

TROY TECHNICAL

NEXT-GENERATION ENERGY STORAGE WEEKLY REPORT

October 17 - October 23, 2026 | Issue 2026-W42

**Cell-level evidence, manufacturing yield, safety
and bankable supply**

13

ANALYZED ARTICLES

10

PRIORITY THEMES

Issued 2026-10-23 | English edition | fixed approved cover artwork



Next-Generation Energy Storage: the boundary moved from isolated claims to qualification evidence

13 English articles were reviewed independently from the Japanese edition. Ten themes are retained for management decisions.

SIGNAL 01 | ACTIVE MATERIALS

Fraunhofer ISE Silicon Battery: 1,000-Cycle Test and Specs

Researchers at Fraunhofer ISE have developed a silicon-rich anode pouch cell that retains over 83 per cent capacity after 1,000 full cycles.

SIGNAL 02 | CELL DESIGN

Compressed CO₂ Storage: China Huadian's 100 MW Plant Specs

China Huadian has connected a 100 MW/1,000 MWh compressed carbon dioxide (CO₂) energy storage plant to the grid in Xinjiang. This facility marks a transition from pilot systems to utility-scale deployment for long-duration energy storage.

SIGNAL 03 | MANUFACTURING

cylib: EU Strategic Project status for Dormagen recycling site

The European Commission has designated cylib's battery recycling project in Dormagen, Germany, as a Strategic Project under the Critical Raw Materials Act (CRMA).

SIGNAL 04 | SYSTEM VALIDATION

NCM811 Synthesis: Residence Time Impact on Cathode Performance

An eight-second residence time during spray pyrolysis optimizes the synthesis of LiNi_{0.8}Co_{0.1}Mn_{0.1}O₂ (NCM811) cathode materials. This specific condition produces uniform 2 µm spherical particles that deliver a discharge capacity of 203 mAh/g at 0.1 C.

DECISION

Focus this week's management attention on cell-level evidence, manufacturing yield, safety and bankable supply. Move only when the linked evidence can be reproduced under your own operating conditions.

THREE MANAGEMENT MOVES

1. Buyers: compare technologies under the same duty cycle, safety envelope and total system cost.
2. Suppliers: connect materials claims to electrode processing, yield, validation and secured capacity.
3. Executives: track cycle life, fast charge, safety abuse, yield, cost, sourcing and warranty.

EVIDENCE DISCIPLINE

FACT states what the collected English source reports. BUSINESS READ and ACTION are editorial interpretations. UNKNOWN lists information that the source file does not establish. A linked article is not treated as independent confirmation of every claim.

Five numbers or evidence anchors that require conditions

450 km A03	SOURCE-BOUND CONDITION This breakthrough addresses the volume expansion issues of silicon, potentially increasing EV range from 450 km to over 600 km at the same battery weight.
100 MW A08	SOURCE-BOUND CONDITION China Huadian has connected a 100 MW/1,000 MWh compressed carbon dioxide (CO2) energy storage plant to the grid in Xinjiang.
2030 g A12	SOURCE-BOUND CONDITION This designation supports the EU's 2030 goal of meeting 25% of its strategic raw material consumption through recycling.
97% A13	SOURCE-BOUND CONDITION Annual failure rates for US grid-scale batteries fell by more than 97% between 2016 and 2025, despite a 250-fold increase in cumulative deployments.
83% A07	SOURCE-BOUND CONDITION Fraunhofer ISE has demonstrated 25 Ah pouch cells with silicon-rich anodes that retain over 83% capacity after 1,000 cycles.
HOW TO USE THESE NUMBERS Each value is shown with the condition stated in the collected English article. Do not compare values across different test methods, device sizes, operating temperatures or commercial stages without normalizing those conditions.	

Where the value chain moved

Each stage combines one leading theme and one supporting theme. The report treats handoffs as evidence transfers, not decorative arrows.



EVIDENCE REQUIRED AT EACH HANDOFF

Active materials to Cell design	Transfer test conditions, acceptance criteria, failure data, owner and decision date. Recheck cycle life, fast charge, safety abuse, yield, cost, sourcing and warranty.
Cell design to Manufacturing	Transfer test conditions, acceptance criteria, failure data, owner and decision date. Recheck cycle life, fast charge, safety abuse, yield, cost, sourcing and warranty.
Manufacturing to System validation	Transfer test conditions, acceptance criteria, failure data, owner and decision date. Recheck cycle life, fast charge, safety abuse, yield, cost, sourcing and warranty.
System validation to Deployment & recycling	Transfer test conditions, acceptance criteria, failure data, owner and decision date. Recheck cycle life, fast charge, safety abuse, yield, cost, sourcing and warranty.

COMMON CONTROL POINT

No theme moves to a commercial commitment until a named owner has reproduced the relevant evidence and documented cycle life, fast charge, safety abuse, yield, cost, sourcing and warranty.

Priority map: maturity and next decision locus



REPRODUCIBLE POSITIONING RULE

Horizontal position uses five discrete stages: Research, Prototype, Joint evaluation, Product adoption and Scale. The vertical bands classify the next decision locus: Tech / process, System / adoption, or Business / rules (including supply systems). Article-title cues take precedence; the overview is used only when the title is silent. These are categories, not impact ranks. Bubble diameter reflects the editorial score.

FACT is source-bound. BUSINESS READ, ACTION and UNKNOWN are explicit editorial layers.

P01

Fraunhofer ISE Silicon Battery: 1,000-Cycle Test and Specs

A03 | Active materials | Product adoption

Date not stated

FACT

Researchers at Fraunhofer ISE have developed a silicon-rich anode pouch cell that retains over 83 per cent capacity after 1,000 full cycles. This breakthrough addresses the volume expansion issues of silicon, potentially increasing EV range from 450 km to over 600 km at the same battery weight.

WHY IT MATTERS

The decision relevance is cell-level evidence, manufacturing yield, safety and bankable supply. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, connect materials claims to electrode processing, yield, validation and secured capacity.

ACTION

Within 30 days, compare technologies under the same duty cycle, safety envelope and total system cost; record the evidence and owner against P01.

UNKNOWN

Still unproven or incompletely stated: cycle life, fast charge, safety abuse, yield, cost, sourcing and warranty.

EDITORIAL SCORE 21/25 | MATURITY 4/5 | DECISION LOCUS: BUSINESS / RULES

P02

Compressed CO2 Storage: China Huadian's 100 MW Plant Specs

A08 | Cell design | Joint evaluation

Date not stated

FACT

China Huadian has connected a 100 MW/1,000 MWh compressed carbon dioxide (CO2) energy storage plant to the grid in Xinjiang. This facility marks a transition from pilot systems to utility-scale deployment for long-duration energy storage.

WHY IT MATTERS

The decision relevance is cell-level evidence, manufacturing yield, safety and bankable supply. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, connect materials claims to electrode processing, yield, validation and secured capacity.

ACTION

Within 30 days, compare technologies under the same duty cycle, safety envelope and total system cost; record the evidence and owner against P02.

UNKNOWN

Still unproven or incompletely stated: cycle life, fast charge, safety abuse, yield, cost, sourcing and warranty.

EDITORIAL SCORE 20/25 | MATURITY 3/5 | DECISION LOCUS: SYSTEM / ADOPTION

FACT is source-bound. BUSINESS READ, ACTION and UNKNOWN are explicit editorial layers.

P03

cylib: EU Strategic Project status for Dormagen recycling site

A12 | Manufacturing | Research

Date not stated

FACT

The European Commission has designated cylib's battery recycling project in Dormagen, Germany, as a Strategic Project under the Critical Raw Materials Act (CRMA). The facility is designed to process up to 140,000 EV batteries annually to reduce dependence on third countries. This designation supports the EU's 2030 goal of meeting 25% of its strategic raw material consumption through recycling.

