiency are accelerating the transition from traditional diesel locomotives to battery-powered rolling stock, making the safety of traction batteries a paramount concern. This review provides objective data and evaluation criteria to select the most suitable battery technologies for railway applications, playing a crucial role in the development of safety regulations and the certification process for new battery technologies.

Strategic Significance & Outlook

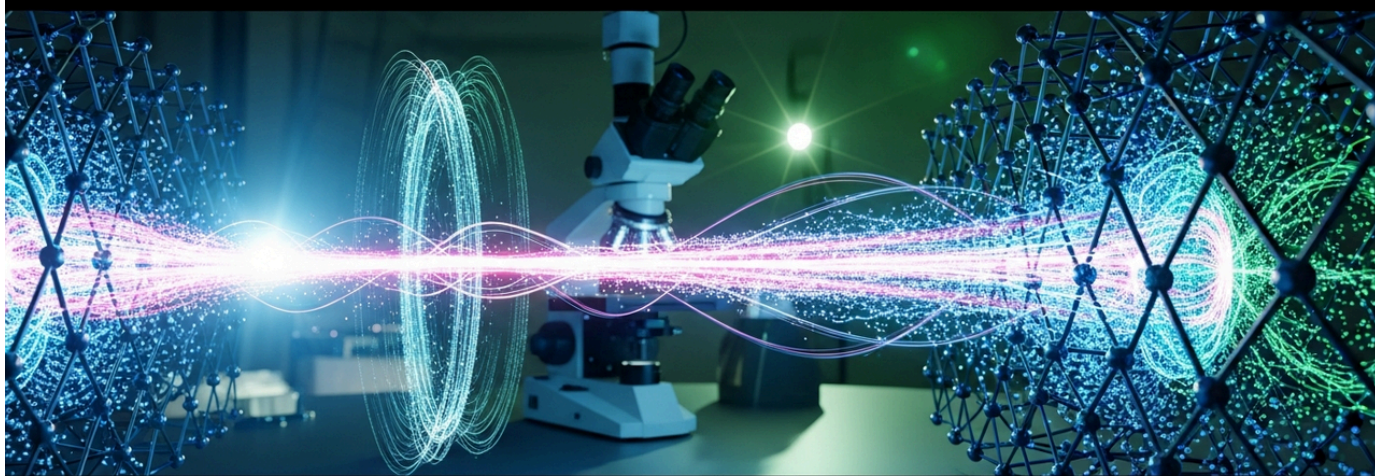
This review article serves to clarify the direction of research and development regarding battery thermal safety in rail transport. Moving forward, deeper understanding of the thermal safety of emerging technologies like all-solid-state lithium batteries will be essential, requiring detailed research to integrate their characteristics into railway vehicle design and operation. Specifically, long-term thermal stability, shock safety, and vibration resistance verification under challenging operational conditions characteristic of railway systems are critical. These insights are expected to contribute significantly to the construction of safer and more reliable railway transport systems, marking an important step towards realizing a sustainable mobility society globally.

Source: <https://pubs.acs.org/doi/10.1021/acs.energyfuels.6c00886>

Collected: July 17, 2026 | Automated Research System (Gemini API)

#16 Osaka University, AIST Unravels 'Superionic Conduction' Mechanism: Ions Flow Like Liquid Through Solid Crystal

Published July 16, 2026 Asia Research News Japan



OVERVIEW

A Japanese research team, including Osaka University and AIST, has for the first time elucidated the fundamental mechanism of 'superionic conduction,' where ions move through solid crystals like a liquid. This breakthrough provides new design principles for high ionic conductivity in next-generation all-solid-state batteries and high-performance energy conversion materials. This discovery is expected to accelerate the development of more efficient materials, contributing to significant breakthroughs in energy storage technology.

Key Findings

A Japanese research team, primarily from Osaka University and the National Institute of Advanced Industrial Science and Technology (AIST), has successfully elucidated the fundamental mechanism of 'superionic conduction'—a phenomenon critical to the performance of all-solid-state batteries—for the first time globally. This groundbreaking discovery unravels the physicochemical principles behind the extraordinary speed at which ions move through solid crystals, almost as if they were in a liquid state. This pivotal insight provides novel design principles for developing high-ionic-conductivity materials essential for next-generation solid-state batteries and other high-performance energy conversion materials, such as fuel cells and thermoelectric devices.

Technical / Clinical Details

The research team employed a combination of state-of-the-art experimental and theoretical techniques, including neutron scattering, high-precision X-ray diffraction, and first-principles calculations. These advanced methods allowed them to visualize, at an atomic level, how ions move dynamically and cooperatively along specific pathways within the crystal lattice of superionic solid materials. This revealed a mechanism different from conventional models where ions hop between fixed lattice sites. Instead, local structural fluctuations and defects were found to promote ion conduction. Specifically, it was shown that in certain crystal structures, some ions exhibit 'quasi-liquid' behavior akin to liquid diffusion, which was identified as the key to achieving exceptionally high ionic conductivity.

Background & Context

All-solid-state batteries are anticipated as a game-changing technology for significantly extending the range and enhancing the safety of electric vehicles (EVs). To maximize their performance, solid electrolytes must possess ionic conductivity comparable to, or even superior to, liquid electrolytes. However, ion movement in solid materials is considerably more complex and slower than in liquids, making the understanding of superionic conduction a long-standing challenge. This discovery from Japan sheds light on this fundamental scientific problem, enabling the rational design of high-performance solid electrolytes.

Strategic Significance & Outlook

The elucidation of the fundamental mechanism of superionic conduction will have immeasurable impact on the future research and development of all-solid-state batteries and energy conversion materials. Based on this knowledge, researchers and engineers will be able to intentionally design ion conduction pathways and develop novel solid electrolyte materials with even higher ionic conductivity than previously thought possible. This is expected to further improve the energy density, power, and cycle life of solid-state batteries, accelerating the adoption of EVs, expanding renewable energy integration, and fostering the creation of new energy conversion technologies. This Japanese research stands to make a significant contribution to global efforts toward a sustainable energy society, setting new benchmarks for materials innovation.

Source: <https://www.asiaresearchnews.com/content/how-ions-flow-liquid-through-solid-crystal>

Collected: July 17, 2026 | Automated Research System (Gemini API)

#17 Succinic Anhydride Effectively Suppresses Dendrite Growth in Lithium Metal Anodes, Improving Solid-State Battery Cycle Life

Published July 09, 2026 ResearchGate International



OVERVIEW

Succinic Anhydride has been identified as an effective deposition-regulating additive to suppress dendrite formation, a critical challenge for lithium metal anodes. This additive strengthens the solid electrolyte interphase (SEI) layer on the lithium anode, effectively blocking dendrite growth. Furthermore, it forms a uniform interfacial layer on Ni-rich NCM cathodes, significantly improving the overall battery cycle life. This breakthrough is vital for enhancing the safety and durability of all-solid-state lithium metal batteries.

Key Findings

To mitigate lithium dendrite growth, a persistent challenge hindering the commercialization of all-solid-state lithium metal batteries, researchers have successfully demonstrated the high efficacy of succinic anhydride as a deposition-regulating additive. This additive effectively reinforces the chemical and mechanical stability of the solid electrolyte interphase (SEI) layer formed on the lithium anode surface, thereby blocking pathways for dendrite proliferation. Consequently, it suppresses dendrite formation and, by creating a uniform and stable interfacial layer even with Ni-rich NCM cathodes, significantly improves the battery's overall cycle life. This marks a groundbreaking discovery that enhances both the safety and durability of all-solid-state lithium metal batteries.

Technical / Clinical Details

When added in small quantities to the electrolyte, succinic anhydride plays a crucial role in controlling the electrodeposition behavior of lithium metal. As lithium ions deposit onto the anode surface, succinic anhydride contributes to forming a more compact, uniform, and stable SEI layer. This reinforced SEI layer reduces the heterogeneous deposition sites that act as 'seeds' for lithium dendrite growth and serves as a physical barrier to prevent dendrite penetration. Moreover, on the Ni-rich NCM cathode side, the additive forms a stable protective layer at the interface with the electrolyte, suppressing cathode degradation and enhancing the overall stability and reversibility of the battery. This allows for long-term charge-discharge cycling while maintaining high capacity, ultimately improving battery durability.

Background & Context

Lithium metal anodes offer a theoretical capacity more than ten times higher than current graphite anodes in lithium-ion batteries, making them indispensable for achieving high energy density in all-solid-state batteries. However, the formation of lithium dendrites during charge cycles poses significant safety and durability issues, leading to short circuits, capacity degradation, and even thermal runaway, which has long been the greatest barrier to practical implementation. The discovery of succinic anhydride demonstrates the potential to effectively resolve this severe dendrite problem with relatively simple modifications to existing material systems, carrying immense significance for accelerating the commercialization of all-solid-state batteries.

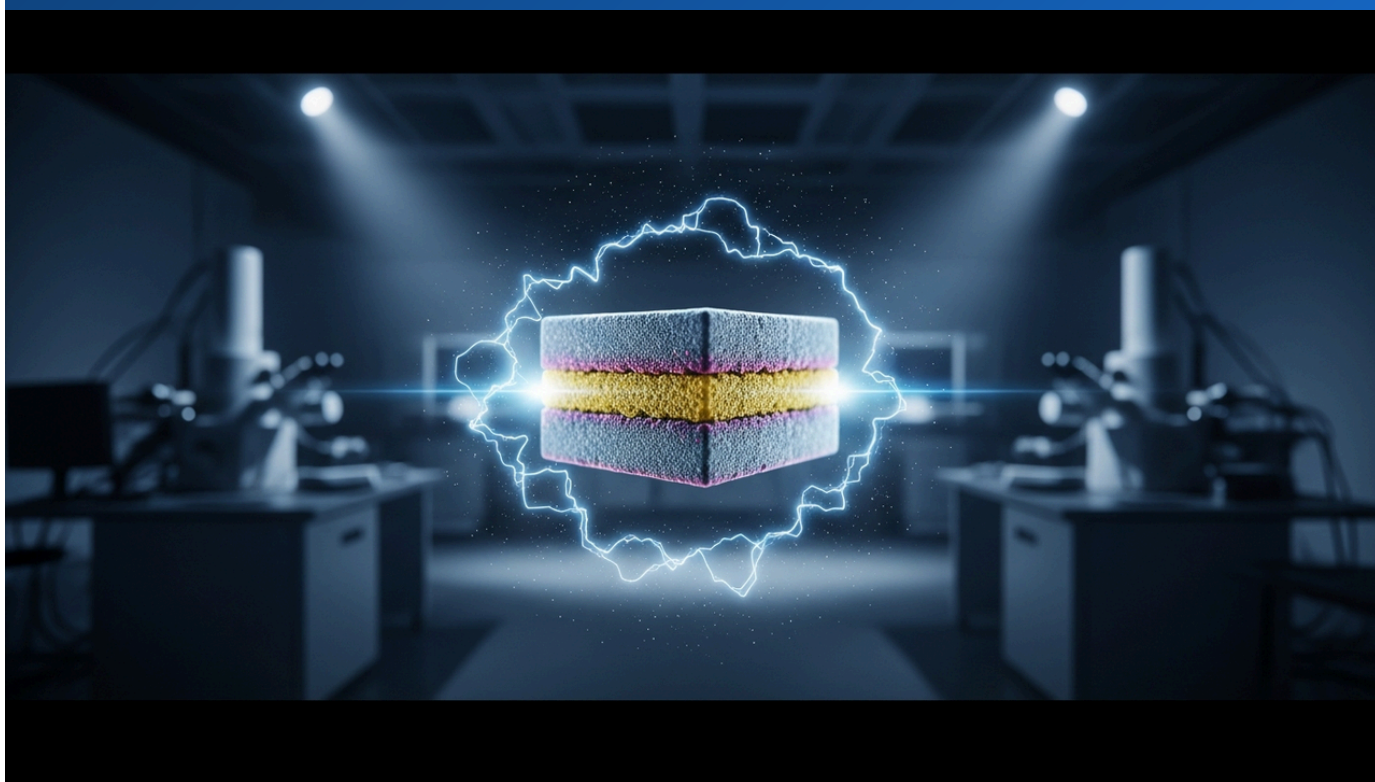
Strategic Significance & Outlook

This approach, utilizing succinic anhydride as an additive, is anticipated for integration into the manufacturing processes of all-solid-state lithium metal batteries due to its simplicity and high effectiveness. Future focus will be on assessing the versatility of succinic anhydride across various solid electrolyte systems and battery configurations, its cost and scalability for mass production, and long-term reliability evaluations in actual electric vehicle (EV) environments. Widespread adoption of this technology is expected to accelerate the proliferation of safer, longer-lasting, and higher-performance all-solid-state batteries, contributing significantly to the growth of the EV market, the development of renewable energy storage systems, and the realization of a sustainable society.

Source: https://www.researchgate.net/publication/353251594_Succinic_Anhydride_as_a_Deposition-Regulating_Additive_for_Dendrite-Free_Lithium_Metal_Anodes

#18 Argonne Lab Unveils 1-Nanometer Magnesium Oxide Coating: A Breakthrough for Sulfide Solid Electrolyte Stability

Published July 16, 2026 Argonne National Laboratory USA



OVERVIEW

Researchers at Argonne National Laboratory have identified and validated a 1-nanometer-thick magnesium oxide (MgO) protective coating that significantly enhances the chemical stability of sulfide-based solid electrolytes. This ultrathin coating effectively suppresses undesirable interfacial reactions with lithium metal, improving solid-state battery performance and longevity. The discovery was enabled by an integrated computational and experimental approach, offering a faster, more predictive pathway for advanced battery material discovery.

Key Findings

Scientists at Argonne National Laboratory have achieved a significant breakthrough in solid-state battery technology by identifying and validating a 1-nanometer-thick magnesium oxide (MgO) protective coating for sulfide-based solid electrolytes. This ultrathin coating effectively overcomes the inherent chemical fragility of sulfide electrolytes, which typically react adversely at interfaces with lithium metal. The successful implementation of this nanocoating demonstrably improves both the performance and cycle life of solid-state batteries, marking a critical step towards their commercial viability. This innovation was driven by a novel, integrated approach combining advanced computational and experimental methodologies.

Technical Details

Sulfide solid electrolytes are highly promising for next-generation batteries due to their excellent ionic conductivity, but their chemical instability when in direct contact with lithium metal anodes has posed a major hurdle. The Argonne team initially employed extensive first-principles calculations to screen a vast array of candidate materials capable of forming stable interfaces with both sulfide electrolytes and lithium metal. Magnesium oxide emerged as the most promising candidate. Subsequently, researchers experimentally validated this finding by successfully depositing an extremely thin, 1-nanometer layer of MgO onto the sulfide solid electrolyte. This MgO coating functions by blocking electron transport at the interface while allowing unimpeded lithium ion diffusion, thereby preventing electrolyte decomposition. This mechanism leads to significantly extended battery life and enhanced cycling stability.

Background & Context

Solid-state batteries are widely regarded as a potential successor to conventional lithium-ion technology, offering superior energy density, enhanced safety, and extended lifespan. Sulfide-based electrolytes have garnered particular attention due to their high ionic conductivity. However, the interfacial stability challenge with lithium metal anodes has been a bottleneck for practical applications. Previous attempts to stabilize this interface often involved thicker layers or complex manufacturing processes. Argonne's discovery provides a pathway to resolving this issue with an ultrathin coating, potentially simplifying manufacturing processes and reducing production costs, which are critical factors for mass commercialization.

Strategic Significance & Outlook

The integrated computational and experimental materials discovery framework pioneered by Argonne National Laboratory is a game-changer, significantly reducing the time and cost typically associated with battery material R&D. Beyond the immediate impact of the MgO coating, this methodology offers a powerful tool for rapidly identifying and developing other high-performance, stable solid electrolytes and electrode materials in the future. Further development and scaling of this technology are expected to accelerate the commercialization of sulfide-based all-solid-state batteries, paving the way for their widespread adoption in electric vehicles, grid-scale energy storage, and other demanding applications.

Source: <https://www.anl.gov/article/from-computation-to-coating-argonne-accelerates-search-for-solidstate-battery-materials>

#19 ACS Paper: Li-Al-Si-Zn Alloy Anode Achieves Ultra-Rapid Charging and Extended Life in All-Solid-State Batteries, Retaining 80% Capacity After 2050 Cycles

Published July 09, 2026 ACS Sustainable Chemistry & Engineering USA



OVERVIEW

A quaternary Li-Al-Si-Zn (ASZ@Li) alloy anode has been developed, enabling ultra-rapid charging for all-solid-state batteries through a multiphase electron-ion co-conductive network. A full cell with a Ni90 cathode demonstrated ultra-rapid charge-discharge (72 seconds at 50 C) with 105.6 mAh g⁻¹ capacity and exceptional durability, maintaining 80% capacity after 2,050 cycles at 20 C. This study highlights the synergistic effects of different phases in the anode for improved interfacial stability and Li-ion diffusion.

Key Findings

A novel lithiophilic quaternary Li-Al-Si-Zn (ASZ@Li) alloy anode has been developed, dramatically advancing the charging speed and durability of all-solid-state batteries (ASSBs). This alloy creates a unique multiphase electron-ion co-conductive network, facilitating ultra-rapid charging capabilities. In a full cell configuration paired with a Ni90 cathode, it achieved an astonishingly fast charge-discharge in just 72 seconds at a 50 C rate, delivering a capacity of 105.6 mAh g⁻¹. Furthermore, the battery demonstrated unprecedented cycling durability, retaining 80% of its initial capacity after an impressive 2,050 cycles at a 20 C rate.

Technical Details

Conventional solid-state batteries have faced significant challenges, including the instability of lithium metal anodes, dendrite growth, and high interfacial resistance during high-rate charging. The newly developed ASZ@Li alloy anode addresses these issues by combining lithium (Li), aluminum (Al), silicon (Si), and zinc (Zn) to form multiple crystalline phases within the anode. These phases collectively establish a network that efficiently conducts both electrons and ions, promoting uniform lithium ion diffusion across the anode surface. Crucially, this multiphase structure effectively suppresses lithium dendrite formation and significantly improves interfacial stability between the electrode and the solid electrolyte. This allows for both high-current-density, ultra-rapid charging and extended cycle life.

Background & Context

With the rapid expansion of the electric vehicle (EV) market, there is an increasing demand not only for extended driving range but also for ultra-rapid charging capabilities that rival the refueling times of gasoline-powered vehicles. Current lithium-ion batteries struggle with high-rate charging due to issues like lithium dendrite formation and thermal runaway, posing safety risks. All-solid-state batteries are considered the ultimate solution to these challenges, but developing anode materials that can combine high-rate charging performance with long cycle life has been a critical hurdle. The ASZ@Li alloy anode presented in this research represents a significant breakthrough, substantially advancing the practical implementation of ASSBs.

Strategic Significance & Outlook

This Li-Al-Si-Zn alloy anode technology offers a transformative solution for achieving both ultra-rapid charging and long cycle life in all-solid-state batteries. The demonstrated performance, including 72-second charge-discharge at 50 C and 80% capacity retention after 2,050 cycles, has the potential to revolutionize the EV charging experience, dramatically improving user convenience. Beyond EVs, this technology is also highly promising for other high-power and high-reliability applications such as drones and industrial robotics. The next steps for commercialization will involve optimizing manufacturing costs and establishing large-scale production processes for this advanced anode material.

Source: <https://pubs.acs.org/doi/abs/10.1021/acssuschemeng.6c03084>

Collected: July 17, 2026 | Automated Research System (Gemini API)

#20 Max Planck Institute Uncovers Hydrostatic Pressure as Key to Dendrite Fracture, While Chinese Firms Accelerate Solid-State Battery Production

Published July 11, 2026 El Debate スペイン



OVERVIEW

New research from the Max Planck Institute for Sustainable Materials has overturned a long-held belief, identifying hydrostatic pressure within lithium dendrites as the primary cause of solid electrolyte fracture, not lithium accumulation at grain boundaries. This discovery promises new strategies for dendrite suppression, a critical hurdle for solid-state batteries. Meanwhile, major Chinese players like CATL, BYD, and GAC are aggressively advancing production, with GAC aiming for high-capacity solid-state cell mass production between 2027 and 2030, signaling an imminent market shift.

Background

All-solid-state batteries are at the forefront of global competition, promising significant advancements in electric vehicle (EV) range, safety, and performance. However, a major hurdle to their commercialization and long-term stability has been the formation of lithium dendrites, needle-like structures that can penetrate solid electrolytes, leading to short circuits and battery degradation. Effective dendrite suppression technologies are therefore paramount for realizing the full potential of this next-generation battery chemistry.

Globally, research and development in solid-state batteries are intensifying, with China emerging as a significant player. Leveraging robust government support and aggressive corporate investments, Chinese companies are rapidly accelerating both R&D and manufacturing capacity in this critical sector. Industry giants like CATL and BYD, already global powerhouses in conventional battery production, are heavily invested, as is major automotive manufacturer GAC, which is also pursuing substantial in-house battery technology development.

Key Scientific Discovery: Hydrostatic Pressure in Dendrite Fracture

In a pivotal breakthrough, researchers at the Max Planck Institute for Sustainable Materials have fundamentally altered our understanding of how lithium dendrites damage solid electrolytes. Challenging long-held assumptions, their work demonstrates that the primary mechanism for electrolyte fracture is not, as previously thought, stress concentration from lithium accumulation at grain boundaries—the interfaces between crystalline grains. Instead, the Max Planck team revealed that the dominant factor is the “self-pressure,” or hydrostatic pressure, generated *within* the growing lithium metal crystals as the dendrite penetrates the solid electrolyte.

This internal pressure, exerted by the expanding dendrite itself, creates insidious microcracks within the electrolyte, which eventually propagate and lead to short circuits and battery degradation. This groundbreaking insight not only necessitates a re-evaluation of current dendrite suppression strategies—moving beyond simple physical blocking—but also opens entirely new avenues for innovative material designs and sophisticated interfacial engineering. These new approaches could focus on controlling the internal structure and growth behavior of dendrites, specifically targeting the mitigation of this newly identified hydrostatic pressure generation.

The Chinese Manufacturing Push

While scientific understanding progresses, the industrial landscape for solid-state batteries is undergoing rapid transformation, particularly in China. Major Chinese players like CATL, BYD, and GAC are aggressively accelerating their solid-state battery production initiatives. GAC, a prominent automotive manufacturer, has notably completed a high-capacity solid-state cell production line, with ambitious targets for mass production between 2027 and 2030.

This aggressive ramp-up by Chinese firms underscores a critical shift: solid-state batteries are no longer a distant theoretical technology but a tangible product poised for market introduction within the next few years. GAC's ambitious mass production timeline of 2027-2030 is set to not only redefine performance and safety benchmarks for electric vehicles but also significantly intensify competition across the global EV market. This rapid scaling of manufacturing capacity signals a profound commitment to leading the next generation of battery technology.

Strategic Significance & Outlook

The Max Planck Institute's scientific discovery is a significant stride forward, deepening our fundamental understanding of the lithium dendrite challenge. This newfound knowledge is crucial for developing far more effective and targeted dendrite suppression strategies, which will directly enhance the safety, longevity, and overall reliability of solid-state batteries. By revealing the true mechanism of fracture, researchers can now design materials and interfaces that specifically counteract hydrostatic pressure, rather than merely attempting to block dendrite growth.

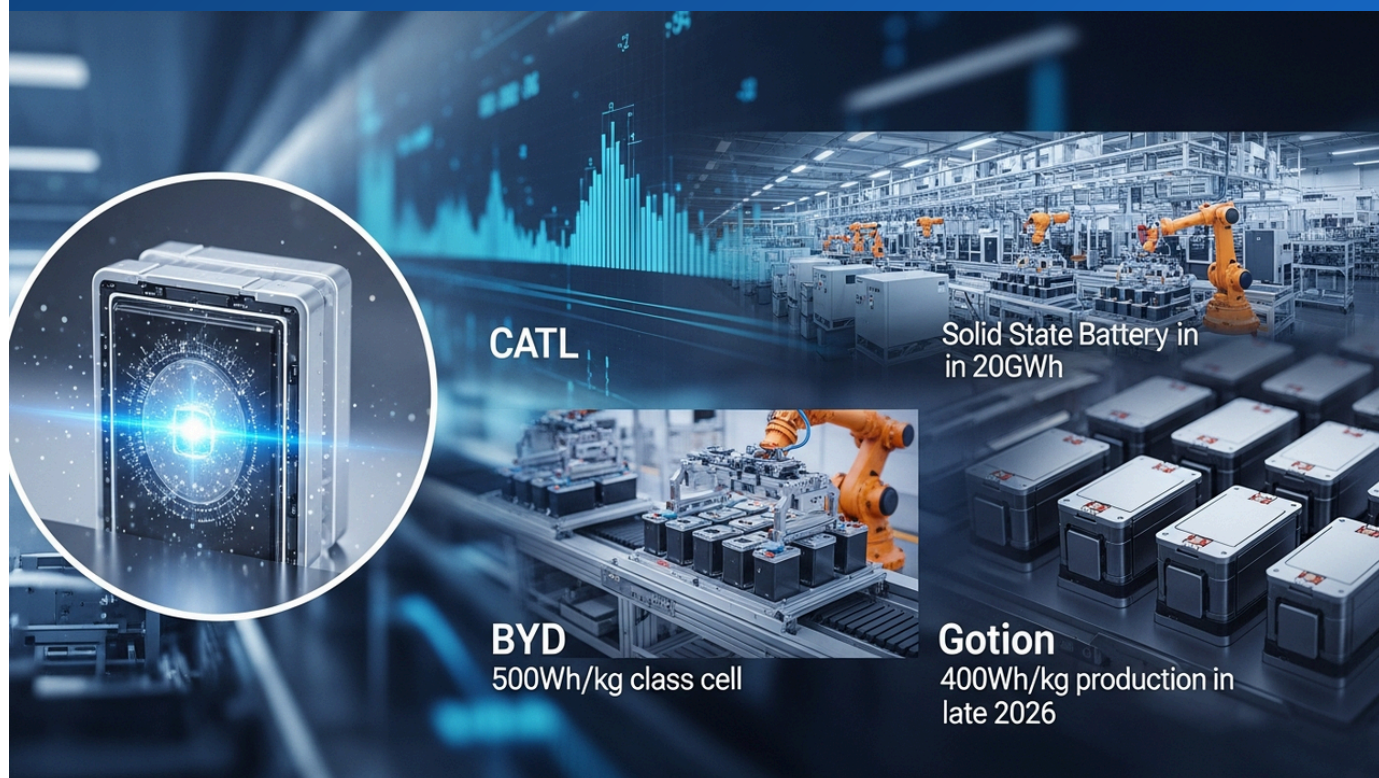
Concurrently, the aggressive manufacturing push from Chinese companies, highlighted by GAC's 2027-2030 mass production target, indicates that solid-state batteries are on a fast track to commercial viability. This dual progress—breakthrough science enabling better design, combined with rapid industrial scaling—is poised to have a profound impact on the entire battery industry. It promises to accelerate the global transition towards sustainable mobility by delivering higher-performing, safer electric vehicles and establishing new competitive landscapes for battery manufacturers worldwide.

Source: <https://en.hwlibre.com/Solid-state-batteries%3A-science-solves-the-dendrite-problem-while-China-accelerates-production/>

Collected: July 17, 2026 | Automated Research System (Gemini API)

#21 China Unifies Solid-State Battery Definition as CATL Targets 500Wh/kg Samples, BYD Plans 20GWh Line, and Gotion Commences 400Wh/kg Cell Production in Late 2026

Published July 15, 2026 All-About-Industries China



OVERVIEW

China has unified its solid-state battery definition, with CATL developing sulfide solid-state cells exceeding 500 Wh/kg for small-series production in 2027. BYD plans a 20 GWh production line in Q3 2026, and Gotion High-Tech anticipates small-scale production of 400+ Wh/kg cells by late 2026. While many projects are still in pilot or testing phases, true solid-state batteries are expected for limited commercial applications around 2030.

Key Findings

China has made significant strides in the solid-state battery sector this year, with leading battery manufacturers actively pursuing commercialization strategies. CATL has developed sulfide-based solid-state cells boasting an energy density exceeding 500 Wh/kg, targeting small-series production by 2027. BYD has announced plans to launch a 20 GWh production line in Q3 2026, while Gotion High-Tech expects to commence small-scale production of 400+ Wh/kg cells by late 2026. These developments underscore China's strong ambition to lead globally in solid-state battery technology.

Technical Details

CATL's sulfide-based solid-state cells, with their remarkable energy density exceeding 500 Wh/kg, hold the potential to drastically extend the driving range of electric vehicles (EVs). Sulfide electrolytes are considered highly promising candidates for high-performance solid-state batteries due to their excellent ionic conductivity and relatively favorable mechanical properties. BYD's planned 20 GWh production line aims to establish substantial battery manufacturing capacity, accelerating market supply. Gotion High-Tech's 400+ Wh/kg cells represent a significant performance upgrade over current lithium-ion batteries and are poised to elevate the standards for next-generation EV batteries. These technologies are designed to surpass conventional batteries in terms of safety, energy density, and charging speed.

Background & Context

Globally, as the transition to electric vehicles accelerates, battery technology has become a critical component of national strategies. The Chinese government is vigorously promoting domestic companies to gain a leading edge in solid-state battery technology, supported by substantial R&D investments and policy backing. Companies like CATL, BYD, and Gotion High-Tech are leveraging this favorable policy environment to enhance their competitiveness in the global market. However, the article emphasizes that many projects are still in pilot or testing phases, projecting that limited commercial deployment of "true solid-state batteries" (zero liquid electrolyte) will occur around 2030. This suggests a realistic timeline and acknowledges the complex technical challenges involved.

Strategic Significance & Outlook

The aggressive development and production plans for solid-state batteries by Chinese companies are expected to have a profound impact on the global EV and battery markets. Specifically, the realization of high-performance solid-state batteries could enable electric vehicles to offer driving ranges and charging times comparable to gasoline cars, further accelerating EV adoption. The commencement of small-scale production from late 2026 to 2027 indicates increasing technological maturity, with subsequent transitions to large-scale production drawing significant attention. However, reducing production costs and further validating safety and reliability will be crucial challenges for the widespread commercialization of "true solid-state batteries."

Source: <https://www.all-about-industries.com/china-what-may-be-called-a-solid-state-battery-a-4b88ecc2d3010cab8c1a2d78f46c29dd/>

Collected: July 17, 2026 | Automated Research System (Gemini API)

#22 AZoM Reports Thiourea Coating Boosts Lithium-Rich Cathode Capacity Retention to 97% After 600 Cycles, Revolutionizing Solid-State Battery Performance

Published July 16, 2026 AZoM Unknown



OVERVIEW

Researchers have developed a thiourea-derived coating for lithium-rich manganese oxide (LRMO) cathodes, significantly improving their performance in solid-state batteries. This surface engineering method achieved an initial discharge capacity of 220.2 mAh g^{-1} and an outstanding 97% capacity retention after 600 cycles at 1C in lab-scale half-cells. The coating forms a sulfur-rich outer layer for chemical protection and a manganese-rich spinel layer for 3D Li-ion diffusion, enhancing interfacial stability and ion transport.

Key Findings

Researchers have developed a novel thiourea-derived coating technology that dramatically improves the performance of lithium-rich manganese oxide (LRMO) cathodes used in solid-state batteries. Applying this advanced surface engineering method resulted in an initial discharge capacity of 220.2 mAh g^{-1} in laboratory-scale half-cell tests. Crucially, the cells demonstrated an exceptionally high capacity retention of 97% after 600 cycles at a 1C rate. This breakthrough represents a significant step forward for the long-term stability and practical application of all-solid-state batteries.

Technical Details

Lithium-rich manganese oxide (LRMO) is a promising next-generation cathode material due to its high energy density, but it has been challenged by capacity degradation and voltage fade during cycling. Specifically, parasitic side reactions and structural changes at the interface with solid electrolytes have been major contributors to performance loss. The newly developed thiourea coating creates a dual-layer structure on the LRMO cathode surface. First, a sulfur-rich outer layer acts as a chemical protective barrier, suppressing undesirable reactions with the electrolyte. Beneath this, a manganese-rich spinel layer forms, which provides a three-dimensional pathway for efficient lithium ion diffusion. This combined action enhances interfacial stability and maintains the structural integrity of the cathode material, leading to superior capacity retention and stable cycling performance.

Background & Context

With increasing demand for electric vehicles (EVs) and portable electronic devices, there is a growing need for batteries with higher energy density, longer lifespan, and enhanced safety. LRMO cathodes have been extensively studied as a promising alternative to existing nickel-rich cathodes due to their high lithium storage capacity. However, their cycle stability issues have hampered widespread adoption. In the context of all-solid-state battery applications, interfacial stability between the solid electrolyte and cathode is paramount. This thiourea coating technology successfully unlocks the full potential of LRMO cathodes, marking a significant advancement towards the commercialization of solid-state batteries.

Strategic Significance & Outlook

This thiourea coating technology is a powerful tool for significantly improving the performance of lithium-rich cathodes and accelerating the practical application of all-solid-state batteries. The high capacity retention of 97% expands its applicability for long-life EVs and industrial applications requiring frequent charge-discharge cycles. Future challenges will involve scaling up this coating technology and establishing cost-effective manufacturing methods for commercialization. This breakthrough sets a new direction for next-generation battery material development and is expected to contribute to the realization of a sustainable energy society.