WHY IT MATTERS

The decision relevance is cell-level evidence, manufacturing yield, safety and bankable supply. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, connect materials claims to electrode processing, yield, validation and secured capacity.

ACTION

Within 30 days, compare technologies under the same duty cycle, safety envelope and total system cost; record the evidence and owner against P03.

UNKNOWN

Still unproven or incompletely stated: cycle life, fast charge, safety abuse, yield, cost, sourcing and warranty.

EDITORIAL SCORE 20/25 | MATURITY 1/5 | DECISION LOCUS: TECH / PROCESS

P04

NCM811 Synthesis: Residence Time Impact on Cathode Performance

A05 | System validation | Product adoption

Date not stated

FACT

An eight-second residence time during spray pyrolysis optimizes the synthesis of $\text{LiNi}_0.8\text{Co}_0.1\text{Mn}_0.1\text{O}_2$ (NCM811) cathode materials. This specific condition produces uniform 2 μm spherical particles that deliver a discharge capacity of 203 mAh/g at 0.1 C. The findings establish residence time as a critical variable for regulating particle morphology and electrochemical stability in nickel-rich materials.

WHY IT MATTERS

The decision relevance is cell-level evidence, manufacturing yield, safety and bankable supply. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, connect materials claims to electrode processing, yield, validation and secured capacity.

ACTION

Within 30 days, compare technologies under the same duty cycle, safety envelope and total system cost; record the evidence and owner against P04.

UNKNOWN

Still unproven or incompletely stated: cycle life, fast charge, safety abuse, yield, cost, sourcing and warranty.

EDITORIAL SCORE 20/25 | MATURITY 4/5 | DECISION LOCUS: BUSINESS / RULES

FACT is source-bound. BUSINESS READ, ACTION and UNKNOWN are explicit editorial layers.

P05

US Grid Batteries: Fire Risk Trends and 2025 Failure Rates

A13 | Deployment & recycling | Research

Date not stated

FACT

Annual failure rates for US grid-scale batteries fell by more than 97% between 2016 and 2025, despite a 250-fold increase in cumulative deployments. Data indicates that battery failure rates are now comparable to those of legacy oil-filled substation transformers, suggesting that public concern over fire risk is disproportionate to actual technical risk.

WHY IT MATTERS

The decision relevance is cell-level evidence, manufacturing yield, safety and bankable supply. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, connect materials claims to electrode processing, yield, validation and secured capacity.

ACTION

Within 30 days, compare technologies under the same duty cycle, safety envelope and total system cost; record the evidence and owner against P05.

UNKNOWN

Still unproven or incompletely stated: cycle life, fast charge, safety abuse, yield, cost, sourcing and warranty.

EDITORIAL SCORE 20/25 | MATURITY 1/5 | DECISION LOCUS: SYSTEM / ADOPTION

P06

Fraunhofer ISE Silicon-Rich Cells: 1,000-Cycle Life and Specs

A07 | Active materials | Product adoption

Date not stated

FACT

Fraunhofer ISE has demonstrated 25 Ah pouch cells with silicon-rich anodes that retain over 83% capacity after 1,000 cycles. The cells achieve a cell-level gravimetric energy density of 280 Wh/kg, highlighting the critical role of mechanical contact pressure in stabilizing silicon-rich anodes.

WHY IT MATTERS

The decision relevance is cell-level evidence, manufacturing yield, safety and bankable supply. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, connect materials claims to electrode processing, yield, validation and secured capacity.

ACTION

Within 30 days, compare technologies under the same duty cycle, safety envelope and total system cost; record the evidence and owner against P06.

UNKNOWN

Still unproven or incompletely stated: cycle life, fast charge, safety abuse, yield, cost, sourcing and warranty.

EDITORIAL SCORE 20/25 | MATURITY 4/5 | DECISION LOCUS: BUSINESS / RULES

FACT is source-bound. BUSINESS READ, ACTION and UNKNOWN are explicit editorial layers.

P07

Lithium-Ion Clusters: Columbia University's Battery Chemistry Map

A10 | Cell design | Product adoption

Date not stated

FACT

Columbia University researchers discovered that up to 40% of lithium ions in standard battery electrolytes form multi-ion clusters without anions. These clusters are identified as key intermediates in the formation of the protective solid electrolyte interphase (SEI) film. This finding challenges long-held assumptions and provides a foundation for designing higher-capacity and faster-charging batteries.

WHY IT MATTERS

The decision relevance is cell-level evidence, manufacturing yield, safety and bankable supply. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, connect materials claims to electrode processing, yield, validation and secured capacity.

ACTION

Within 30 days, compare technologies under the same duty cycle, safety envelope and total system cost; record the evidence and owner against P07.

UNKNOWN

Still unproven or incompletely stated: cycle life, fast charge, safety abuse, yield, cost, sourcing and warranty.

EDITORIAL SCORE 20/25 | MATURITY 4/5 | DECISION LOCUS: BUSINESS / RULES

P08

Bismuth-Carbon Nanocomposites: Sodium Battery Anode Specs

A02 | Manufacturing | Product adoption

Date not stated

FACT

Researchers have developed a bismuth-carbon nanocomposite that mitigates volumetric swelling in sodium-ion battery anodes, maintaining high capacity over 1,000 cycles. The material achieves a reversible capacity of 416.5 mAh/g at 1 A/g with 99.9% coulombic efficiency. This architecture addresses the critical degradation issues of alloying anodes, paving the way for more durable, affordable energy storage.

WHY IT MATTERS

The decision relevance is cell-level evidence, manufacturing yield, safety and bankable supply. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, connect materials claims to electrode processing, yield, validation and secured capacity.

ACTION

Within 30 days, compare technologies under the same duty cycle, safety envelope and total system cost; record the evidence and owner against P08.

UNKNOWN

Still unproven or incompletely stated: cycle life, fast charge, safety abuse, yield, cost, sourcing and warranty.

EDITORIAL SCORE 19/25 | MATURITY 4/5 | DECISION LOCUS: BUSINESS / RULES

FACT is source-bound. BUSINESS READ, ACTION and UNKNOWN are explicit editorial layers.

P09

Sodium-Ion Batteries: AI-Ready Materials Library for Cathodes

A01 | System validation | Product adoption

Date not stated

FACT

University of Surrey researchers have developed a materials library of 28 sodium manganese oxide compositions to optimize cathode performance. The study identifies specific elemental substitutions that enhance energy capacity, stability, and charging rates, providing a dataset to train future AI models for battery design.

WHY IT MATTERS

The decision relevance is cell-level evidence, manufacturing yield, safety and bankable supply. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, connect materials claims to electrode processing, yield, validation and secured capacity.

ACTION

Within 30 days, compare technologies under the same duty cycle, safety envelope and total system cost; record the evidence and owner against P09.

UNKNOWN

Still unproven or incompletely stated: cycle life, fast charge, safety abuse, yield, cost, sourcing and warranty.

EDITORIAL SCORE 19/25 | MATURITY 4/5 | DECISION LOCUS: BUSINESS / RULES

P10

Donut Lab Battery: Cold-Weather Energy Retention Specs at -30°C

A11 | Deployment & recycling | Research

Date not stated

FACT

A first-generation battery module from Donut Lab retained approximately 93% of its energy at -30°C without external heating or insulation. Testing conducted by VTT showed the module delivered 1,254 watt-hours in freezing conditions compared to 1,354 watt-hours at 25°C. This performance addresses the critical challenge of energy loss in electric vehicles during cold weather.

WHY IT MATTERS

The decision relevance is cell-level evidence, manufacturing yield, safety and bankable supply. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, connect materials claims to electrode processing, yield, validation and secured capacity.