Source: <https://www.azom.com/news.aspx?newsID=65626>

Collected: July 17, 2026 | Automated Research System (Gemini API)

#23 Volt Coffer Reports European & Asia-Pacific Automakers Accelerate Solid-State Battery Deployment, Targeting Doubled EV Range and 40+ Minute Drone Flights

Published July 10, 2026 Volt Coffer Unknown



OVERVIEW

Volt Coffer reports that major automotive players in Europe and Asia-Pacific are accelerating solid-state battery deployments, aiming to double EV range by 2025-2030 through initiatives like pilot lines and roll-to-roll manufacturing. Beyond EVs, prototype solid-state batteries enable UAVs to achieve over 40-minute flight durations. Challenges, however, persist in overcoming interfacial issues and enhancing ionic conductivities.

Key Findings

According to a report from Volt Coffer, leading automotive manufacturers in Europe and the Asia-Pacific region are rapidly accelerating their efforts to deploy all-solid-state batteries (SSBs), with a strategic goal of doubling electric vehicle (EV) ranges by the 2025-2030 timeframe. This ambitious push is being driven by concrete manufacturing initiatives, including the establishment of pilot production lines and the adoption of advanced roll-to-roll manufacturing techniques. The application of SSB technology extends beyond the automotive sector, showing significant progress in aerospace, where prototype solid-state batteries have enabled unmanned aerial vehicles (UAVs) to achieve flight durations exceeding 40 minutes.

Technical Details

All-solid-state batteries represent a next-generation technology that replaces liquid electrolytes with solid materials, inherently enhancing battery safety, energy density, and lifespan. The expectation is that significantly higher energy density will lead to a substantial increase in EV driving ranges. Roll-to-roll manufacturing is a continuous process that coats materials onto flexible substrates, making it well-suited for cost reduction and large-scale production of SSBs. In aerospace, the application to UAVs maximizes the benefits of SSBs, as high energy density and lightweight design directly translate to extended flight times. However, persistent technical challenges remain in forming stable interfaces between dissimilar materials and further enhancing ionic conductivity within solid electrolytes.

Background & Context

Against the backdrop of global decarbonization efforts and the rapid growth of the EV market, improving battery performance is a paramount concern for the automotive industry. Conventional lithium-ion batteries, which rely on liquid electrolytes, are approaching their limits in terms of safety and energy density, making the transition to SSBs an imperative. Europe and the Asia-Pacific region are key drivers of EV market growth, and manufacturers in these regions are at the forefront of SSB development. Companies are accelerating R&D investments and focusing on establishing production technologies to bring these batteries to market sooner.

Strategic Significance & Outlook

The global race toward commercializing all-solid-state batteries is set to intensify further. The achievement of the 2025-2030 targets set by automakers will dramatically boost EV competitiveness and accelerate consumer adoption. The success in the UAV sector demonstrates that SSBs can create significant value in niche markets beyond EVs. The remaining challenges of interfacial issues and improving ionic conductivity are expected to be overcome through interdisciplinary collaboration and the development of novel electrolyte compositions. If these hurdles are cleared, SSBs are poised to not only be an evolution in battery technology but a revolution across fundamental societal sectors, including transportation, aerospace, and energy infrastructure.

Source: <https://www.voltcoffer.com/the-global-race-for-solid-state-battery-supremacy/>

Collected: July 17, 2026 | Automated Research System (Gemini API)

#24 MG (SAIC) to Launch PHEVs with 'SolidCore' Semi-Solid-State Batteries in 2027, Aiming for Enhanced Efficiency and Extended Range in Extreme Temperatures

Published July 09, 2026 Electrek China



OVERVIEW

MG (SAIC) announced plans to integrate its 'SolidCore' semi-solid-state battery technology into three new plug-in hybrid SUVs, starting with the MG ZS PHEV in 2027, following mass production of semi-solid EVs like the MG4. MG's semi-solid-state batteries are engineered for improved energy conversion efficiency, faster power response, and extended range and charging speeds in extreme temperatures compared to conventional liquid-electrolyte batteries.

Key Findings

Chinese automaker MG (SAIC) has unveiled plans to introduce three new plug-in hybrid SUVs (PHEVs) in 2027, which will feature the company's proprietary 'SolidCore' semi-solid-state battery technology. This announcement follows the successful mass production of semi-solid-state electric vehicles (EVs) such as the MG4, demonstrating a strategic extension of their battery innovation. MG's SolidCore semi-solid-state batteries are specifically designed to deliver enhanced energy conversion efficiency, faster power response, and significantly improved range and charging speeds under extreme temperature conditions, both cold and hot, compared to conventional liquid-electrolyte batteries.

Technical Details

MG's SolidCore semi-solid-state battery represents a hybrid technology that aims to enhance safety and performance by replacing a portion of the liquid electrolyte with a solid electrolyte. This technology reduces fire risk due to less liquid electrolyte content and leverages the solid electrolyte's mechanical strength and stability. The improvement in performance under extreme temperatures is particularly critical for addressing challenges faced by many EVs. In cold conditions, liquid electrolyte viscosity often increases, leading to performance degradation; semi-solid technology mitigates this effect, enabling more stable low-temperature operation. In hot conditions, the solid electrolyte provides thermal stability, maintaining high efficiency while preventing battery overheating. This ensures the battery functions optimally across a wider operating temperature range, enhancing the user experience.

Background & Context

Plug-in hybrid electric vehicles (PHEVs) continue to hold a significant position in the automotive market as they combine the flexibility of an internal combustion engine with the benefits of electric propulsion, offering extended range and EV-only driving capabilities. Advancements in battery technology are key to improving PHEV's EV driving range, fuel efficiency, and overall environmental performance. MG's adoption of semi-solid-state batteries for PHEVs indicates that this technology is an effective solution for enhancing performance and safety across diverse electrified vehicle types, not just pure EVs. Chinese automakers are leading the world in battery technology innovation, and MG's SolidCore technology is a prime example of this trend.

Strategic Significance & Outlook

MG's plan to introduce PHEVs equipped with SolidCore semi-solid-state batteries in 2027 signifies the impact of evolving battery technology on the PHEV market. The enhanced performance in extreme temperatures will be a significant advantage for consumers in colder regions or fleet vehicles operating in high-temperature environments. This will further boost the appeal of PHEVs, potentially capturing demand from consumers hesitant to fully transition to EVs. MG's success is likely to encourage other automakers to accelerate the adoption of semi-solid-state batteries across their electrified vehicle lineups, further stimulating technological innovation and market competition within the broader battery industry.

Source: <https://electrek.co/2026/07/09/mg-launch-first-ph-ev-with-semi-solid-state-batteries-2027/>

Collected: July 17, 2026 | Automated Research System (Gemini API)

#25 Honda Develops Novel Dendrite Suppression Method for Solid-State Batteries, Achieving Cost Reduction and Extended Lifespan with Thin Plastic Barrier and Roll-Press Manufacturing

Published July 15, 2026 Top Speed Japan



OVERVIEW

Honda has reportedly developed a breakthrough method to prevent dendrite growth in solid-state battery technology. Their solution involves placing a thin plastic barrier where lithium crystals would otherwise form, maintaining electrical flow while significantly extending battery life. Additionally, Honda is adopting a roll-pressing assembly method to improve manufacturing efficiency and reduce production costs.

Key Findings

Honda has reportedly achieved a significant breakthrough in solid-state battery technology by developing a novel method to prevent the formation of lithium dendrites, a long-standing challenge. This innovative solution involves strategically placing a thin plastic barrier at sites where lithium crystals would otherwise nucleate and grow. This barrier effectively inhibits dendrite formation while preserving efficient electrical flow, thereby substantially extending battery lifespan. Furthermore, Honda is implementing a roll-pressing method for battery assembly, aiming to enhance manufacturing efficiency and reduce overall production costs.

Technical Details

Lithium dendrites are a major threat to the safety and lifespan of next-generation batteries utilizing lithium metal anodes, particularly solid-state batteries. These tree-like structures can grow to penetrate the electrolyte, leading to internal short circuits. Honda's newly developed thin plastic barrier functions by physically impeding the non-uniform nucleation and growth of lithium crystals as lithium ions pass through the solid electrolyte and deposit onto the anode. This barrier is precisely engineered to maintain ionic conductivity while effectively suppressing dendrite propagation. Concurrently, the roll-pressing assembly method involves precisely and uniformly laminating and compressing electrode and solid electrolyte sheets. This technique reduces interfacial resistance, minimizes poor contact between electrodes, and improves manufacturing yield, ultimately contributing to reduced production costs and enhanced product quality and consistency.

Background & Context

With the growth of the electric vehicle (EV) market, there is an increasing demand for batteries with high energy density, fast charging capabilities, and exceptional safety. All-solid-state batteries are considered the most promising technology to meet these demands, but the dendrite problem and high manufacturing costs have been significant barriers to their commercialization. For a major automotive manufacturer like Honda, developing proprietary battery technology is crucial for stabilizing the supply chain, differentiating its products, and accelerating its electrification strategy. This breakthrough addresses core challenges of solid-state batteries, bolstering Honda's electric vehicle roadmap.

Strategic Significance & Outlook

Honda's new dendrite suppression method and the adoption of roll-press manufacturing represent critical advancements towards the commercialization of solid-state batteries. Resolving the dendrite issue will dramatically improve battery safety and reliability, further accelerating EV adoption. Enhancing manufacturing efficiency and reducing costs will enable solid-state batteries to be introduced to the market at more accessible price points, boosting competitiveness. Honda is already collaborating with QuantumScape on solid-state battery development, and combining this with their proprietary technology is expected to lead to the integration of high-performance, safe solid-state batteries into Honda EVs in the late 2020s to early 2030s. This technology is poised to be a key enabler for accelerating the electrification future of the automotive industry.

Source: <https://www.topspeed.com/the-honda-solid-state-battery-breakthrough/>

Collected: July 17, 2026 | Automated Research System (Gemini API)

#26 ACS Paper: Spin-Coated Asymmetric Ultrathin Salt-Rich Composite Polymer Electrolyte Achieves 82.5% Capacity Retention After 500 Cycles in Lithium Metal Batteries

Published July 09, 2026 ACS Applied Materials & Interfaces USA



OVERVIEW

This research details a spin-coated asymmetric high-salt polymer electrolyte for solid-state lithium metal batteries, designed for high energy density and enhanced safety. Featuring a PVDF framework, a sulfolane-containing PEO/LiTFSI-rich cathode-side layer, and dispersed LLTO fillers, the electrolyte optimizes Li^+ transference (0.78) and suppresses dendrite growth. Full cells demonstrated 82.5% capacity retention after 500 cycles with nearly 100% Coulombic efficiency.

Key Findings

A novel asymmetric ultrathin salt-rich composite polymer electrolyte (CPE) has been developed via spin coating for solid-state lithium metal batteries, combining high energy density with enhanced safety. This electrolyte features a polyvinylidene fluoride (PVDF) framework, a sulfolane-containing polyethylene oxide (PEO)/lithium bis(trifluoromethanesulfonyl)imide (LiTFSI)-rich layer on the cathode side, and dispersed lithium lanthanum titanate (LLTO) fillers. This sophisticated design optimizes the Li^+ transference number to an impressive 0.78 and effectively suppresses dendrite growth. As a result, full cells exhibited 82.5% capacity retention after 500 cycles with nearly 100% Coulombic efficiency.

Technical Details

Conventional polymer electrolytes have faced challenges related to low room-temperature ionic conductivity and interfacial instability with lithium metal. The CPE developed in this study addresses these issues through several key features. Firstly, the PVDF framework provides mechanical strength and thermal stability to the electrolyte. Secondly, the incorporation of a high salt concentration (PEO/LiTFSI) and sulfolane on the cathode side enhances Li^+ dissociation and conductivity. Sulfolane offers excellent high-voltage stability, while LiTFSI contributes to high ionic conductivity. Furthermore, LLTO nanoparticles act as fillers, boosting Li^+ conduction pathways within the polymer matrix and physically suppressing dendrite growth. This asymmetric and layered structure promotes uniform lithium ion distribution at the electrode interfaces, reducing interfacial resistance, and thereby achieving high efficiency and long-life battery performance.

Background & Context

Lithium metal batteries are highly anticipated for applications in electric vehicles (EVs) and aerospace due to their significantly higher energy density (potentially up to 500 Wh/kg) compared to current lithium-ion batteries. However, major barriers to their practical implementation include the formation of dendrites on the lithium metal anode, leading to short circuits and safety hazards, as well as high interfacial resistance between solid electrolytes and electrodes. Polymer electrolytes are promising due to their flexibility and simpler manufacturing processes, but improvements in performance and stability have been crucial. This research presents a novel approach to overcoming these challenges by combining asymmetric design with advanced materials engineering.

Strategic Significance & Outlook

The spin-coated asymmetric ultrathin high-salt CPE holds significant potential to accelerate the commercialization of high-energy-density and safe all-solid-state lithium metal batteries. The achievement of 82.5% capacity retention after 500 cycles and nearly 100% Coulombic efficiency is critical for extending EV ranges and enhancing the reliability of battery lifespans. Spin coating is a relatively low-cost method capable of forming large-area thin films, which is advantageous for scaling up manufacturing processes and reducing costs. Future research will focus on further optimizing this technology and its integration into practical battery packs for widespread adoption.

Source: <https://pubs.acs.org/doi/10.1021/acsami.6c08312>

Collected: July 17, 2026 | Automated Research System (Gemini API)

#27 Samsung SDI Announces 2027 Solid-State Battery Mass Production Plan, Targeting Robotics, AAM, and Drone Markets for Initial Penetration

Published July 13, 2026 The Elec Inc. South Korea



OVERVIEW

Samsung SDI announced plans for mass production of solid-state batteries in 2027, showcasing robotic and EV applications at InterBattery 2026. While offering high energy density and safety, solid-state batteries face high manufacturing costs due to expensive materials like lithium sulfide and complex production processes. Consequently, early adoption is anticipated in high-performance, cost-insensitive sectors such as robotics, advanced air mobility (AAM) aircraft, and drones.

Key Findings

Samsung SDI has unveiled ambitious plans to commence mass production of all-solid-state batteries (SSBs) by 2027. At InterBattery 2026, the company presented its vision for utilizing this cutting-edge technology across a range of applications, including robotics and electric vehicles (EVs). While solid-state batteries offer significantly higher energy density and superior safety advantages compared to existing lithium-ion batteries, they currently face high manufacturing costs due to expensive materials like lithium sulfide and complex production processes. Consequently, early adoption is projected to occur in high-performance, cost-insensitive sectors such as robotics, advanced air mobility (AAM) aircraft, and drones.

Technical Details

The all-solid-state batteries under development by Samsung SDI fundamentally eliminate the risk of thermal runaway and fire by replacing liquid electrolytes with non-flammable solid electrolytes. This dramatically enhances battery safety. Moreover, solid electrolytes are highly compatible with lithium metal anodes, which are key to achieving high energy density. However, the high cost is primarily driven by expensive solid electrolyte materials like lithium sulfide, and the intricate process technology required for large-scale manufacturing while minimizing interfacial resistance between solid components. Samsung SDI is intensifying its R&D efforts in both materials science and manufacturing engineering to overcome these challenges, focusing particularly on electrode-electrolyte stacking technologies and interface control.

Background & Context

As electric vehicles become more widespread, battery safety and performance improvements are paramount. All-solid-state batteries are hailed as the "holy grail" of battery technology, promising extended driving ranges, faster charging times, and above all, superior safety, thus potentially accelerating EV adoption. However, cost and the establishment of mass production technology remain significant hurdles, influencing the pace of commercialization. Samsung SDI, as a global battery manufacturer, announcing concrete mass production plans signals that solid-state battery technology is maturing and making substantial progress towards industrial application. The strategy to target high-value applications as initial markets is a realistic approach, considering the current technological maturity and cost challenges.

Strategic Significance & Outlook

Samsung SDI's plan to begin mass production of solid-state batteries in 2027 will have a significant impact on the global battery market, particularly the EV sector. The initial application in robotics, AAM, and drones will provide opportunities for solid-state batteries to demonstrate their superior performance and safety, thereby building technological confidence. Success in these niche markets will further mature the technology, enabling its gradual expansion into broader markets such as electric vehicles. If further reductions in manufacturing costs and scalability are achieved, solid-state batteries are expected to become a mainstream battery technology, playing a crucial role in accelerating a future of sustainable mobility and energy storage.

Source: <https://www.thelec.net/news/articleView.html?idxno=12197>

#28 Tattu Unveils Revolutionary Semi-Solid State Battery for Industrial Drones: 350 Wh/Kg, 1200+ Cycles, Enhanced Safety and Flight Time via Dual Electrolyte Innovation

Published July 16, 2026 Tattu China



OVERVIEW

Tattu has unveiled a revolutionary semi-solid-state battery for commercial drones, boasting an energy density of 350 Wh/Kg and over 1,200 charge cycles. This is achieved through dual electrolyte innovations, including solid-state electrolyte coatings and in-situ gel electrolyte solidification, which minimize liquid electrolyte usage and effectively suppress dendrite growth. These advancements extend drone flight durations and significantly enhance safety.

Key Findings

Tattu has unveiled a groundbreaking semi-solid-state battery specifically designed for the commercial drone market. This new battery boasts an impressive energy density of 350 Wh/Kg and an extended lifespan exceeding 1,200 charge cycles. These performance metrics are achieved through innovative "dual electrolyte innovations," which include solid-state electrolyte coatings and in-situ gel electrolyte solidification. This technology minimizes the use of liquid electrolyte and effectively suppresses dendrite growth, thereby extending drone flight durations and substantially enhancing both safety and reliability.

Technical Details

Commercial drones demand long flight times, high power output, and reliable operation in diverse and often harsh environments. Conventional liquid-electrolyte lithium-ion batteries have inherent limitations in safety (fire risk) and energy density. Tattu's semi-solid-state battery addresses these challenges by employing a "dual electrolyte innovation." Firstly, a thin solid-state electrolyte coating is applied to electrode surfaces, suppressing parasitic side reactions at the interface and preventing dendrite nucleation. Secondly, a small amount of liquid electrolyte within the cell is solidified in-situ into a gel, maintaining flexibility while ensuring high ionic conductivity. This dual approach minimizes liquid electrolyte content, dramatically improving thermal stability and significantly reducing the risk of leakage and fire. The result is a high energy density of 350 Wh/Kg and a lifespan of over 1,200 cycles, which drastically improves drone operational efficiency and safety.

Background & Context

The commercial drone market is rapidly expanding across various sectors, including logistics, inspection, agriculture, and disaster response. These applications require longer flight times, greater payload capacities, and stable operation under extreme temperatures, which existing battery technologies have struggled to fully meet. Semi-solid-state batteries are emerging as a pragmatic solution to significantly surpass current lithium-ion battery performance, particularly as all-solid-state batteries still face challenges in large-scale production. Tattu's announcement is a significant example of how advancements in battery technology are broadening the possibilities within the drone industry.

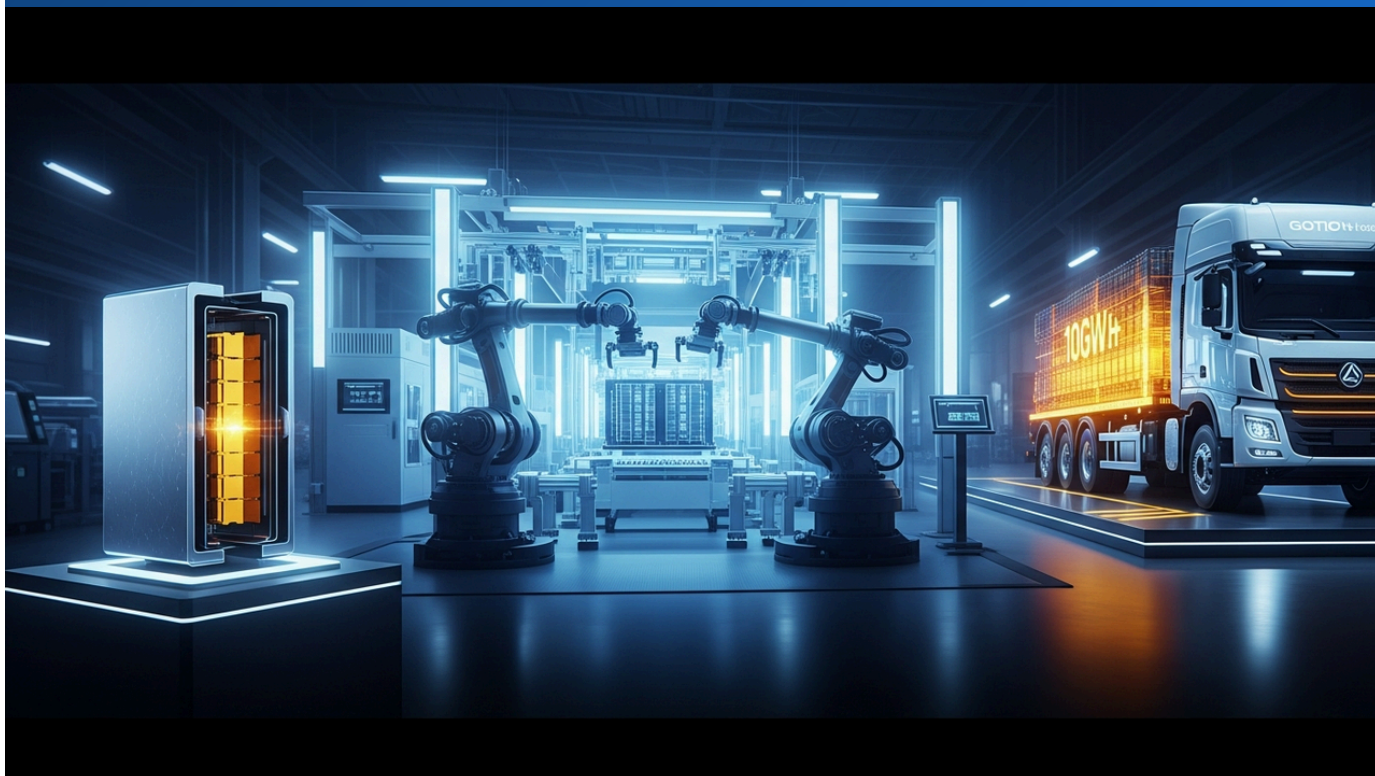
Strategic Significance & Outlook

The semi-solid-state battery unveiled by Tattu is poised to bring a significant transformation to the commercial drone market. Its 350 Wh/Kg energy density and 1,200+ cycle life will substantially extend drone flight ranges and reduce operational costs by decreasing the need for frequent battery replacements. Enhanced safety could also contribute to more relaxed regulations for drone operations in urban and hazardous areas. Moving forward, Tattu is expected to further evolve this technology and integrate it into a diverse range of industrial drone platforms, accelerating the creation of new services and business models powered by drones. This will significantly contribute to the growth and development of the entire commercial drone industry.

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

#29 Gotion High-Tech's Semi-Solid-State Battery Passes Extreme Tests, Four Overseas Plants Begin Production; Partnership with SANY Group Targets Over 10GWh for Trucks

Published July 14, 2026 Gasgoo China



OVERVIEW

Gotion High-Tech's semi-solid-state batteries have passed extreme tests, and the company has begun production at four overseas plants. This follows a partnership with SANY Group to supply over 10GWh for heavy-duty trucks. While Gotion is advancing semi-solid-state mass production, full mass production of all-solid-state batteries remains a future prospect, with the company currently focusing on LFP and hybrid technologies.

Key Findings

Gotion High-Tech has announced that its semi-solid-state batteries have successfully passed rigorous extreme tests, and the company has commenced production at four overseas plants. This initiative is part of a strategic partnership with SANY Group, aiming to supply over 10GWh of batteries specifically for heavy-duty trucks. While Gotion is actively advancing mass production of its semi-solid-state batteries, the company positions full mass production of all-solid-state batteries as a future prospect, currently focusing its primary efforts on lithium iron phosphate (LFP) and hybrid battery technologies.

Technical Details

Gotion High-Tech's semi-solid-state batteries represent a hybrid technology designed to enhance safety and performance by replacing a portion of the liquid electrolyte with a solid electrolyte. This approach reduces the risk of thermal runaway by minimizing liquid content, while the solid electrolyte contributes to mechanical stability and dendrite suppression. The extreme tests include a series of stringent evaluations for battery safety and durability, such as overcharge, over-discharge, short circuit, high/low temperatures, and physical impact. Successfully passing these tests indicates the high reliability of Gotion's semi-solid-state batteries across a wide range of operating conditions. The partnership with SANY Group specifically targets commercial vehicles, particularly heavy-duty trucks, which demand high power output and exceptional durability.

Background & Context

With the growth of the electric vehicle (EV) market, innovation in battery technology is a pressing need. In the commercial vehicle sector, in particular, higher energy density, safety, and durability are critical requirements. While full all-solid-state batteries are considered the ultimate goal, their current technical challenges and manufacturing costs make semi-solid-state batteries a pragmatic bridge technology between existing lithium-ion batteries and future all-solid-state solutions. Chinese battery manufacturers, strongly supported by the government, are global leaders in this field, and Gotion High-Tech is a key player. Its current strategy, leveraging cost-effective and safe LFP batteries alongside versatile hybrid technologies, is both realistic and robust.

Strategic Significance & Outlook

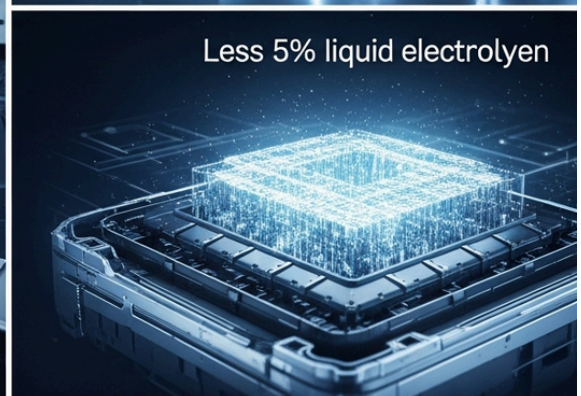
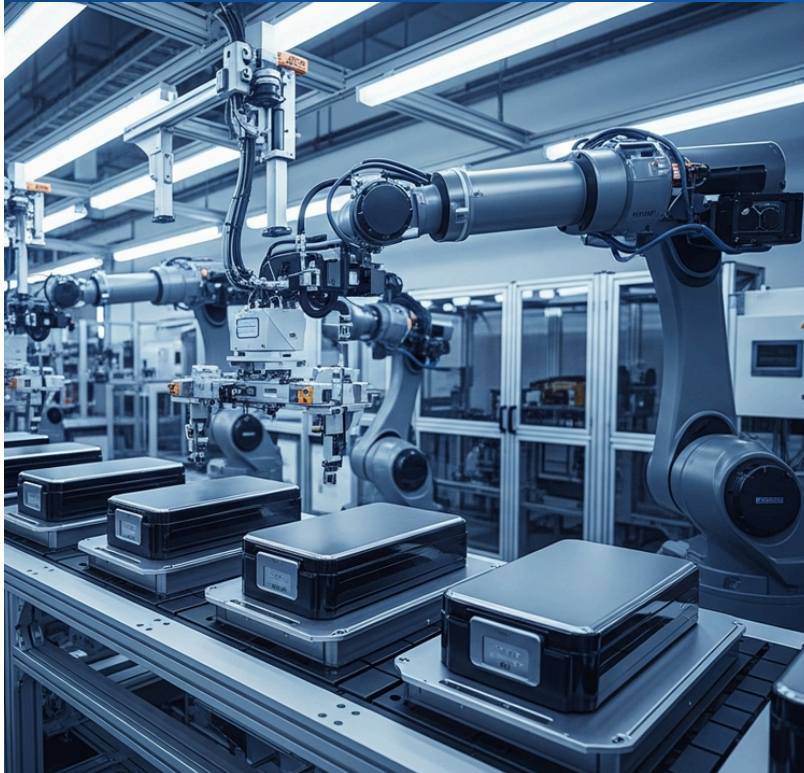
Gotion High-Tech's commencement of semi-solid-state battery production and its entry into the heavy-duty truck market through the SANY Group partnership will contribute significantly to the acceleration of commercial vehicle electrification. Large trucks have high demands for battery capacity and durability, so success in this market will widely validate the technology's reliability. Production at four overseas plants strengthens Gotion's global expansion strategy and enhances its competitiveness in international markets. Moving forward, continued improvement and cost reduction in semi-solid-state battery technology are expected to drive its adoption across a broader EV market. Furthermore, the knowledge and technology gained from current semi-solid-state development will form a crucial foundation when Gotion eventually transitions to full mass production of all-solid-state batteries.

Source: <https://autonews.gasgoo.com/articles/ev/gotions-semi-solid-state-battery-passes-extreme-tests-four-overseas-plants-begin-production-2077006817534980097>

Collected: July 17, 2026 | Automated Research System (Gemini API)

#30 China Enacts National Solid-State Battery Standard: Defines 'All-Solid-State' as Under 5% Liquid Electrolyte, Dongfeng and Doctex Commission GWh-Scale Factories for EV Integration

Published July 13, 2026 Asia Financial China



OVERVIEW

China's new national standard for solid-state batteries, effective July 1, 2026, defines an "all-solid-state" automotive cell as having less than 5% liquid electrolyte mass after a 6-hour vacuum chamber test at 120°C. Following this, Doctex has commissioned a GWh-scale factory in Tianjin producing certified 350 Wh/kg solid-state cells for immediate vehicle deployment. Dongfeng Motor is also advancing its 0.2 GWh manufacturing plant for integrating oxide-polymer hybrid cells into vehicles in H2 2026.

Key Findings

China has implemented a new national standard for solid-state batteries, effective July 1, 2026. This standard precisely defines an "all-solid-state" automotive cell as one retaining less than 5% liquid electrolyte mass after a 6-hour vacuum chamber test at 120°C. In response to this regulation, Doctex has commissioned a GWh-scale factory in Tianjin, which is already producing certified solid-state cells with an energy density of 350 Wh/kg for immediate deployment in electric vehicles. Concurrently, Dongfeng Motor is advancing its 0.2 GWh manufacturing plant, with plans to integrate oxide-polymer hybrid cells into its vehicles during the second half of 2026.

Technical Details

The new national standard aims to prevent the misuse of the term "solid-state battery" and provide a clear definition based on actual performance and safety. The criterion of less than 5% liquid electrolyte content is a crucial indicator for distinguishing these advanced batteries from conventional liquid-electrolyte lithium-ion batteries and promoting truly solid-state technologies. The 350 Wh/kg cells produced by Doctex's factory achieve energy densities comparable to or exceeding current high-performance lithium-ion batteries, enabling extended-range EVs. Dongfeng Motor's oxide-polymer hybrid cells combine the high ionic conductivity of oxide solid electrolytes with the flexibility of polymers, aiming to reduce interfacial resistance and simplify manufacturing. Both technologies significantly enhance battery safety and reliability, reducing the risk of thermal runaway.

Background & Context

China is strategically focused on battery technology innovation to establish its global leadership in the electric vehicle (EV) market. While solid-state batteries are anticipated to improve EV range, charging speed, and safety, their definitions and quality standards have been unclear. The implementation of this national standard reflects the government's strong commitment to preventing market confusion and fostering healthy technological competition. The acceleration of battery production and EV integration by companies like Doctex and Dongfeng Motor clearly demonstrates China's leading position in the commercialization of solid-state batteries globally.

Strategic Significance & Outlook

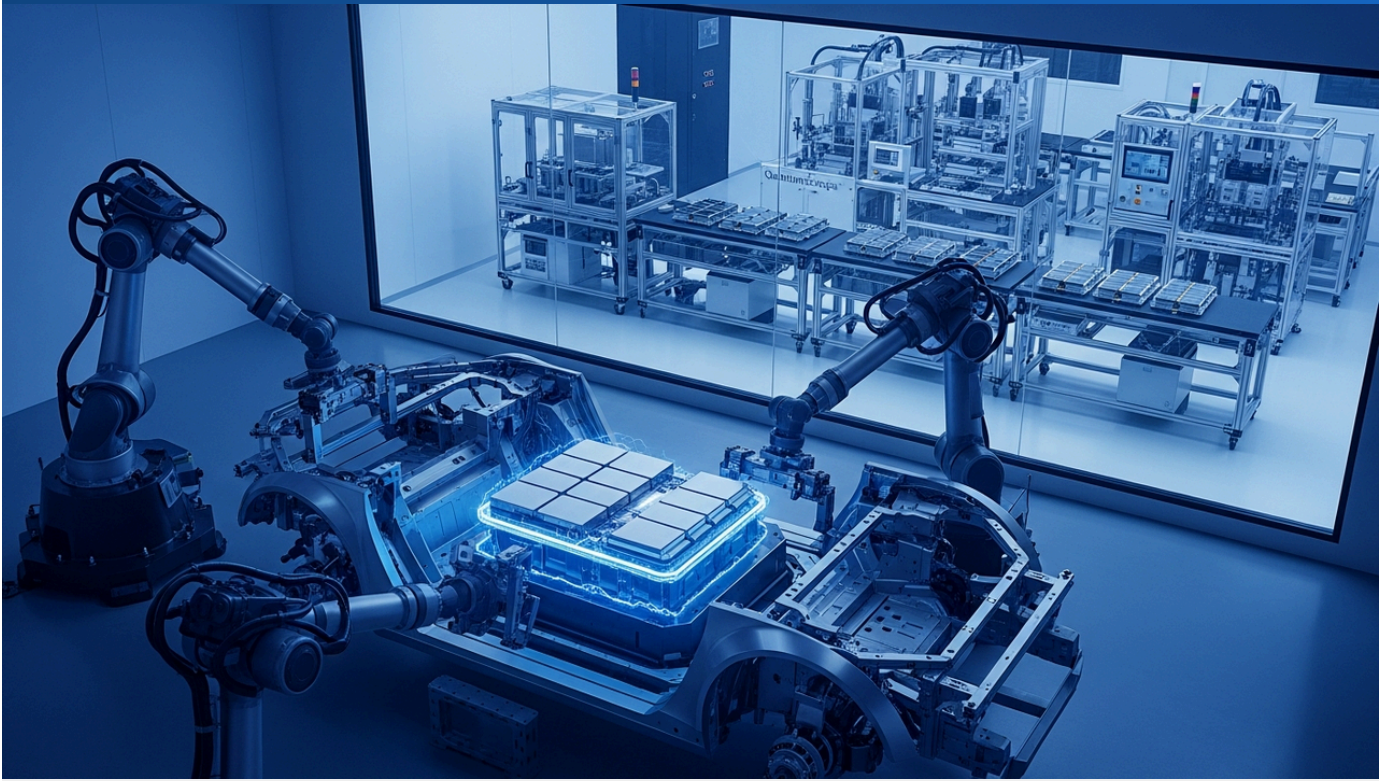
China's new national solid-state battery standard will have a profound impact on the global battery industry. Clear definitions will enable consumers and automakers to select more reliable solid-state battery products. The commissioning of GWh-scale factories by Doctex and Dongfeng Motor and their immediate integration into EVs indicate that solid-state batteries are no longer a distant future technology but are rapidly becoming a tangible reality. This will further elevate EV performance and safety standards, intensifying market competition. China's actions are expected to encourage similar standardization and commercialization efforts in other countries, serving as a critical driving force for accelerating the future of sustainable mobility.