ACTION

Within 30 days, compare technologies under the same duty cycle, safety envelope and total system cost; record the evidence and owner against P10.

UNKNOWN

Still unproven or incompletely stated: cycle life, fast charge, safety abuse, yield, cost, sourcing and warranty.

EDITORIAL SCORE 19/25 | MATURITY 1/5 | DECISION LOCUS: TECH / PROCESS

Playbook and 0-5 year roadmap

STAKEHOLDER	NOW 0-30 DAYS	NEXT 1-12 MONTHS	LATER 1-5 YEARS
Operating companies	compare technologies under the same duty cycle, safety envelope and total system cost	Run production-like qualification with explicit acceptance and stop criteria.	Build a portfolio and architecture that can absorb technology and supplier changes.
Materials, equipment and technology suppliers	connect materials claims to electrode processing, yield, validation and secured capacity	Create shared reliability, process-window and failure-analysis data with customers.	Standardize interfaces, traceability, lifecycle support and recovery services.
Trading, investment and legal teams	Map cycle life, fast charge, safety abuse, yield, cost, sourcing and warranty.	Contract for capacity, quality, change notice, liability, alternatives and exit.	Diversify regional, technical and customer concentration risk.

ROADMAP

NOW 0-30 DAYS Evidence ledger Owner: Strategy + quality Deliverable: claim, source, condition, owner	NOW 0-30 DAYS Risk screen Owner: Procurement + legal Deliverable: unknowns, alternatives, stop	NEXT 1-12 MONTHS Joint qualification Owner: R&D + supplier Deliverable: process window and failure data
NEXT 1-12 MONTHS Commercial gate Owner: Business + finance Deliverable: unit economics and capacity	LATER 1-5 YEARS Platform strategy Owner: Executive team Deliverable: portfolio and interface roadmap	LATER 1-5 YEARS Service layer Owner: Operations + channel Deliverable: monitoring, maintenance and recovery

GO / NO-GO GATES

GATE	OWNER	REQUIRED EVIDENCE	NO-GO CONDITION
G1 Evidence	Quality	Source, test conditions and reproducibility	No traceable evidence
G2 Integration	R&D	Interface, process window and failure analysis	Cannot meet system conditions
G3 Commercial	Business	Capacity, total cost, contract and alternatives	Economics or supply cannot be supported
G4 Lifecycle	Operations	Monitoring, maintenance, change notice and exit	No accountable operating plan

ANALYZED ARTICLES | ITEMS 01-13

Every title and URL is displayed in full. URLs wrap without shortening and remain clickable. A verified-reference label means the translated HTML did not retain its original source URL.

ID	FULL ARTICLE TITLE	FULL SOURCE / VERIFIED REFERENCE URL - CLICKABLE
A01	Sodium-Ion Batteries: AI-Ready Materials Library for Cathodes	https://www.surrey.ac.uk/news/new-materials-library-could-help-ai-design-better-sodium-ion-batteries
A02	Bismuth-Carbon Nanocomposites: Sodium Battery Anode Specs	https://bioengineer.org/bismuth-trapped-in-carbon-cages-tames-swelling-in-sodium-battery-anodes/
A03	Fraunhofer ISE Silicon Battery: 1,000-Cycle Test and Specs	https://www.electrive.com/2026/10/22/greater-range-at-the-same-weight-silicon-battery-passes-laboratory-test/
A04	Multimetal MOFs: TAC-linked bifunctional catalysts for Zn-air batteries	https://bioengineer.org/tac-linked-multimetal-mof-enables-13-day-cycling-in-rechargeable-zinc-air-battery/
A05	NCM811 Synthesis: Residence Time Impact on Cathode Performance	https://bioengineer.org/eight-second-spray-pyrolysis-condition-improves-ncm811-cathode-performance-in-laboratory-study/
A06	Sungrow PowerTitan 3.0 BESS: Large-Scale Fire Test Results 2026	https://www.ess-news.com/2026/10/22/sungrow-details-powertitan-3-0-bess-successfully-completing-large-scale-fire-test/
A07	Fraunhofer ISE Silicon-Rich Cells: 1,000-Cycle Life and Specs	https://www.ess-news.com/2026/10/21/fraunhofer-silicon-rich-cells-retain-over-83-after-1000-cycles/
A08	Compressed CO2 Storage: China Huadian's 100 MW Plant Specs	https://www.ess-news.com/2026/10/15/chinas-first-100-mw-compressed-co2-storage-plant-connects-to-grid/
A09	FG-3 Graphene Catalyst: Zinc-Air Battery Efficiency and Specs	https://interestingengineering.com/energy/zinc-air-battery-hits-98-efficiency-820-hour-lifespan
A10	Lithium-Ion Clusters: Columbia University's Battery Chemistry Map	https://interestingengineering.com/energy/research-reveals-unexpected-lithium-ion-clusters
A11	Donut Lab Battery: Cold-Weather Energy Retention Specs at -30°C	https://interestingengineering.com/energy/donut-battery-cold-weather-test
A12	cylib: EU Strategic Project status for Dormagen recycling site	https://battery-tech.net/battery-markets-news/cylib-eu-strategic-recycling-project/
A13	US Grid Batteries: Fire Risk Trends and 2025 Failure Rates	https://www.canarymedia.com/articles/batteries/us-grid-batteries-fire-risk

NextGenEnergyStorage — Selected Articles

Date: 2026-10-25

Articles: 13

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#01 Sodium-Ion Batteries: AI-Ready Materials Library for Cathodes

Published October 21, 2026 University of Surrey UK



OVERVIEW

University of Surrey researchers have developed a materials library of 28 sodium manganese oxide compositions to optimize cathode performance. The study identifies specific elemental substitutions that enhance energy capacity, stability, and charging rates, providing a dataset to train future AI models for battery design.

Key Findings

Researchers have identified that substituting manganese with specific elements in sodium manganese oxide cathodes directly impacts battery performance. The study found that iron is linked to higher energy-storage capacity, while vanadium improves stability during repeated charging and discharging cycles. Additionally, small amounts of titanium enhance performance at higher rates, with some titanium-containing compositions retaining more than 90 per cent of their capacity after 100 cycles.

Technical Details

The team created a library consisting of 28 different chemical compositions. By substituting portions of the manganese with varying amounts of iron, titanium, and vanadium, the researchers were able to compare the performance of each variant within sodium-ion batteries. To handle the resulting data, the team developed an automated analysis approach, which was subsequently used to train a machine-learning model.

Background and Context

Sodium-ion batteries are being positioned as a viable alternative to conventional lithium-ion batteries due to the higher abundance and availability of sodium. However, widespread adoption has been hindered by limitations in energy density and performance degradation over repeated charging cycles. This research, published in the *Journal of Materials Chemistry A*, focuses on the cathode—a critical component that determines both the energy storage capacity and the overall performance of the battery.

Significance and Outlook

While the current library of 28 compositions is too small for reliable AI predictions, it establishes a framework for accelerating material discovery. Expanding this library to a wider range of cathode materials will create the high-quality, large-scale datasets necessary for machine learning to identify optimal battery compositions before they are physically synthesized in a lab. Future expansions of this materials library will allow scientists to tailor sodium-ion cathodes to specific requirements, such as prioritizing faster charging, higher energy storage, or increased cycle life.

Source: <https://www.surrey.ac.uk/news/new-materials-library-could-help-ai-design-better-sodium-ion-batteries>

Collected: October 24, 2026 | Automated Research System (AI)

#02 Bismuth-Carbon Nanocomposites: Sodium Battery Anode Specs

Published October 18, 2026 BIOENGINEER.ORG China



OVERVIEW

Researchers have developed a bismuth-carbon nanocomposite that mitigates volumetric swelling in sodium-ion battery anodes, maintaining high capacity over 1,000 cycles. The material achieves a reversible capacity of 416.5 mAh/g at 1 A/g with 99.9% coulombic efficiency. This architecture addresses the critical degradation issues of alloying anodes, paving the way for more durable, affordable energy storage.