Source: <https://carnewschina.com/2026/07/13/chinas-new-solid-state-law-takes-effect-dongfeng-leads-solid-state-battery-factory-race/>

Collected: July 17, 2026 | Automated Research System (Gemini API)

#31 QuantumScape Partners with Honda on Solid-State Batteries, Initiates Pilot Production in San Jose to Enhance EV Range and Safety

Published July 15, 2026 Atlas EV Hub USA



OVERVIEW

QuantumScape has partnered with Honda for the development and manufacturing processes of solid-state batteries for EV applications, commencing production at its pilot manufacturing facility in San Jose. Solid-state batteries hold the potential for longer driving ranges, faster charging, and safer operations by utilizing a solid electrolyte. However, challenges in durability, cost, and scalability persist.

Key Findings

QuantumScape, a leading company in solid-state battery technology, has entered into a strategic partnership with Honda, a major Japanese automaker, for the development and manufacturing processes of solid-state batteries for electric vehicle (EV) applications. Concurrently, QuantumScape has initiated production at its solid-state pilot manufacturing facility in San Jose. Solid-state batteries, by replacing liquid electrolytes with solid electrolytes, hold the potential to extend EV driving ranges, accelerate charging speeds, and significantly enhance safety. This marks a crucial step towards the practical implementation of next-generation EV batteries.

Technical Details

QuantumScape's solid-state battery technology features a ceramic-based solid electrolyte. This solid electrolyte not only conducts lithium ions but also functions as a separator, preventing physical short circuits between electrodes. The absence of liquid electrolytes dramatically reduces the risk of battery fires, thereby enhancing safety. Furthermore, solid electrolytes are highly compatible with lithium metal anodes, offering the potential for significantly higher energy densities (e.g., over 500 Wh/kg) than existing lithium-ion batteries, which can lead to a substantial increase in EV driving range. The partnership with Honda is focused on developing manufacturing processes to adapt QuantumScape's innovative cell technology to automotive-grade requirements and enable large-scale production.

Background & Context

The electric vehicle market is growing rapidly, and consumers are demanding higher-performing and safer batteries. Current lithium-ion batteries are nearing their performance limits in terms of range, charging time, and safety. Solid-state batteries are anticipated as the "ultimate battery" to address these challenges, attracting substantial R&D investments from automakers and battery companies worldwide. QuantumScape leads the industry with its dendrite-free technology and high-performance solid electrolytes, and partnerships with automotive giants like Honda are crucial for accelerating the market introduction of this technology.

Strategic Significance & Outlook

The partnership between QuantumScape and Honda, along with QuantumScape's initiation of pilot manufacturing, provides a concrete pathway for bringing solid-state batteries to market. This will enable EVs to achieve longer ranges, faster charging speeds, and superior safety, further enhancing their competitiveness against gasoline vehicles. However, as the article points out, durability, manufacturing costs, and the scalability to mass production remain significant challenges for solid-state batteries. Continuous R&D and technological innovation to overcome these hurdles will be key for solid-state batteries to become a mainstream battery technology. Successful implementation of this technology is expected to have a profound impact not only on the automotive industry but also on energy storage, aerospace, and many other sectors.

Source: <https://www.atlasevhub.com/weekly-digest/battery-innovation-is-amping-up/>

Collected: July 17, 2026 | Automated Research System (Gemini API)

#32 China Nationalizes Solid-State Battery Development with CASIP Program: CATL Targets 500Wh/kg Samples, Chinese Academy of Sciences Unveils 451.5Wh/kg Prototype with Over \$830M Investment

Published July 12, 2026 Youtube (Channel: "Tech of Future") China



OVERVIEW

China's CASIP program unites major companies like CATL and BYD with universities and government agencies to accelerate solid-state battery development, investing over \$830 million. CATL entered trial production of 20 Ah solid-state samples in late 2024, targeting 500 Wh/kg, while the Chinese Academy of Sciences unveiled a prototype with 451.5 Wh/kg. This initiative aims for Chinese leadership in EV battery technology by focusing on sulfide-based solid-state batteries for their high energy density and improved safety.

Key Findings

China has made solid-state battery development a core national strategy through its CASIP (China Automotive Solid-State Battery Industrialization Promotion) program, funneling over \$830 million into a robust ecosystem integrating major corporations like CATL and BYD with universities and government agencies. Under this program, CATL initiated trial production of 20 Ah solid-state battery samples in late 2024, aiming for an ambitious energy density target of 500 Wh/kg. Furthermore, the Chinese Academy of Sciences has already unveiled a solid-state battery prototype achieving an impressive 451.5 Wh/kg. This concerted effort is focused on sulfide-based solid-state batteries, with the overarching goal of establishing China's global leadership in EV battery technology through superior energy density and enhanced safety.

Technical Details

The CASIP program specifically prioritizes the development of sulfide-based solid-state batteries. Sulfide solid electrolytes are considered highly promising for realizing high-energy-density, fast-charging solid-state batteries due to their excellent ionic conductivity, relatively good mechanical properties, and wide electrochemical window. CATL's 20 Ah samples represent a crucial first step towards cell-level validation for practical applications, with their 500 Wh/kg target representing nearly double the energy density of current top-performing lithium-ion batteries. The 451.5 Wh/kg prototype from the Chinese Academy of Sciences, with its high energy density, holds the potential to significantly extend EV driving ranges and revolutionize conventional EV performance. This technology, by eliminating liquid electrolytes, fundamentally removes the risk of battery thermal runaway, dramatically improving safety.

Background & Context

In an increasingly competitive electric vehicle market, supremacy in battery technology is a critical determinant of a nation's industrial competitiveness. China is aggressively promoting EV adoption and aims to establish global leadership in battery technology, particularly in solid-state batteries. The CASIP program is a comprehensive initiative designed to achieve these national goals, maximizing the speed and efficiency of development by strengthening collaboration between research institutions and industry. The investment exceeding \$830 million underscores China's profound commitment to this sector.

Strategic Significance & Outlook

The national strategic focus on solid-state battery development through China's CASIP program will have an immeasurable impact on the global EV and battery markets. The tangible achievements by CATL and the Chinese Academy of Sciences demonstrate China's steady progress in solid-state battery technology, potentially transforming the competitive landscape of the EV market in the future. Higher energy density and enhanced safety are key to electric vehicles fully surpassing gasoline cars. As these technologies transition to mass production and enter the market, China is poised to establish new standards in EV battery technology and further accelerate the global electrification wave. This is expected to bring about significant changes across the entire automotive industry worldwide.

Source: <https://www.youtube.com/watch?v=NfvZl61mzvs>

#33 SHENGYA Reports Solid-State and Semi-Solid Drone Batteries Improve Extreme Temperature Performance, Enhancing Industrial UAV Flight Time and Safety

Published July 10, 2026 SHENGYA China



OVERVIEW

SHENGYA highlights that solid-state and semi-solid drone batteries perform better in extreme temperatures (cold and hot) due to improved thermal stability and less liquid content. These batteries overcome rapid power loss in cold or overheating in hot conditions, common issues with conventional liquid-based batteries. This enhanced performance is crucial for extending industrial UAV flight durations and significantly improving safety in demanding operational environments.

Key Findings

According to SHENGYA, all-solid-state and semi-solid-state drone batteries demonstrate significantly superior performance in extreme cold and hot environments compared to conventional liquid-electrolyte lithium-ion batteries. These next-generation batteries, with their improved thermal stability and reduced liquid content, overcome critical challenges faced by liquid-based batteries, such as rapid power loss in cold conditions and overheating in high temperatures. This characteristic is paramount for extending the flight durations of industrial unmanned aerial vehicles (UAVs) and substantially enhancing operational safety.

Technical Details

Traditional liquid-electrolyte batteries suffer from significant performance degradation in low-temperature environments, where electrolyte viscosity increases and lithium ion migration slows, leading to higher internal resistance. Conversely, in high-temperature environments, there is an elevated risk of electrolyte decomposition and thermal runaway, raising safety concerns. All-solid-state batteries completely replace liquid electrolytes with solid ones, making them non-flammable and capable of maintaining stable ionic conductivity across a wide temperature range. Semi-solid-state batteries also significantly mitigate these issues by minimizing liquid content. As a result, drones can maintain stable power output and capacity even under extreme weather conditions. Combined with lighter battery packs and increased energy density, this enables longer flights and higher reliability.

Background & Context

The industrial drone market is rapidly expanding across diverse sectors such as surveying, inspection, logistics, agriculture, and disaster relief, all of which demand reliable operation under harsh environmental conditions. Conventional drone batteries have posed significant operational constraints, particularly regarding performance degradation in cold winter conditions or under scorching summer sun. All-solid-state and semi-solid-state battery technologies are key enablers for overcoming these limitations and dramatically expanding the operational range and capabilities of drones, attracting intensive development efforts from research institutions and companies worldwide.

Strategic Significance & Outlook

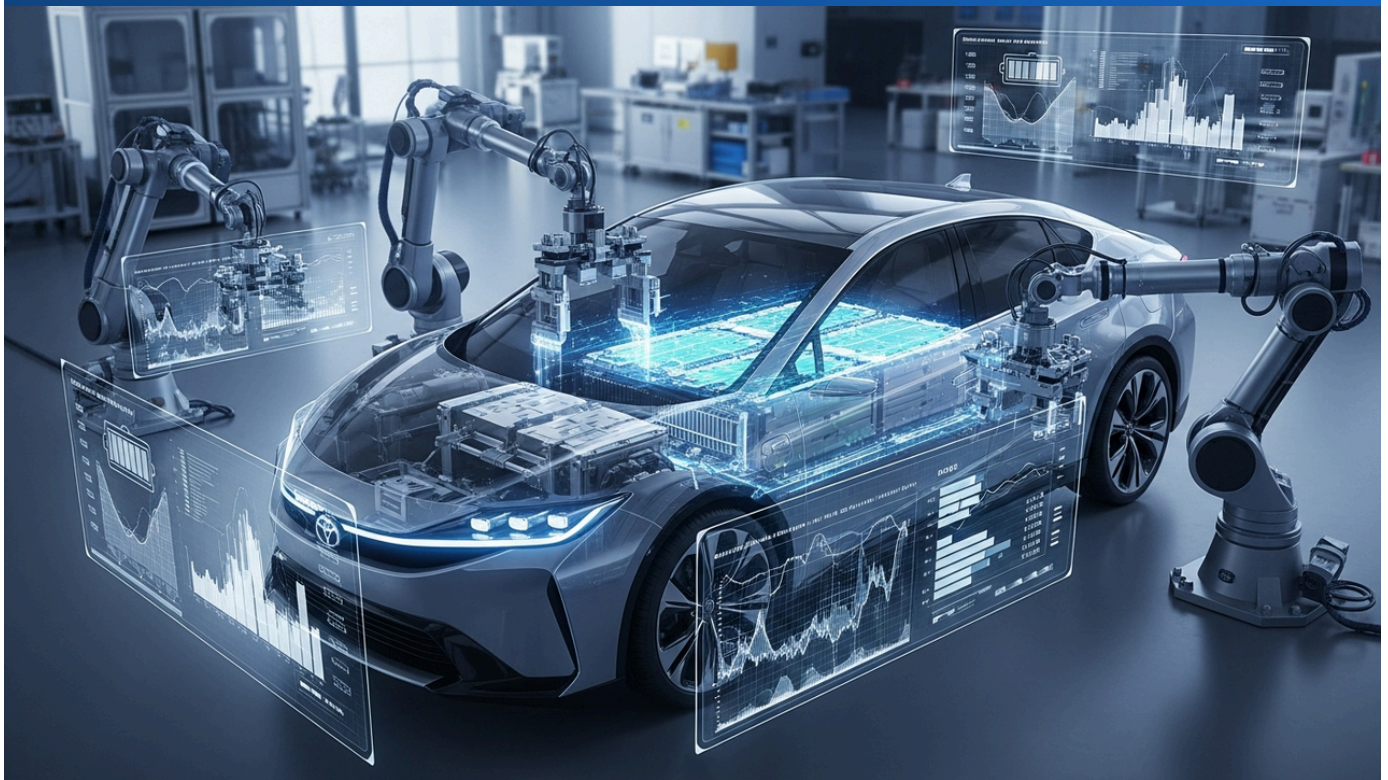
The introduction of all-solid-state and semi-solid-state drone batteries is set to bring about a major transformation in the industrial UAV market. Their superior performance under extreme temperatures will enable drone operations in previously inaccessible regions and environments, creating new business opportunities. Extended flight times and enhanced safety will boost drone operational efficiency and facilitate their application in more complex and mission-critical tasks. As the mass production and cost reduction of these battery technologies progress, the industrial drone market is expected to accelerate further, positively impacting various societal aspects such as logistics efficiency, advanced infrastructure inspection, and enhanced disaster response capabilities.

Source: <https://www.txshengya.com/overcoming-extreme-temperatures-why-industrial-drones-rely-on-solid-state-batteries/>

Collected: July 17, 2026 | Automated Research System (Gemini API)

#34 Toyota Targets 40-Year EV Battery Life with Solid-State Technology: Over 8,000-10,000 Cycles and 1,000km Range Goal

Published July 09, 2026 EVDANCE Japan



OVERVIEW

Toyota claims its developing solid-state battery could last up to 40 years, fundamentally redefining EV manufacturing and ownership. This marks a groundbreaking leap in durability compared to current lithium-ion batteries, which typically retain 90% performance for about 10 years. Toyota aims for increased energy density, enhanced safety, and rapid charging capabilities using sulfide, oxide, or polymer solid electrolytes, though material brittleness, manufacturing complexity, and high costs remain significant hurdles for mass production.

Key Findings

Toyota Motor Corporation has announced that its solid-state battery technology, currently under development, possesses the potential to last for up to 40 years, fundamentally redefining how electric vehicles (EVs) are manufactured and owned. This assertion represents an unprecedented advancement in durability when compared to conventional lithium-ion batteries, which typically maintain 90% of their initial performance for approximately 10 years. Such a long-life battery holds the potential to significantly enhance EV sustainability and economic viability, revolutionizing the user experience.

Technical / Clinical Details

Toyota's solid-state battery technology focuses on replacing existing liquid electrolytes with solid-state alternatives based on sulfide, oxide, or polymer materials. This transition to solid electrolytes is expected to yield higher energy density, enhanced safety through reduced thermal runaway risks, and ultra-fast charging capabilities. Specifically, the company targets an astounding charge-discharge cycle life of 8,000 to 10,000 cycles, implying that the battery could continue functioning well beyond the typical lifespan of a vehicle. This would allow for multiple reuse cycles in second and third-life applications, as well as providing long-term value in energy storage solutions. Theoretical targets suggest a 30-year lifespan, with an ultimate goal of 40 years.

Background & Context

Solid-state battery technology is widely recognized as a 'game-changer' for addressing key challenges in the current EV market, including extending driving range, shortening charging times, and improving safety. Toyota has invested billions of dollars in solid-state battery R&D for over two decades. The company initially projected market introduction dates in 2020, 2023, and 2026, but overcoming technical hurdles for mass production has proven time-consuming, with current targets set for 2027 or 2028 and beyond. Specifically, the brittleness of solid electrolytes, complex manufacturing processes, and high costs remain significant barriers to large-scale production.