Key Findings

The optimized electrode, designated Bi@C-100:30-800, demonstrates exceptional stability and capacity retention. At a current density of 500 mA/g, it delivered a reversible specific capacity of 443.6 mAh/g after 500 cycles. When the current density was increased to 1 A/g, the electrode maintained a reversible capacity of 416.5 mAh/g after 1,000 cycles, with a coulombic efficiency of 99.9%.

Technical Details

The team from North China University of Science and Technology utilized metal-organic frameworks (MOFs) to create a porous bismuth-carbon composite. The synthesis process involves two primary stages:

- **MOF Precursor Fabrication:** A facile solvothermal method is used to create crystalline scaffolds where bismuth atoms are distributed at the molecular level.
- **Carbonization:** By regulating solvent volume ratios and thermal treatment temperatures, the organic linkers are converted into a conductive carbon matrix that wraps the bismuth species.

The researchers identified a 100:30 solvent ratio and a treatment temperature of 800 degrees Celsius as the optimal parameters for morphology control. This carbon cage acts as a mechanical buffer, absorbing the volumetric expansion that occurs during the sodium-bismuth alloying reaction and preventing the electrode from pulverizing.

Background & Context

Metallic bismuth is a high-capacity anode material, but it suffers from severe volumetric pumping—swelling during charging and shrinking during discharge—which typically leads to rapid capacity fade. Bismuth is preferred over other metals due to its lower toxicity, lower reactivity, and a layered crystal structure that allows for fast charge transfer with low diffusion barriers.

Significance & Outlook

The high coulombic efficiency suggests that the carbon confinement stabilizes the interface between the electrode and the electrolyte, suppressing parasitic side reactions. By combining MOF-derived porous carbon architectures with alloying anode stabilization, this approach provides a controllable synthesis method essential for scaling laboratory materials toward practical manufacturing for sodium-ion batteries.

Source: <https://bioengineer.org/bismuth-trapped-in-carbon-cages-tames-swelling-in-sodium-battery-anodes/>

Collected: October 24, 2026 | Automated Research System (AI)

#03 Fraunhofer ISE Silicon Battery: 1,000-Cycle Test and Specs

Published October 22, 2026 electrive.com Germany



OVERVIEW

Researchers at Fraunhofer ISE have developed a silicon-rich anode pouch cell that retains over 83 per cent capacity after 1,000 full cycles. This breakthrough addresses the volume expansion issues of silicon, potentially increasing EV range from 450 km to over 600 km at the same battery weight.

Key Findings

As part of the 'StrOboBatt' project, the Fraunhofer Institute for Solar Energy Systems (ISE) successfully operated a self-manufactured 25-Ah pouch cell with silicon-rich anodes for over 1,000 full cycles. The cell maintained more than 83 per cent of its capacity, surpassing the 80 per cent threshold generally considered the minimum requirement for commercial viability.

Technical Details

The cell utilizes a silicon-carbon composite, which constitutes 51 per cent of the anode's active material, paired with a nickel-rich cathode. This configuration was produced on an industry-scale pilot line to achieve higher energy density than conventional graphite anodes.

Testing revealed that external mechanical pressure is a critical factor for stability. The prototypes were subjected to an axial pressure of 1,000 kilopascals (approx. 10 bar), which kept electrode contact stable despite material movement. In contrast, a lower pressure of 300 kilopascals (approx. 3 bar) resulted in a significantly faster decrease in usable capacity. Additionally, data showed that usable capacity declines more rapidly at high power levels than during gentle test cycles.

Background and Context

Silicon is desirable for its high energy density but suffers from extreme volume expansion—up to 300 per cent—during lithium-ion absorption during charging. This expansion and subsequent shrinkage during discharging typically lead to electrical contact loss and electrolyte decomposition. For comparison, graphite expands by only 10 to 12 per cent.

Significance and Outlook

The tested cells achieved a gravimetric energy density of 280 Wh/kg, with Fraunhofer ISE stating that industrially optimised mass production could reach approximately 330 Wh/kg. This represents a 20 to 35 per cent increase over current NMC and NCA cells, and nearly double the density of LFP cells.

- **EV Impact:** A vehicle could carry nearly 100 kWh of storage instead of 75 kWh at the same weight, increasing range from 450 km to over 600 km.
- **Strategic Sourcing:** Increasing silicon composite use allows for a partial shift in raw material value creation to Europe, reducing reliance on imported graphite.

Source: <https://www.electrive.com/2026/10/22/greater-range-at-the-same-weight-silicon-battery-passes-laboratory-test/>

Collected: October 24, 2026 | Automated Research System (AI)

#04 Multimetal MOFs: TAC-linked bifunctional catalysts for Zn–air batteries

Published October 22, 2026 BIOENGINEER.ORG



OVERVIEW

A trimesic acid (TAC)-linked multimetal metal–organic framework (MOF) film achieved a current density of 60 mA cm^{-2} and stable cycling for over 13 days in rechargeable zinc–air batteries. The study demonstrates that carboxylate ligand selection significantly influences catalytic behavior and overall battery performance.

Key Findings

The TAC-linked multimetal MOF delivered the highest performance among the tested electrodes in rechargeable zinc–air batteries. Assembled devices achieved a current density of 60 mA cm^{−2}, a round-trip efficiency of approximately 60%, and a charge–discharge voltage gap of 0.8–0.9 V. During long-term cycling at 5 mA cm^{−2}, the material remained stable for more than 13 days.

Technical Details

Researchers synthesized polymetallic framework films directly on carbon cloth using cathodic electrodeposition. The frameworks combined nickel, cobalt, iron, and manganese centers. To evaluate the effect of carboxylate coordination, three different organic ligands were compared: trimesic acid (TAC), terephthalic acid (BDC), and 2,6-naphthalenedicarboxylic acid (NDC).

- **Oxygen Evolution Reaction (OER):** The NDC-based MOF showed the lowest overpotential at 310 mV (at 10 mA cm^{−2}), followed by TAC (340 mV) and BDC (350 mV). This variation is attributed to the electrochemically active surface area and the redistribution of electrons at metal sites.
- **Oxygen Reduction Reaction (ORR):** All three samples exhibited similar half-wave potentials of approximately 0.76 V. However, Koutecky–Levich analysis indicated that the TAC-based material had an electron-transfer number of about 3.8, suggesting a higher contribution from the four-electron pathway.

Background & Context

The study focused on the relationship between ligand structure and the resulting bifunctional catalytic behavior. By retaining the same four metal centers while varying the organic linker, the investigators examined how coordination affects metal–oxygen interactions and electron distribution. The research was conducted by Silvia N. Cruz Orellana, Próspero Acevedo-Peña, and Edilso Reguera.