Strategic Significance & Outlook

If Toyota's solid-state battery successfully achieves commercialization, it will have a profound impact on EV purchasing cycles, the used car market, and the broader energy storage infrastructure. Long-life batteries could substantially reduce the Total Cost of Ownership (TCO) for vehicles, potentially accelerating EV adoption. However, realizing these revolutionary benefits necessitates overcoming persistent manufacturing challenges and reducing costs to a competitive level. Toyota is expected to leverage partnerships to address these issues and drive the full market introduction of its solid-state battery technology. This innovation has the potential to contribute not only to the EV industry but also to the integration of renewable energy and grid stabilization.

Source: <https://www.evdances.com/blogs/news/toyota-s-solid-state-battery-could-redefine-the-future-of-evs>

Collected: July 17, 2026 | Automated Research System (Gemini API)

#35 Factorial Energy and Tulip Tech Partner for Next-Gen Solid-State Drone Batteries, Boosting Flight Range Over 30%

Published July 13, 2026 Quiver Quantitative / GLOBE NEWSWIRE USA



OVERVIEW

Factorial Energy has formed a strategic partnership with Tulip Tech Group to accelerate the deployment of solid-state and lithium-metal batteries for next-generation drones. Initial customer flight tests demonstrated over a 30% increase in flight range with Factorial's battery technology, proving its superior performance. This collaboration includes a commercialization framework with joint customer engagement and a clear roadmap for mass production, underscoring Factorial's expansion into the aerospace sector.

Key Findings

Factorial Energy has announced a strategic partnership with Tulip Tech Group to accelerate the market deployment of solid-state and lithium-metal batteries for next-generation drones. A key early outcome of this collaboration is the demonstration of over a 30% increase in flight range for drones powered by Factorial's advanced battery technology during customer flight tests, validating its superior performance. This technological breakthrough significantly extends drone operational capabilities and opens new possibilities for commercial and defense applications.

Technical / Clinical Details

Solid-state and lithium-metal batteries developed by Factorial Energy are characterized by high energy density and enhanced safety compared to conventional battery technologies. Optimized for drone applications, these batteries enable longer flight times while maintaining a lightweight profile, thereby improving drone range and payload capacity. The initial test results, showing over a 30% increase in flight distance, underscore tangible benefits for drone operations, allowing for broader surveillance, extended cargo transport, or access to more remote areas. The partnership includes a commercialization framework with joint customer engagement programs and a clear roadmap towards future mass production.

Background & Context

The drone market is rapidly expanding across diverse sectors such as logistics, infrastructure inspection, agriculture, and defense, driving a growing demand for high-performance batteries that enable longer flights and heavier payloads. Factorial Energy is recognized as a pioneer in solid-state battery technology, with its innovations also garnering significant attention in the electric vehicle (EV) sector. This partnership with Tulip Tech Group represents a strategic move for Factorial to expand its technological applications into the aerospace domain, specifically targeting the drone market. Tulip Tech Group brings specialized expertise in drone technology, and the synergistic combination of both companies' strengths is expected to accelerate innovation within the drone industry.

Strategic Significance & Outlook

This strategic partnership holds the potential to fundamentally enhance the performance of next-generation drones. Extended flight range will significantly boost the practicality and market value of drones, leading to the creation of new business models. Factorial Energy is expected to leverage this collaboration to further strengthen its presence in the aerospace sector and ultimately promote diverse industrial applications of its battery technology. The existence of a clear roadmap for mass production indicates that this technology is not merely at a research stage but is poised for significant market entry in the near future, becoming an indispensable component for the sustained growth of the drone industry.

Source: <https://www.globenewswire.com/news-release/2026/07/13/3326060/0/en/factorial-and-tulip-seal-strategic-partnership-after-successful-flight-test.html>

Collected: July 17, 2026 | Automated Research System (Gemini API)

#36 SwRI and SMU Launch Joint Research to Address Solid-State Battery Interface Degradation, Pursuing Long-Life, High-Efficiency Designs

Published July 16, 2026 Southwest Research Institute (SwRI) USA



OVERVIEW

Southwest Research Institute (SwRI) and Southern Methodist University (SMU) have initiated a collaborative research project aimed at advancing solid-state battery technology. This partnership seeks to develop safer, longer-lasting, and more efficient solid-state batteries as an alternative to conventional lithium-ion cells. Given that electrode-electrolyte interface degradation over time significantly constrains current solid-state designs, the research team will focus on developing more stable architectural solutions, with potential to accelerate commercialization in electric vehicles.

Key Findings

The Southwest Research Institute (SwRI) and Southern Methodist University (SMU) have launched a new collaborative research project with the goal of achieving groundbreaking advancements in solid-state battery technology. This partnership is focused on developing solid-state batteries that are safer, longer-lasting, and more efficient than current lithium-ion counterparts, for a wide range of applications, including electric vehicles (EVs). A critical limitation in existing solid-state battery designs is the degradation of the interface between electrodes and solid electrolytes over time; consequently, this collaboration aims to address this issue by developing more stable design architectures.

Technical / Clinical Details

One of the most significant technical challenges in maximizing the performance and extending the practical lifespan of solid-state batteries is the stability of the interface between the electrode and the solid electrolyte. At this interface, lithium-ion transport can be hindered, or chemical side reactions can occur, leading to a degradation of battery performance over time. The research team at SwRI and SMU will conduct detailed analyses of these interfacial degradation mechanisms and explore innovative materials and structural designs to suppress them. This may involve, for instance, introducing new interfacial layer materials or optimizing the layered structure of electrodes and electrolytes. The research aims to establish fundamental technologies to significantly enhance battery cycle life and ensure long-term performance stability.

Background & Context

Solid-state batteries are highly anticipated to significantly contribute to extending EV driving range and improving fast-charging capabilities, in addition to offering superior safety due to the absence of flammable liquid electrolytes. This potential has spurred a global race among research institutions and corporations to develop them. SwRI has a strong track record in applied research and engineering, while SMU possesses expertise in fundamental research in materials science and chemistry. The collaboration between these two institutions is expected to foster the integration of fundamental scientific insights with applied technological development, helping to overcome bottlenecks in solid-state battery commercialization.

Strategic Significance & Outlook

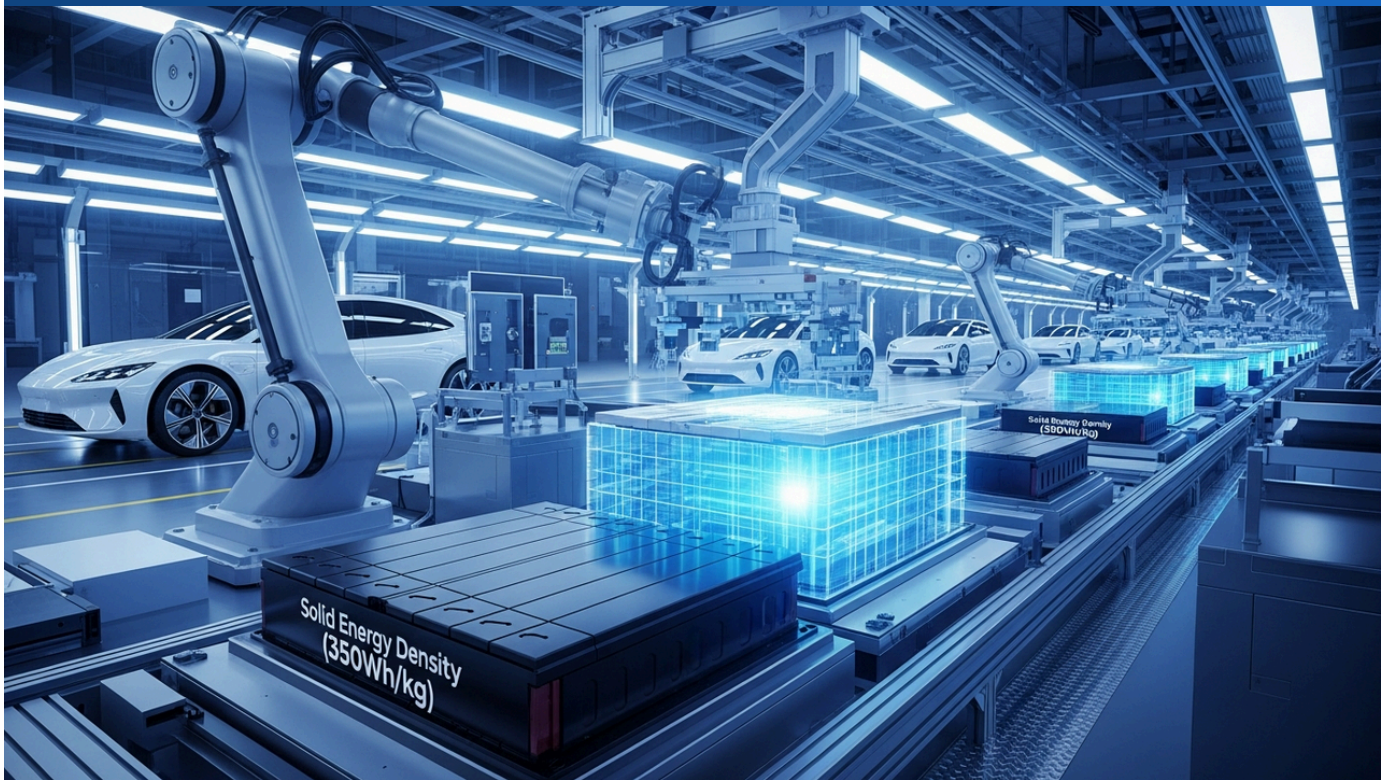
The joint research between SwRI and SMU holds crucial significance for accelerating the commercialization of solid-state batteries. If interfacial degradation issues are resolved and more stable solid-state battery designs are established, it will be possible to meet the demand for high-performance batteries not only in the EV market but also in sectors such as renewable energy storage, aerospace, and defense. In the future, insights gained from this research are expected to contribute to reducing solid-state battery manufacturing costs and developing scalable production technologies, ultimately playing a major role in the widespread adoption of next-generation battery technology. This partnership serves as a model for bridging scientific discovery with industrial application.

Source: <https://www.swri.org/newsroom/press-releases/swri-smu-collaborate-advance-solid-state-batteries>

Collected: July 17, 2026 | Automated Research System (Gemini API)

#37 China's Dongfeng Motor Plans 50,000 Solid-State Battery EV Deliveries by 2027, Achieving 350 Wh/kg Energy Density

Published July 14, 2026 Megaproject China



OVERVIEW

Chinese automaker Dongfeng Motor announced an ambitious plan to deliver 50,000 electric vehicles (EVs) equipped with its proprietary solid-state battery technology by 2027. Ahead of this, approximately 100 demonstration vehicles are scheduled for production by the end of 2026. The core solid-state battery boasts an energy density of 350 Wh/kg and successfully completed winter testing in January 2026. This technology is expected to be integrated into the first vehicles in Q4 2026, marking a significant step by a Chinese company towards mass production of solid-state batteries.

Key Findings

Dongfeng Motor, a major Chinese automaker, has set a groundbreaking target to deliver a total of 50,000 electric vehicles (EVs) equipped with its proprietary solid-state battery technology by 2027. Preceding this large-scale deployment, approximately 100 demonstration vehicles are scheduled for test production and validation by the end of 2026. Central to this initiative is a solid-state battery that has achieved a high energy density of 350 Wh/kg, having successfully completed rigorous winter testing in January 2026. This announcement highlights a significant move by a Chinese enterprise, demonstrating a concrete roadmap and progress towards the mass production of solid-state batteries.

Technical / Clinical Details

The solid-state battery developed by Dongfeng Motor achieves a high energy density of 350 Wh/kg, which will enable a significant extension of EV driving range compared to conventional liquid-electrolyte lithium-ion batteries. The company reported that it successfully completed stringent winter testing in January 2026 to verify the reliability and durability of this battery technology. The battery is believed to employ an oxide-polymer hybrid electrolyte, balancing high safety and performance. In the fourth quarter of 2026, this new solid-state battery is expected to be integrated into the first demonstration vehicles, initiating comprehensive real-world performance evaluations. Dongfeng Motor forecasts small-scale mass production by approximately 2030, with large-scale production and market penetration projected from around 2035.

Background & Context

Competition in the electric vehicle (EV) market is intensifying, and battery technology is one of the most critical factors influencing EV performance, cost, safety, and market competitiveness. Solid-state batteries are anticipated as a next-generation technology surpassing existing lithium-ion batteries in terms of high energy density, superior safety, and longer lifespan, driving significant development efforts worldwide from automakers and battery manufacturers. The Chinese government positions the development of the EV industry as a national strategy, vigorously promoting R&D and commercialization of advanced technologies like solid-state batteries. Dongfeng Motor's announcement reflects China's strong intent to establish global leadership in this sector.

Strategic Significance & Outlook

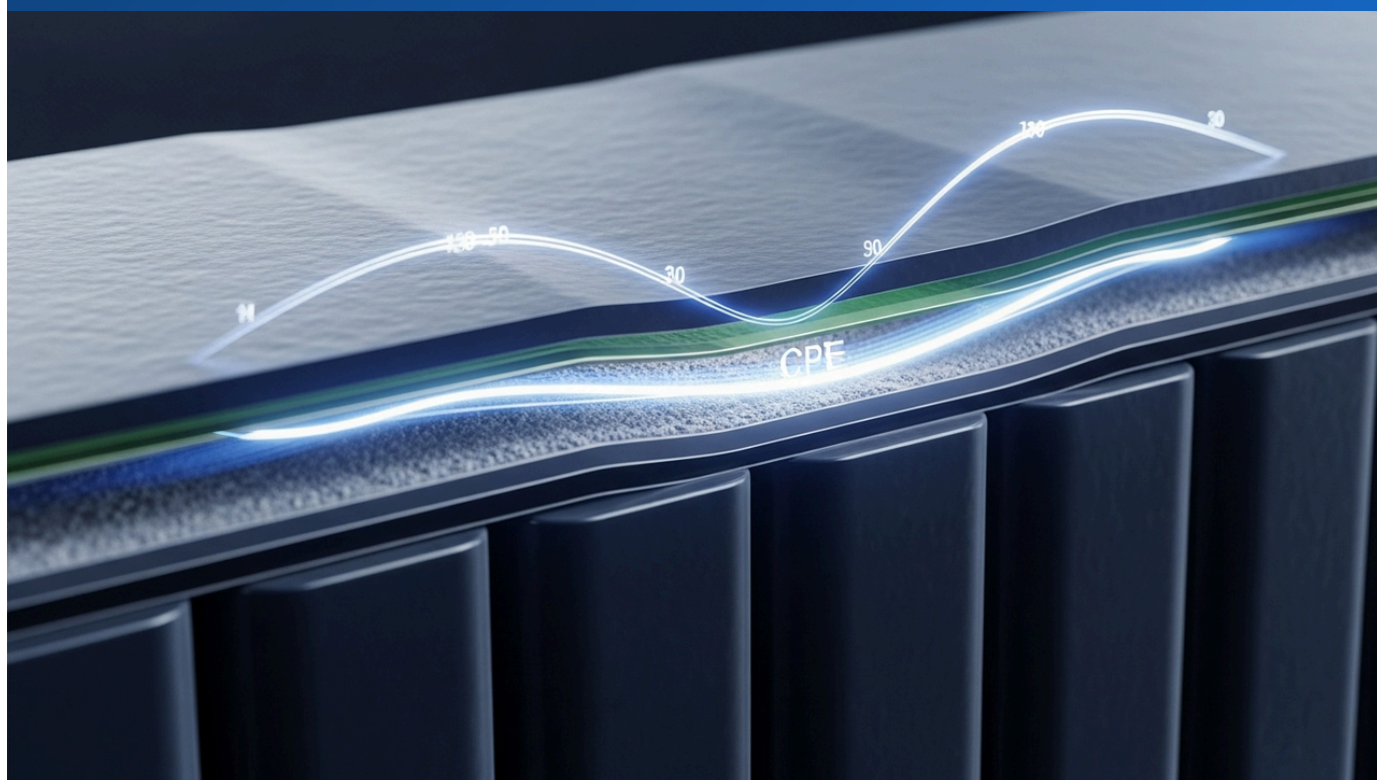
Dongfeng Motor's plan to deliver 50,000 vehicles by 2027 will be a crucial milestone in the commercialization of solid-state battery technology. If successful, China could lead the world in mass production of solid-state EVs, significantly altering the global EV market's competitive landscape. Furthermore, this success is expected to stimulate new technological innovations for solid-state battery cost reduction and production efficiency improvements, influencing other automakers and battery suppliers. In the future, solid-state batteries have the potential to further push the boundaries of EV performance and make a substantial contribution to realizing a sustainable mobility society. The performance evaluation of Dongfeng Motor's demonstration vehicles and the subsequent progress towards mass production will be closely watched.