Significance & Outlook

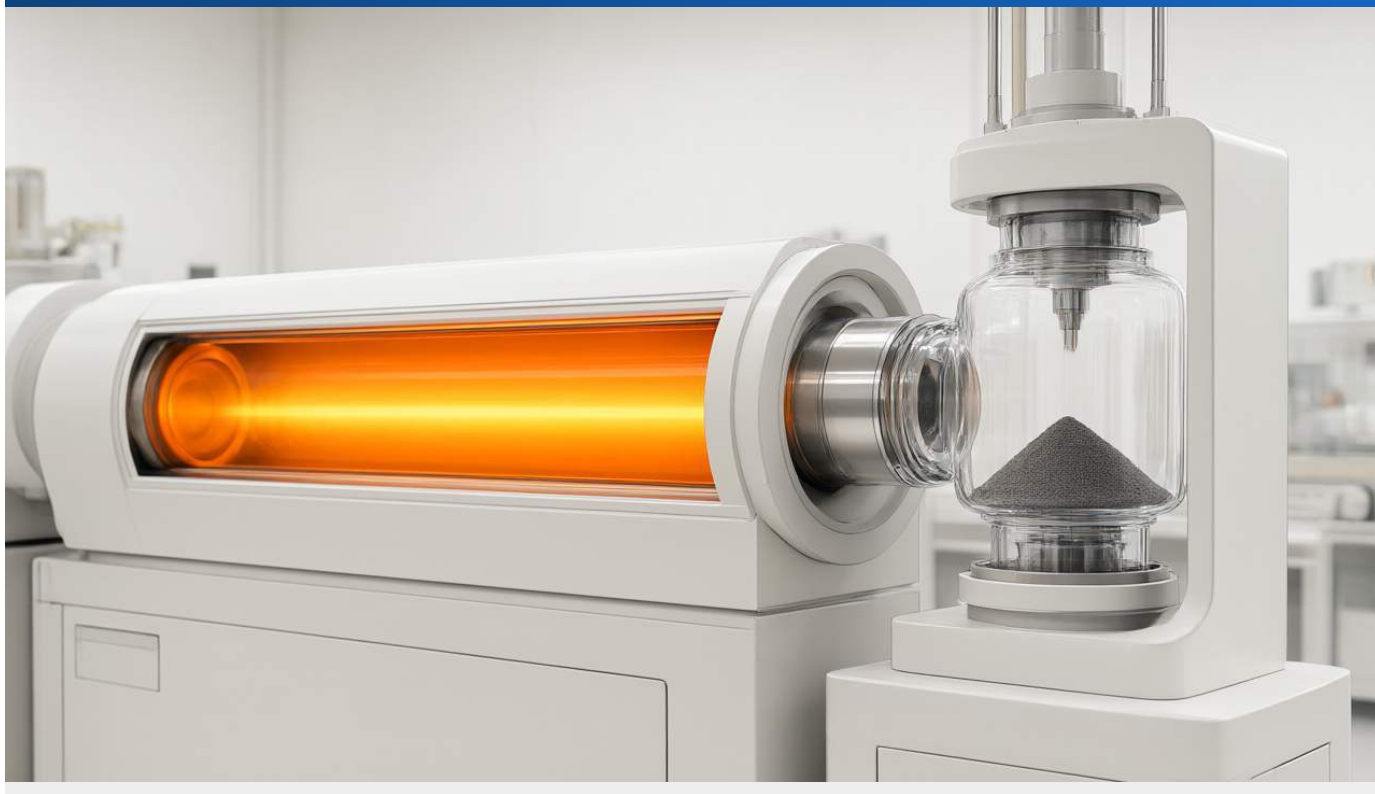
The results indicate that the selection of the carboxylate linker is a critical factor in optimizing both the catalytic properties and the device-level performance of multimetal MOFs. While the TAC-linked framework showed superior stability and efficiency, the study notes that the findings are based on specific experimental conditions and do not yet establish performance against commercial benchmarks or fully define long-term degradation mechanisms.

Source: <https://bioengineer.org/tac-linked-multimetal-mof-enables-13-day-cycling-in-rechargeable-zinc-air-battery/>

Collected: October 24, 2026 | Automated Research System (AI)

#05 NCM811 Synthesis: Residence Time Impact on Cathode Performance

Published October 22, 2026 Bioengineer.org (J. Mater. Sci.)



OVERVIEW

An eight-second residence time during spray pyrolysis optimizes the synthesis of $\text{LiNi}_{0.8}\text{Co}_{0.1}\text{Mn}_{0.1}\text{O}_2$ (NCM811) cathode materials. This specific condition produces uniform $2\text{ }\mu\text{m}$ spherical particles that deliver a discharge capacity of 203 mAh/g at 0.1 C . The findings establish residence time as a critical variable for regulating particle morphology and electrochemical stability in nickel-rich materials.

Key Findings

Research into the synthesis of nickel-rich cathode materials indicates that a residence time of eight seconds during spray pyrolysis yields the best electrochemical performance for NCM811. Particles produced under this condition exhibited a discharge capacity of 203 mAh/g at 0.1 C, superior rate capability, and excellent cycling stability. These particles were characterized by a well-defined spherical morphology, an average size of 2 μm , and a uniform composition.

Technical Details

The study utilized a force analysis method to calculate residence time and evaluate the conversion of droplets into solid particles. Researchers compared four specific residence-time conditions: 2.5, 6, 8, and 15 seconds. The data revealed that as residence time increased, droplets moved more slowly through the reactor, leading to more extensive evaporation and pyrolysis, which resulted in smaller precursor particles.

Following the annealing process, the eight-second samples maintained favorable structural features, specifically a well-ordered layered structure with minimal $\text{Li}^+/\text{Ni}^{2+}$ disorder. This structural integrity is directly linked to the improved electrochemical behavior observed during testing.

Background and Context

Spray pyrolysis was examined as a scalable, one-step continuous synthesis method for cathode materials. While the conversion of droplets to solid particles is known to affect the final material properties, the detailed influence of residence time had previously been insufficiently characterized. This research focused on how droplet motion, evaporation, and decomposition vary based on the time spent in the reactor.

Significance and Outlook

The results demonstrate that residence time is an effective experimental variable for regulating particle formation without requiring changes to the NCM811 chemical composition. However, the study's scope is limited to laboratory-scale synthesis and a single nickel-rich composition. It remains undetermined if these optimum conditions apply to other cathode chemistries or different industrial reactor configurations.

Source: <https://bioengineer.org/eight-second-spray-pyrolysis-condition-improves-ncm811-cathode-performance-in-laboratory-study/>

Collected: October 24, 2026 | Automated Research System (AI)

#06 Sungrow PowerTitan 3.0 BESS: Large-Scale Fire Test Results 2026

Published October 22, 2026 ESS News USA



OVERVIEW

Sungrow's PowerTitan 3.0 BESS successfully completed a large-scale fire test (LSFT) demonstrating that thermal runaway does not propagate to adjacent containers or medium-voltage substations. The test, conducted by UL Solutions, verified safety designs under extreme conditions with all fire suppression systems disabled.

Key Findings

The large-scale fire test (LSFT) confirmed that thermal runaway initiated in one PowerTitan 3.0 BESS container did not propagate to adjacent BESS containers or the medium-voltage substation (MVS). Despite internal temperatures in the initiating container (Container A) reaching 1259.8°C, the highest cell temperatures in adjacent containers remained below their thermal runaway thresholds. All containers, including Container A, remained structurally intact without deformation and could be lifted as complete units following the test.

Technical Details

The test was conducted in China by UL Solutions in accordance with UL 9540A: 2026 and CSA/ANSI C800-2025, with witnessing by the Fire Risk Alliance (FRA) and observation by Jensen Hughes. The setup replicated a utility-scale installation consisting of:

- 28.56 MWh of fully liquid-cooled PowerTitan 3.0 BESS in 20ft configurations.
- A 7.4 MW medium-voltage substation (MVS).
- A layout featuring Containers A–E, with the initiating and one adjacent container installed back-to-back.

To simulate extreme conditions, the BESS was at 100% state of charge. All active fire suppression and thermal management systems were disabled, and rooftop pressure-relief panels on the initiating container were fully opened to maximize oxygen availability. The test ran for 7.5 hours under uninterrupted monitoring. To protect the environment, the facility utilized ultra-large ventilation and hoods to treat all smoke and gases.

Background and Significance

According to Roger Li, general manager of the utility-scale product line at Sungrow, the test validates that safety must be engineered into the product through a combination of cell performance, system integration, thermal management, and structural protection.

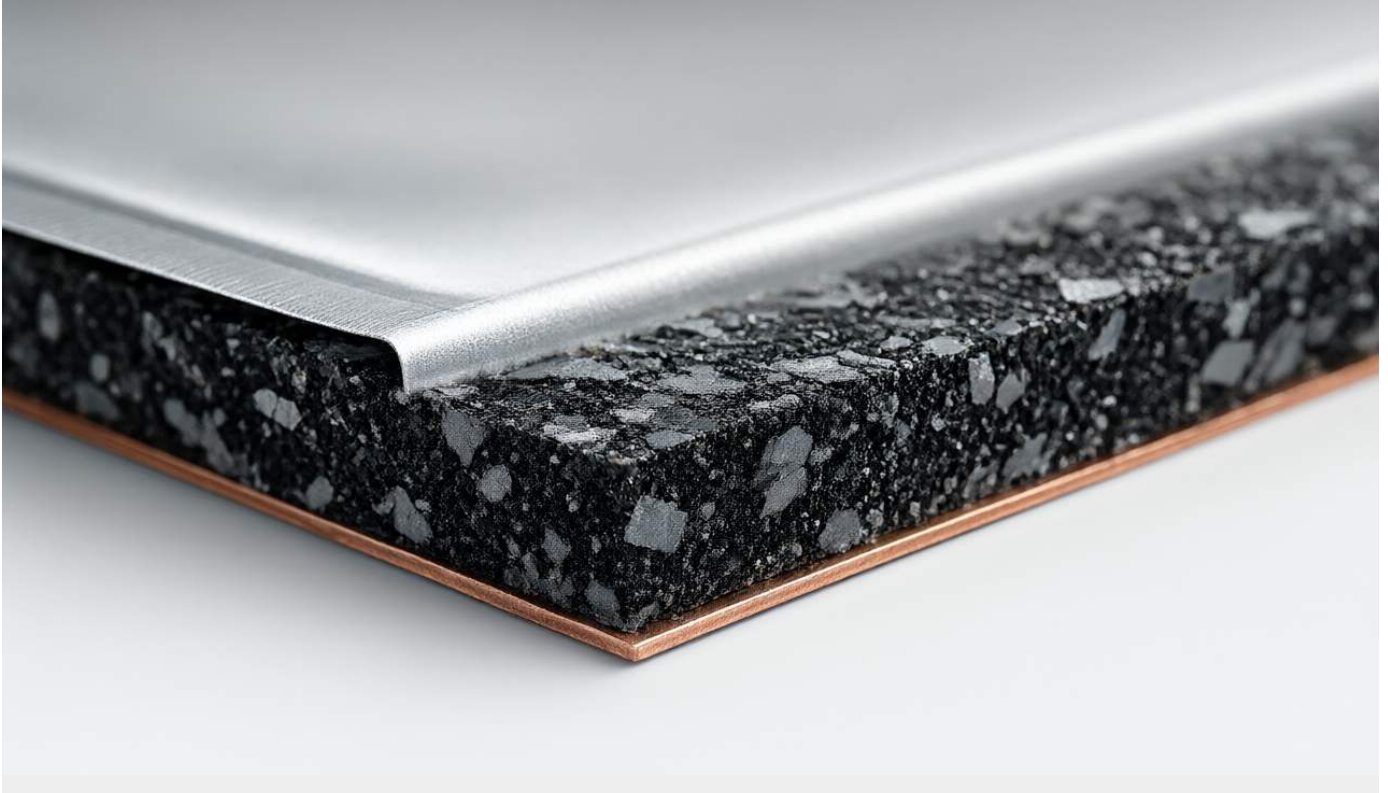
Benjamin Liu of UL Solutions noted that Sungrow's approach of using pre-test assessments to predict fire behavior, followed by physical validation, significantly reduces the potential scale of loss by containing fire and preventing propagation.

Source: <https://www.ess-news.com/2026/10/22/sungrow-details-powertitan-3-0-bess-successfully-completing-large-scale-fire-test/>

Collected: October 24, 2026 | Automated Research System (AI)

#07 Fraunhofer ISE Silicon-Rich Cells: 1,000-Cycle Life and Specs

Published October 21, 2026 ESS News Germany



OVERVIEW

Fraunhofer ISE has demonstrated 25 Ah pouch cells with silicon-rich anodes that retain over 83% capacity after 1,000 cycles. The cells achieve a cell-level gravimetric energy density of 280 Wh/kg, highlighting the critical role of mechanical contact pressure in stabilizing silicon-rich anodes.

Key Findings

Fraunhofer ISE has successfully cycled 25 Ah pouch cells featuring silicon-rich anodes for more than 1,000 cycles, maintaining over 83% of their original capacity. These results were achieved at a cell-level gravimetric energy density of 280 Wh/kg. According to Lukas Dold, team leader for battery materials technology and scaling, reaching 1,000 cycles with at least 80% retention is a critical performance target for the industrial adoption of silicon-rich anodes.

Technical Details

The 40-layer cells were produced on a semi-automatic line at the institute's Center for Electrical Energy Storage in Freiburg, Germany. The technical specifications include:

- **Chemistry:** A nickel-rich nickel-manganese-cobalt (NMC) cathode paired with a silicon-carbon/graphite anode.
- **Anode Composition:** Silicon-carbon composite constitutes 51% of the anode active material.
- **Capacity:** Anodes reached a specific capacity exceeding 1,000 mAh/g and an areal capacity over 5 mAh/cm².
- **Pressure Variables:** Testing at 1C showed that cells held at 1,000 kPa achieved the 83% retention figure, while those at 300 kPa exhibited a significantly greater decline in usable capacity.

While the current 280 Wh/kg figure was recorded using the non-optimized PreclSE research cell format, Fraunhofer ISE expects an industrially optimized pouch format to reach approximately 330 Wh/kg.

Background and Context

This research is part of the StrOboBatt project, led by PCC Thorion alongside Fraunhofer ISE and Glatt Ingenieurtechnik, with partners including LG Chem Europe, E-Lyte Innovations, and UniverCell Holding. The project, which launched in 2024 with €2.6 million in federal funding, targets applications in electric mobility, aerospace, and stationary storage for wind and solar power.

Significance and Outlook

Because silicon's theoretical specific capacity is 10 times that of graphite, silicon-carbon composites could reduce global dependence on graphite and shift raw-material value creation toward the European Union. Other industry movements include Sicona, which received up to AUD 45 million from the Australian Renewable Energy Agency (ARENA) for a commercial-scale plant to produce materials that could increase energy density by up to 20% and accelerate charging by up to 40% compared to graphite anodes.

Source: <https://www.ess-news.com/2026/10/21/fraunhofer-silicon-rich-cells-retain-over-83-after-1000-cycles/>

Collected: October 24, 2026 | Automated Research System (AI)

#08 Compressed CO2 Storage: China Huadian's 100 MW Plant Specs

Published October 15, 2026 ESS News China



OVERVIEW

China Huadian has connected a 100 MW/1,000 MWh compressed carbon dioxide (CO₂) energy storage plant to the grid in Xinjiang. This facility marks a transition from pilot systems to utility-scale deployment for long-duration energy storage.

Key Findings

China Huadian has completed the first grid connection of a 100 MW/1,000 MWh compressed CO₂ energy storage plant on September 30. Located in the Gobi Desert of Changji Prefecture, Mulei County, the facility is integrated with a renewable energy hub consisting of 600 MW of wind and 400 MW of solar capacity. Once fully operational, the plant is expected to generate approximately 200 GWh annually, potentially reducing standard coal consumption by 50,000 metric tons and CO₂ emissions by 170,000 metric tons per year.