Source: <https://megaproject.com/news/factory/dongfeng-plans-50000-solid-state-battery-electric-car-deliveries-by-2027>

Collected: July 17, 2026 | Automated Research System (Gemini API)

#38 Conductive and Stable CPE Interlayer Solves NASICON Solid-State Battery Challenges, Enabling Over 300 Hours Stable Cycling and 90% Capacity Retention

Published July 09, 2026 ACS Publications International



OVERVIEW

NASICON-based solid electrolytes are promising candidates for all-solid-state lithium batteries due to high ionic conductivity and wide electrochemical stability, but interfacial side reactions with lithium metal anodes hindered their practical use. This study proposes a mechanism-guided design incorporating a conductive and stable composite polymer electrolyte (CPE) interlayer between the LAGP solid electrolyte and lithium metal anode. This interlayer enabled Li|CPE|LAGP|CPE|Li symmetric cells to cycle stably for over 300 hours, and all-solid-state full cells retained 90% capacity after cycling, marking a significant step towards NASICON-based solid-state battery commercialization.

Key Findings

NASICON-based solid electrolytes, possessing excellent properties such as high lithium-ion conductivity and a wide electrochemical stability window, have been considered highly promising candidates for all-solid-state lithium batteries. However, interfacial side reactions with lithium metal anodes posed a significant challenge, hindering their practical application. To address this fundamental problem, this study proposes a 'mechanism-guided design' that introduces a composite polymer electrolyte (CPE) interlayer, balancing both conductivity and stability, between the LAGP (lithium aluminum germanium phosphate) solid electrolyte and the lithium metal anode. This innovative interlayer enabled Li|CPE|LAGP|CPE|Li symmetric cells to exhibit stable cycling performance for over 300 hours, and constructed all-solid-state full cells retained an excellent 90% of their initial capacity even after numerous cycles.

Technical / Clinical Details

While NASICON-based solid electrolytes are attractive for their high ionic conductivity, they tend to destabilize upon contact with lithium metal, forming high-resistance interfacial layers or inducing dendrite growth. The proposed CPE interlayer is designed to suppress reactivity with lithium on the anode side while maintaining good contact with the LAGP solid electrolyte. This interlayer also possesses ionic conductivity, ensuring smooth lithium-ion transport. The stable cycling for over 300 hours in symmetric cells demonstrates that the interlayer effectively suppresses dendrite formation and provides long-term interfacial stability. Furthermore, the 90% capacity retention in full cells implies that this design can achieve a balance between practical energy density and lifespan, making it highly promising for applications such in electric vehicles and large-scale energy storage systems.

Background & Context

All-solid-state batteries are being extensively researched and developed worldwide as a next-generation technology to overcome the limitations of conventional liquid-electrolyte lithium-ion batteries in terms of safety (thermal runaway, fire risk) and performance (energy density, cycle life). NASICON-based solid electrolytes have attracted attention for their excellent bulk conductivity for many years, but the interfacial problems with lithium metal anodes have consistently been a bottleneck for commercialization. This research is critically important for addressing this fundamental challenge from an interfacial engineering perspective and providing a practical solution. The design of an interlayer that combines both conductivity and stability offers crucial insights into a common challenge in solid-state battery development aiming for high energy density and long lifespan.

Strategic Significance & Outlook

The introduction of a CPE interlayer that balances both conductivity and stability is a groundbreaking step that will accelerate the commercialization of NASICON-based all-solid-state batteries. Further development of this technology will enable the creation of safer, higher-performing, and longer-lasting solid-state batteries, significantly contributing to improvements in electric vehicle range and charging times. Applications are also expected in other high-reliability and high-durability demanding fields, such as grid storage for renewable energy, aerospace, defense, and portable electronic devices. Future research will focus on improving the scalability and cost-efficiency of the interlayer manufacturing process, as well as verifying compatibility with higher-voltage cathode materials. This design approach also holds potential for application to various solid electrolyte systems.

Source: <https://pubs.acs.org/doi/10.1021/acs.acsaem.6c01337>

#39 China's New Solid-State Battery Standard Spurs Doctex Gigawatt Facility in Tianjin, Saike Power and Dongfeng Follow Suit

Published July 14, 2026 [不明, Vertex AI Search redirect] China



OVERVIEW

Effective July 1, 2026, China's new national standard for solid-state batteries, GB/T 43568-2026, defines 'all-solid-state' through rigorous criteria including a 120°C vacuum test and less than 5% liquid content. This regulatory clarity has immediately spurred Doctex to commission China's first gigawatt-scale facility in Tianjin, producing certified 350 Wh/kg solid-state cells, while Saike Power and Dongfeng Motor are rapidly advancing their respective solid-state battery manufacturing and integration plans for late 2026.

Background

China, the world's largest electric vehicle (EV) market, prioritizes battery technology evolution as a national strategic imperative. Solid-state batteries promise to fundamentally transform EV performance with their potential for high energy density, superior safety, and extended lifespan. However, a lack of clear definition has led to market ambiguity, with numerous technologies claiming 'all-solid-state' status. The introduction of a new national standard is therefore a critical measure to enhance technological transparency and accelerate the development and mass production of truly solid-state battery technologies, thereby strengthening the competitive edge of Chinese companies globally.

Regulatory Catalyst and Market Response

Effective July 1, 2026, China's new national standard GB/T 43568-2026 for solid-state batteries introduces stringent criteria for 'all-solid-state battery' certification, notably requiring a 120°C vacuum test and a liquid content of less than 5%. Responding to this regulatory clarity, Doctex has swiftly become the first Chinese company to commission a gigawatt-scale manufacturing facility in Tianjin, now producing certified 350 Wh/kg solid-state cells. This landmark achievement underscores China's tangible progress in solid-state battery mass production and its assertive leadership in global technological competition.

Technological Diversification and Progress

The newly commissioned Doctex gigawatt-scale facility is poised to produce 350 Wh/kg solid-state battery cells, meeting the rigorous new national standard. This high energy density is expected to significantly extend EV driving ranges, offering a substantial advantage over conventional liquid lithium-ion batteries. In parallel, Saike Power is constructing a 0.1 GWh pilot line focused on sulfide-based solid electrolytes. Sulfide electrolytes, prized for their high ionic conductivity, represent a promising avenue for next-generation solid-state batteries, with mechanical testing slated for late 2026. Meanwhile, Dongfeng Motor is advancing a 0.2 GWh manufacturing plant for 350 Wh/kg oxide-polymer hybrid cells, targeting vehicle integration by late 2026. These concurrent developments highlight China's multifaceted approach to developing and commercializing a diverse array of solid-state battery technologies.

Strategic Implications and Outlook

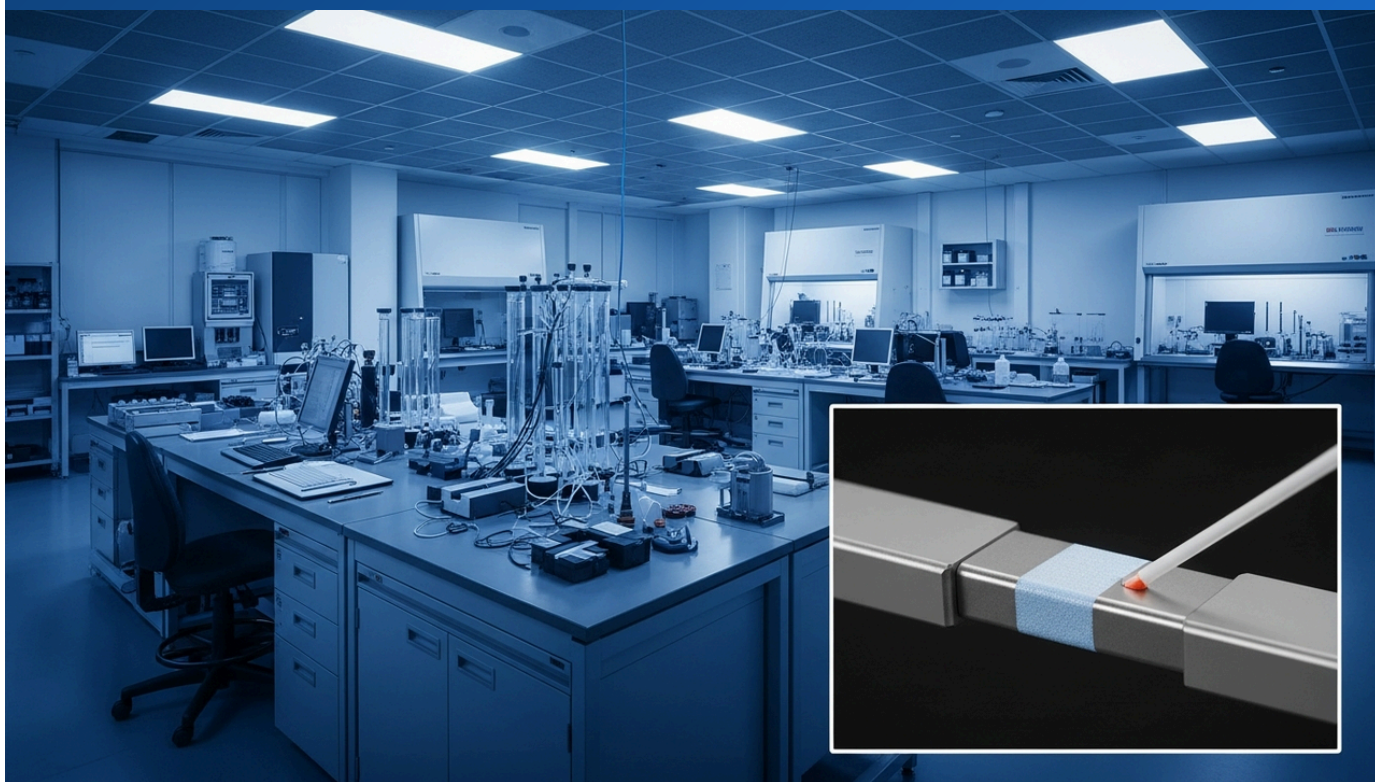
The introduction of China's new national standard, coupled with the rapid commissioning of gigawatt-scale facilities by industry leaders like Doctex, signifies a pivotal moment in solid-state battery commercialization. As other key players, including Saike Power and Dongfeng Motor, accelerate their mass production efforts across various technological pathways, China is strategically positioned to secure a dominant role in the global solid-state battery supply chain. This trajectory will profoundly reshape the competitive landscape of the global EV market, impacting automakers and battery suppliers worldwide. The broader adoption of high-performance and inherently safer solid-state batteries is anticipated to bolster consumer confidence in EVs, substantially advancing the vision of a sustainable transportation future. China's proactive measures are thus critically important in defining the future trajectory of the global battery industry.

Source: <https://battery-tech.net/battery-markets-news/chinas-new-solid-state-battery-mandate-spurs-gigawatt-plant/>

Collected: July 17, 2026 | Automated Research System (Gemini API)

#40 SwRI and SMU Pioneer Interfacial Engineering for Solid-State Battery Life Extension: Ultrathin Film on Lithium Metal Anode Boosts Reliability and Safety

Published July 14, 2026 Labroots USA



OVERVIEW

A research team from Southwest Research Institute (SwRI) and Southern Methodist University (SMU) is investigating a novel method to enhance solid-state battery reliability and safety. They plan to implement 'interfacial engineering,' a process involving ultrathin films, tens to hundreds of nanometers thick, on lithium metal anodes. This film aims to mitigate damage to contacting materials and suppress dendrite formation, thereby improving battery reliability and safety, representing a crucial approach for extending solid-state battery lifespan and commercial viability.

Key Findings

A collaborative research team from the Southwest Research Institute (SwRI) and Southern Methodist University (SMU) has embarked on a new research initiative focusing on 'interfacial engineering' as a novel approach to significantly enhance the reliability and safety of all-solid-state batteries. Specifically, they aim to improve battery lifespan and safety by employing a technique that forms an extremely thin film, ranging from tens to hundreds of nanometers in thickness, on the surface of the lithium metal anode. This ultrathin film is expected to play a critical role in mitigating damage to materials that come into contact with lithium metal and effectively suppressing the growth of lithium dendrites.

Technical / Clinical Details

The lithium metal anode is highly anticipated as the material capable of achieving the highest energy density in all-solid-state batteries; however, its high reactivity has posed challenges related to dendrite formation and side reactions at interfaces. The interfacial engineering approach offers a fundamental solution to this problem. The ultrathin film creates a stable protective layer between the lithium metal and the solid electrolyte, preventing direct reactions between the two. This helps to suppress the non-uniform growth of lithium dendrites and reduces the risk of short circuits. A film thickness of tens to hundreds of nanometers can function as a physical barrier without impeding lithium-ion conduction. This technology has the potential to significantly improve the overall performance profile of solid-state batteries by extending battery cycle life and enhancing stability in high-temperature environments.

Background & Context

All-solid-state batteries are anticipated as next-generation battery technology for electric vehicles (EVs) and large-scale energy storage systems, offering numerous advantages over conventional liquid-electrolyte lithium-ion batteries, such as higher energy density, superior safety (reduced thermal runaway risk), and longer lifespan. However, problems like dendrite formation and interfacial resistance, which impede the practical use of lithium metal anodes, have been long-standing challenges. SwRI has a strong track record in applied research and engineering, while SMU excels in fundamental research in materials science; their collaboration plays a crucial role in bridging fundamental scientific insights with practical technological development.

Strategic Significance & Outlook

The interfacial engineering research by SwRI and SMU holds critical significance for accelerating the commercialization of all-solid-state batteries. If this ultrathin film technology succeeds, it will significantly improve the safety and reliability of solid-state batteries employing lithium metal anodes, contributing to the realization of high-energy-density EV batteries. This approach is also applicable to other high-durability and high-reliability demanding application fields such as drones, robotics, and aerospace. Future research will focus on optimizing thin-film materials, improving the scalability of manufacturing processes, and evaluating long-term performance in full cells. This innovative interfacial design is poised to open new avenues for the widespread adoption of next-generation battery technology.

Source: <https://www.labroots.com/trending/technology/30780/thin-film-fix-boosts-solid-state-battery-life-2/amp>

#41 Solid-State Battery Manufacturing Advances to Pilot Lines, Automotive Programs, and Vehicle Testing: QuantumScape and Honda Strengthen Collaboration

Published July 16, 2026 XWELL International



OVERVIEW

Solid-state battery development in 2026 is shifting from laboratory breakthroughs to practical, manufacturing-focused stages. The industry is now concentrating on building pilot production lines, integrating into automotive development programs, conducting real-world vehicle testing, scaling up electrolyte production, and defining new module/pack design requirements. Notably, QuantumScape and Honda announced a joint development agreement on June 18, 2026, strengthening collaboration to advance their solid-state lithium-metal battery platform and associated manufacturing processes, signaling imminent practical application of solid-state batteries.

Key Findings

The progression of solid-state battery technology in 2026 has unequivocally shifted from the phase of fundamental research breakthroughs to a more practical and manufacturing-oriented stage. The industry-wide focus is no longer confined to laboratory-scale proof-of-concepts; instead, it has moved towards establishing pilot production lines, integrating into specific automotive development programs, executing real-world vehicle testing, establishing scalable production technologies for solid electrolyte materials, and defining new battery module and pack design requirements. Symbolizing this acceleration towards practical implementation, QuantumScape and Honda announced a joint development agreement on June 18, 2026, enhancing their collaborative efforts to further advance the solid-state lithium-metal battery platform and its associated manufacturing processes.

Technical / Clinical Details

Mass production of solid-state batteries requires not only fundamental material science but also advanced engineering and manufacturing techniques. In pilot production lines, processes such as solid electrolyte sheet formation, lamination with electrodes, and cell sealing are validated in a practical environment. Integration into automotive development programs involves optimizing battery pack thermal management, crash safety, and vehicle communication systems. Real-world vehicle testing is indispensable for evaluating performance, durability, and safety under actual driving conditions. Scalable production technology for electrolytes is key to cost reduction and supply stability. The QuantumScape-Honda partnership specifically aims to collaboratively resolve challenges of solid-state batteries (dendrite formation, interfacial resistance), especially those using lithium metal anodes, and to streamline production processes. This cooperation is setting a concrete roadmap for the mass production of batteries with high energy density and safety.

Background & Context

All-solid-state batteries have been anticipated as a next-generation technology to replace existing lithium-ion batteries by extending EV driving range, shortening charging times, and reducing the risk of thermal runaway. While results have long been predominantly at the laboratory level, recent advancements in material development and manufacturing technology have heightened expectations for commercialization. Strategic partnerships between automakers and battery development companies are indispensable for accelerating the practical application of the technology. The collaboration of a major automaker like Honda with an advanced battery technology company like QuantumScape is evidence that solid-state batteries are recognized as a core technology for the future of EVs, potentially significantly altering the competitive landscape of the EV market.