Technical Details

The plant occupies 565,000 square meters and utilizes a closed thermodynamic cycle with CO₂ as the working fluid. The infrastructure includes five gas storage enclosures, 141 liquid CO₂ storage units, and 97 thermal storage units, providing a nominal discharge duration of 10 hours. The process operates as follows:

- **Charging:** Surplus electricity powers compressors to pressurize gaseous CO₂. Generated heat is recovered and stored, while the gas is cooled and liquefied for storage in pressure vessels.
- **Discharging:** Liquid CO₂ is evaporated, reheated using stored thermal energy, and expanded through a turbine to generate electricity.

The CO₂ turbine features a design efficiency exceeding 92%. The system is designed for a 30-year operational life, supporting over 20,000 start-stop cycles with a startup-to-full-load time of under 20 minutes. However, system-level round-trip efficiency and levelized storage costs have not been disclosed.

Background and Context

The technology was developed by Professor Xie Yonghui's team at Xi'an Jiaotong University and commercialized by Exax Energy (Bairang New Energy), with Dongfang Electric serving as the EPC contractor. This 100 MW project follows smaller Chinese demonstrations, including a 10 MW/20 MWh system in 2022 and a 10 MW/80 MWh plant in Anhui province in December 2023. Internationally, Italy's Energy Dome has deployed a similar 20 MW/200 MWh facility in Sardinia.

Significance and Outlook

By using CO₂, which liquefies at moderate pressures, the system allows for more compact storage than conventional compressed air energy storage (CAES) and eliminates the requirement for underground salt caverns. While it still requires significant above-ground infrastructure and specialized turbomachinery, the Mulei project demonstrates the engineering integration of this technology at a utility scale.

Source: <https://www.ess-news.com/2026/10/15/chinas-first-100-mw-compressed-co2-storage-plant-connects-to-grid/>

Collected: October 24, 2026 | Automated Research System (AI)

#09 FG-3 Graphene Catalyst: Zinc-Air Battery Efficiency and Specs

Published October 15, 2026 Interesting Engineering China



OVERVIEW

Researchers have developed a fluorinated graphene catalyst (FG-3) that enables zinc-air batteries to achieve 98 percent round-trip efficiency and a lifespan exceeding 820 hours. By utilizing a two-electron reaction pathway, the catalyst significantly improves the rechargeability and durability of zinc-based energy storage.

Key Findings

A research team from the Fujian Institute of Research on the Structure of Matter (FJIRSM) at the Chinese Academy of Sciences (CAS) has developed a fluorinated graphene electrocatalyst, designated as FG-3, that raises zinc-air battery efficiency to approximately 98 percent. In laboratory tests, batteries using this catalyst operated stably for over 820 hours in ambient air and retained 97.6 percent efficiency after 1,500 charging and discharging cycles.

Technical Details

The FG-3 catalyst consists of 3.1 percent fluorine. It was produced via a controlled heating process that gradually removed fluorine to restore the material's electrically conductive carbon structure. This specific concentration of fluorine resulted in a large surface area, evenly distributed fluorine, and improved interaction with the electrolyte. The fluorine-carbon bonds also altered the electrical properties of adjacent carbon atoms.

Performance metrics for the catalyst include:

- 97.4 percent hydrogen peroxide selectivity.
- 98 percent Faradaic efficiency.
- Peak power density of 569 milliwatts per square centimeter (mW cm⁻²) in non-rechargeable configurations.
- 98 percent round-trip efficiency in rechargeable versions.

Background and Context

Zinc-air batteries (ZABs) utilize zinc metal as the negative electrode and oxygen from the surrounding air at the positive electrode. While they offer higher energy density and lower costs compared to lithium-ion batteries due to the abundance of zinc, they have historically been difficult to recharge. This is due to complex chemical reactions during charging and discharging that require high energy and accelerate material degradation.

To overcome this, the team led by Wen Zhenhai, PhD, and Huang Junheng, PhD, utilized a two-electron ($2e^-$) O_2 - H_2O_2 interconversion pathway, which offers faster intrinsic kinetics and superior reversibility compared to traditional methods.

Significance and Outlook

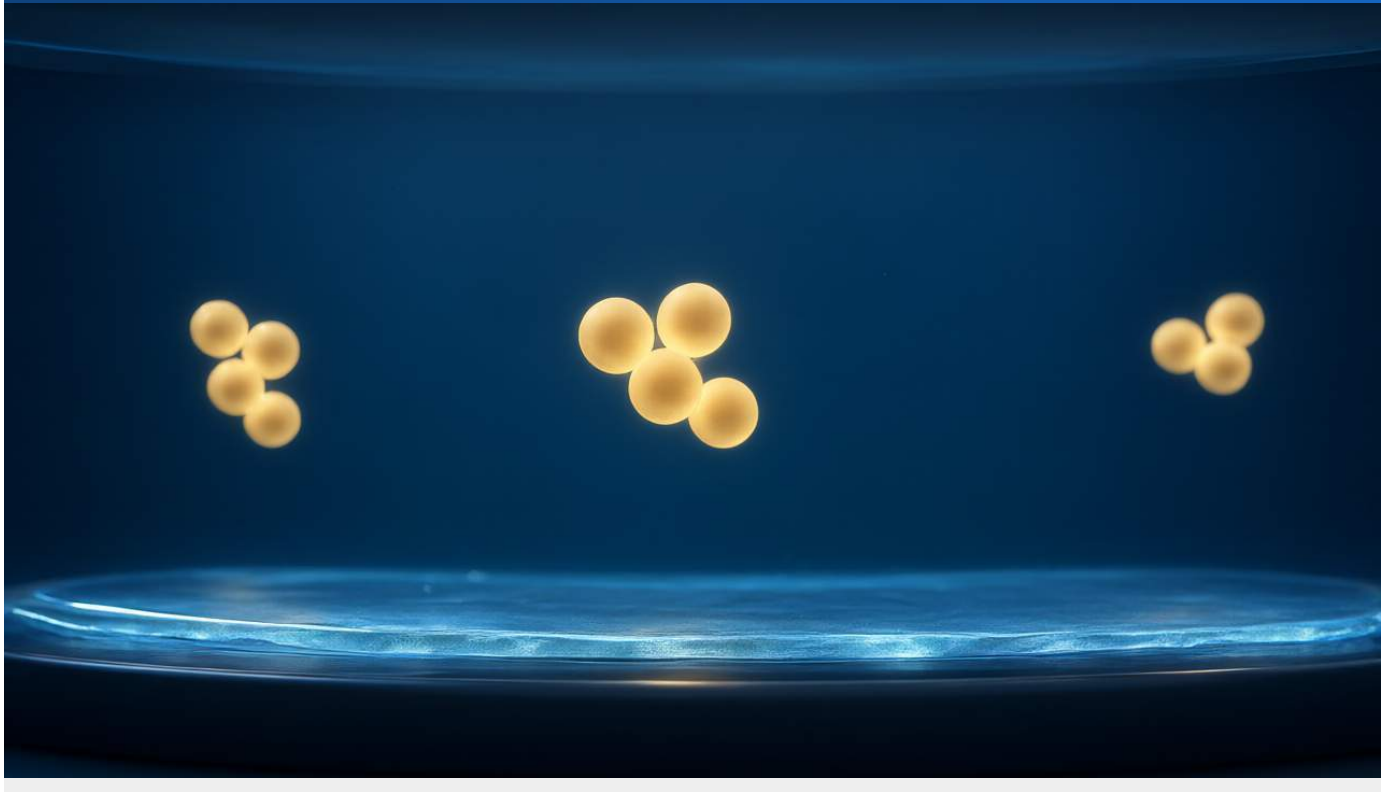
The study, published in *Angewandte Chemie International Edition*, demonstrates a strategy for creating high-performance carbon catalysts without relying on metals. The researchers believe these findings could lead to more efficient next-generation energy storage systems by providing a highly reversible pathway for oxygen and hydrogen peroxide interconversion.