Strategic Significance & Outlook

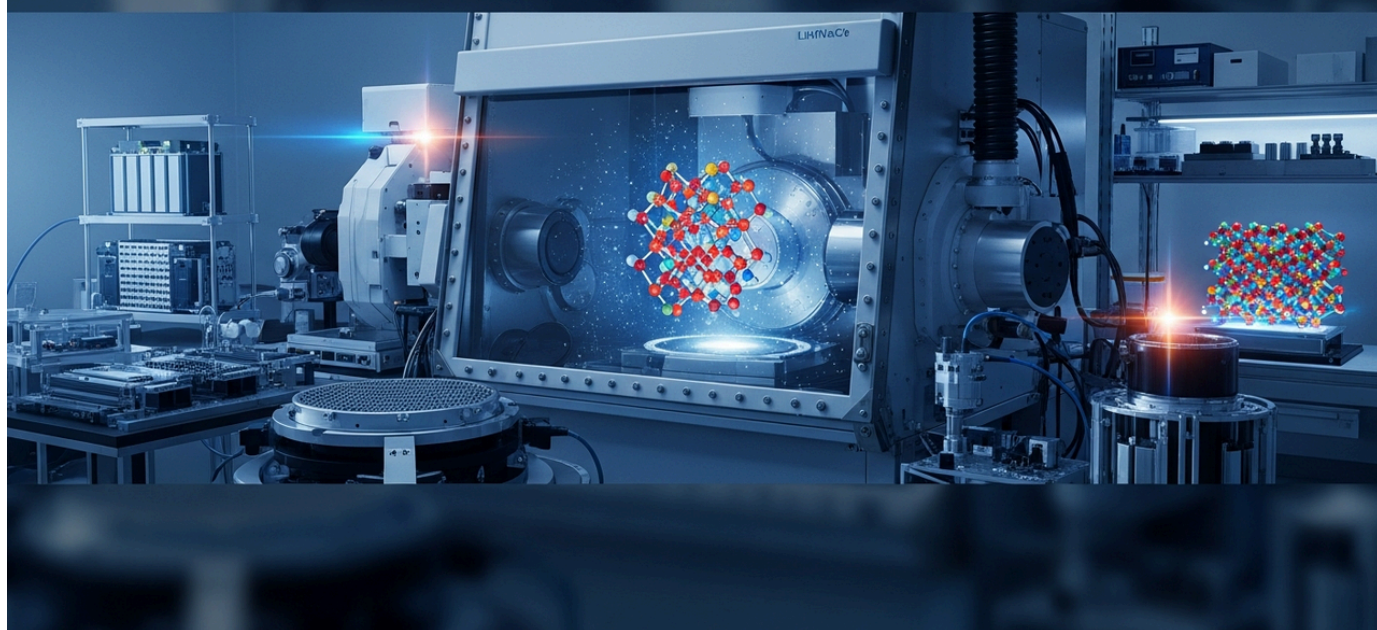
The transition of solid-state battery technology to pilot production, real-world vehicle testing, and scalable electrolyte production clearly indicates that its commercialization is imminent. The QuantumScape-Honda partnership will be a significant driving force, particularly for the mass production of high-performance lithium metal-based solid-state batteries. Moving forward, these efforts are expected to lead to reductions in manufacturing costs, improvements in production efficiency, and the establishment of reliable battery pack designs. Consequently, EVs equipped with solid-state batteries will genuinely enter the market, offering new choices to consumers and making substantial contributions to the realization of a sustainable mobility society. Automakers and battery suppliers worldwide are accelerating their development efforts to avoid being left behind in this wave of technological innovation.

Source: <https://xwellcn.com/battery-news/solid-state-battery-progress-2026-battery-pack-assembly/>

Collected: July 17, 2026 | Automated Research System (Gemini API)

#42 Samsung Patents Novel Halide Solid-State Electrolyte LiHfNaCl_6 for Safer, Longer-Lasting All-Solid-State Batteries

Published July 17, 2026 Patentlyze South Korea



OVERVIEW

Samsung has applied for a patent for LiHfNaCl_6 , a novel lithium compound with potential to serve as an ion-conducting core in solid-state batteries. This hafnium-sodium-chlorine based halide solid electrolyte is expected to play a significant role in the race to build safer, longer-lasting batteries. Halide electrolytes are gaining research attention due to their advantages, being more stable against oxidation than sulfide-based solid electrolytes and easier to process than oxide ceramics, further advancing solid-state battery performance and safety.

Key Findings

Samsung has filed a patent for an innovative lithium compound, 'LiHfNaCl₆,' which holds the potential to function as the ion-conducting core in all-solid-state batteries. This novel material belongs to the halide solid electrolyte class, primarily composed of hafnium, sodium, and chlorine, and is expected to play a potentially very significant role in the competition to develop safer and longer-lasting batteries. This patent application represents a strategic move by Samsung to accelerate the development of next-generation battery technology, marking a significant step towards the practical realization of solid-state batteries.

Technical / Clinical Details

Halide solid electrolytes possess distinct advantages over sulfide-based solid electrolytes, notably higher stability against oxidation, and are easier to process than oxide ceramic electrolytes. These characteristics are beneficial for simplifying the manufacturing process of solid-state batteries and reducing costs. The LiHfNaCl₆ compound aims to further optimize these properties of halide electrolytes, maintaining high lithium-ion conductivity while improving interfacial stability with electrodes. A more stable electrolyte reduces the risk of dendrite formation and enhances battery cycle life and overall safety. This technology is particularly crucial for applications requiring high performance and reliability, such as electric vehicles (EVs) and large-scale energy storage systems.

Background & Context

All-solid-state batteries are drawing global attention as next-generation battery technology due to their numerous advantages over existing lithium-ion batteries, including higher energy density, superior safety (elimination of thermal runaway risk), and long lifespan. The solid electrolyte is the core component of an all-solid-state battery, and a critical factor determining its performance. Active investment and patent acquisition in this field by major electronics manufacturers like Samsung reflect the recognition that solid-state batteries will be a key technological trend in the future. Halide solid electrolytes, in particular, have seen accelerated research in recent years due to their balanced properties, intensifying the race for practical implementation alongside other major solid electrolyte systems such as sulfides and oxides.

Strategic Significance & Outlook

Samsung's patent application for the novel halide solid electrolyte LiHfNaCl_6 is an important milestone towards the further evolution of solid-state battery technology. If this technology is successfully commercialized, it will enable the development of safer, higher-performing solid-state batteries, significantly contributing to extended EV driving range, reduced charging times, and enhanced safety. Furthermore, its ease of processing will lead to manufacturing cost reductions and accelerated mass production. Future focus will be on further optimizing the performance of this material, establishing manufacturing processes, and verifying long-term reliability in full cells. This move by Samsung is expected to reinforce its leadership in the global battery technology competition.

Source: <https://patentlyze.com/patent/new-solid-state-battery-electrolyte-material/>

Collected: July 17, 2026 | Automated Research System (Gemini API)

#43 EV Charging Forecast: Toyota Solid-State EVs to Launch in 2026, Targeting 800km+ Range and Sub-10 Minute Charging

Published Date unknown Nexxt Industry International



OVERVIEW

Toyota's solid-state battery-powered electric vehicles (EVs) are anticipated to hit the market in 2026, poised to revolutionize EV charging infrastructure. These next-generation EVs are expected to achieve ranges exceeding 500 miles (approximately 800 kilometers) and groundbreaking charging times of under 10 minutes. This technological innovation will contribute to extended battery life, enhanced safety, and improved thermal management, dramatically increasing EV convenience and appeal, thereby redefining charging infrastructure demand and form.

Key Findings

In 2026, leading manufacturers such as Toyota are expected to introduce electric vehicles (EVs) equipped with all-solid-state batteries to the market, which will have an immeasurable impact on the EV charging infrastructure industry. These innovative EVs are anticipated to achieve significantly extended driving ranges exceeding 500 miles (approximately 800 kilometers) and groundbreaking ultra-fast charging times of under 10 minutes. This technological advancement will result in extended battery life, substantial improvements in safety, and more efficient thermal management systems, fundamentally transforming the EV user experience and redefining the design and deployment of charging infrastructure.

Technical / Clinical Details

All-solid-state batteries eliminate the risk of thermal runaway inherent in conventional liquid-electrolyte lithium-ion batteries, enabling significant safety improvements. Furthermore, solid electrolytes allow for higher energy density, simultaneously achieving smaller, lighter battery packs and extended driving ranges. The target of under 10 minutes for charging is extremely short compared to many current fast chargers, and this is achieved through the properties of solid electrolytes that enable ultra-fast lithium-ion migration and efficient cell design. Extended battery life reduces the Total Cost of Ownership (TCO) for vehicles, alleviating consumers' financial burdens. Moreover, superior thermal management capabilities are crucial for suppressing heat generation during high-power charging and preventing battery degradation.

Background & Context

While the electric vehicle (EV) market is growing rapidly, consumer concerns regarding range anxiety, long charging times, and insufficient charging infrastructure persist. All-solid-state batteries have been anticipated as the ultimate solution to these challenges. Toyota Motor Corporation is a prime example of a company that has invested heavily in solid-state battery technology research and development for many years, and its market introduction will be a major milestone for the industry. This technological innovation not only improves battery performance but also has the potential to influence the design of charging stations, grid load management, and even user charging habits, transforming the entire EV ecosystem.

Strategic Significance & Outlook

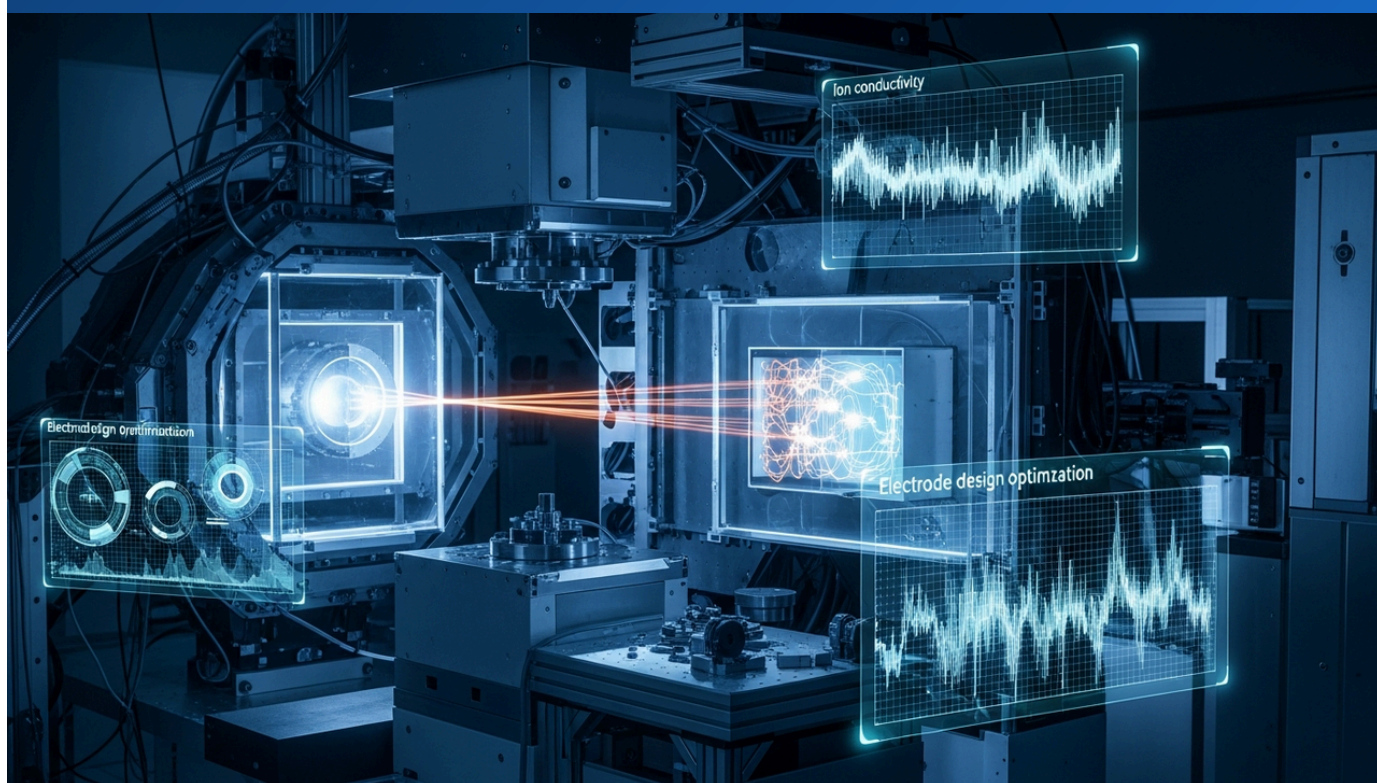
The introduction of Toyota's all-solid-state EVs to the market will accelerate a paradigm shift in EV charging infrastructure. The widespread adoption of chargers compatible with ultra-fast charging will become essential, and the installation of high-power charging stations is expected to further advance. Furthermore, long driving ranges and short charging times could expand the options for charging station frequency and location, alleviating charging infrastructure bottlenecks. Moving forward, it will be crucial for charger manufacturers, power companies, and automakers to collaborate in building a more efficient and robust charging infrastructure in line with the proliferation of solid-state EVs. This technological innovation is expected to further accelerate EV adoption and represent a significant step towards achieving a sustainable transportation society.

Source: <https://www.nexxtindustry.com/post/6-predictions-for-the-ev-charging-industry-in-2026>

Collected: July 17, 2026 | Automated Research System (Gemini API)

#44 Neutron Diffraction Traces Lithium Motion in Solid-State Batteries in Real-Time: Guiding Electrode Design and Ion Conductivity Optimization

Published July 09, 2026 ill.eu France



OVERVIEW

Neutron diffraction experiments at ILL successfully tracked lithium behavior inside thick all-solid-state batteries in real-time for the first time during operation. This pioneering research provides a clearer, comprehensive understanding of how electrode design, ion conductivity, and operating conditions influence the uniformity of battery reactions. The insights gained offer potential guidance for smarter future solid-state battery designs, supplying fundamental data critical for improving battery performance and reliability.

Key Findings

Groundbreaking neutron diffraction experiments conducted at the Institut Laue-Langevin (ILL) in Grenoble, France, have for the first time meticulously tracked the behavior of lithium ions inside thick all-solid-state batteries in real-time during operation. This pivotal research provides an unprecedentedly clear and comprehensive overview of how critical factors such as electrode design, ionic conductivity within the solid electrolyte, and various operating conditions influence the uniformity of electrochemical reactions inside the battery. This direct observation lays a crucial scientific foundation for addressing the fundamental challenges of all-solid-state batteries.

Technical / Clinical Details

Neutron diffraction is a unique tool capable of non-destructively and in detail observing the positions and movements of light elements like lithium. In this study, by using thick all-solid-state batteries, researchers simulated lithium migration under conditions closer to actual battery operation and collected in-situ data. Specifically, they directly visualized how lithium moves from the anode to the cathode, and through the solid electrolyte, including its speed, pathways, and inhomogeneities. This led to a clearer understanding of mechanisms like dendrite formation under high current density and lithium accumulation at the solid electrolyte-electrode interface. The data obtained provides invaluable information for identifying battery degradation processes and optimizing the microstructure of electrode materials and solid electrolytes.

Background & Context

All-solid-state batteries are anticipated as next-generation battery technology for electric vehicles (EVs) and large-scale energy storage systems due to their numerous advantages over conventional liquid-electrolyte lithium-ion batteries, including higher energy density, superior safety (elimination of thermal runaway risk), and long lifespan. However, sluggish lithium-ion transport within solid electrolytes and high resistance at electrode-electrolyte interfaces have been major hurdles for their commercialization. Crucially, directly observing what happens inside a battery during operation has been extremely difficult, acting as a bottleneck for development. The neutron diffraction experiment at ILL plays a decisive role in demystifying this 'black box' and bridging theory with experiment.

Strategic Significance & Outlook

The insights gained from this research will directly guide the design of future all-solid-state batteries. By smarter optimization of electrode material selection, solid electrolyte composition and microstructure, and battery operating conditions, it will be possible to maximize the efficiency of lithium-ion transport and minimize interfacial degradation. This is expected to accelerate the development of higher-performance, longer-lasting, and safer all-solid-state batteries. Specifically, it holds the potential to significantly contribute to extending EV driving range, improving fast-charging capabilities, and enhancing the reliability of grid storage solutions for renewable energy integration. This neutron diffraction technology can also be applied to research on other battery systems and energy materials, becoming an important tool for accelerating the bridge from scientific discovery to industrial application.

Source: <https://www.ill.eu/en/about-the-ill/news-and-events/news/neutrons-catch-lithium-in-motion-inside-a-solid-state-battery/>

Collected: July 17, 2026 | Automated Research System (Gemini API)