Source: <https://interestingengineering.com/energy/zinc-air-battery-hits-98-efficiency-820-hour-lifespan>

Collected: October 24, 2026 | Automated Research System (AI)

#10 Lithium-Ion Clusters: Columbia University's Battery Chemistry Map

Published October 21, 2026 Interesting Engineering USA



OVERVIEW

Columbia University researchers discovered that up to 40% of lithium ions in standard battery electrolytes form multi-ion clusters without anions. These clusters are identified as key intermediates in the formation of the protective solid electrolyte interphase (SEI) film. This finding challenges long-held assumptions and provides a foundation for designing higher-capacity and faster-charging batteries.

Key Findings

Research led by Columbia University has revealed that lithium ions in battery electrolytes do not always remain isolated. Simulations indicate that up to 40% of lithium ions in standard electrolytes form multi-ion clusters in the absence of anions. This clustering behavior becomes more prevalent as salt concentrations increase, contradicting previous assumptions regarding the behavior of lithium ions in solution.

Technical Details

The study utilized a combination of machine-learning force-field technology from Schrödinger, Inc., and experimental validation. This computational approach, supported by the New York Structural Biology Center, allowed the team to simulate electrolyte structures at a larger scale and with higher accuracy than previous methods. Quantum chemical calculations further indicated that these multi-lithium clusters possess particularly favorable reduction potentials.

Background & Context

The research was co-led by Richard Friesner of Columbia's Department of Chemistry, alongside Alexander Urban, Lauren Marbella, and Daniel Steingart of Columbia Engineering. The team focused on the formation of the solid electrolyte interphase (SEI), a protective film on the battery anode that is critical for safety and lifespan. While the theoretical simulations provided the most novel insights, the team emphasized that the experimental work conducted by Columbia Engineering was essential to confirm the physical reality of the predicted clusters.

Significance & Outlook

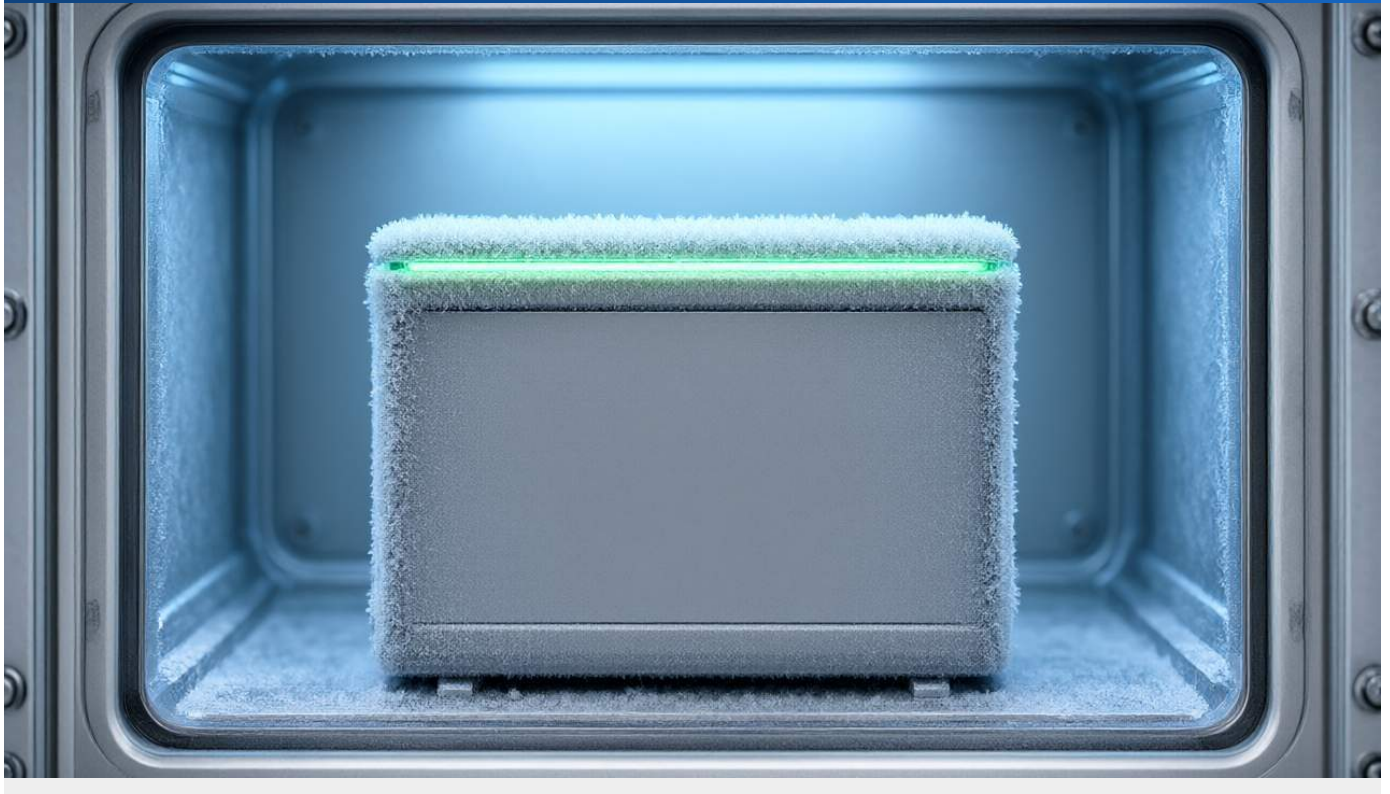
The discovery that lithium clusters drive the creation of the SEI film provides a clearer basis for investigating how electrolyte chemistry influences battery performance. While the research focuses on theoretical and experimental mapping rather than demonstrated battery gains, the findings offer a foundation for developing next-generation electrolytes with improved stability, charging rates, and capacity. The project was funded by Gates Ventures and published in the journal Nature.

Source: <https://interestingengineering.com/energy/research-reveals-unexpected-lithium-ion-clusters>

Collected: October 24, 2026 | Automated Research System (AI)

#11 Donut Lab Battery: Cold-Weather Energy Retention Specs at -30°C

Published October 21, 2026 Interesting Engineering USA



OVERVIEW

A first-generation battery module from Donut Lab retained approximately 93% of its energy at -30°C without external heating or insulation. Testing conducted by VTT showed the module delivered 1,254 watt-hours in freezing conditions compared to 1,354 watt-hours at 25°C. This performance addresses the critical challenge of energy loss in electric vehicles during cold weather.

Key Findings

In tests conducted by VTT, a battery module from Donut Lab retained approximately 93% of its energy at -30°C (-22°F). The module delivered 1,254 watt-hours at this temperature, compared to 1,354 watt-hours at 25°C (77°F). Additionally, the module retained about 97% of its ampere-hour capacity, indicating limited capacity loss under these conditions.

Technical Details

The test utilized a complete module consisting of 14 first-generation Donut Battery cells with a nominal voltage of 48 volts and a small battery management system. To isolate the battery's inherent performance, the setup excluded all thermal management systems, including heating elements, insulation, and cooling equipment.

- **Baseline Test (25°C):** Discharged at a 1C rate, delivering 27.77 ampere-hours and 1,354 watt-hours.
- **Cold Test (-30°C):** After five hours of exposure to the target temperature, the module was discharged at a 1C rate, delivering 26.8 ampere-hours and 1,254 watt-hours.

The discrepancy between charge capacity (97% retention) and energy retention (93% retention) is attributed to a further drop in voltage during cold-weather discharge.

Background & Context

Low temperatures typically slow chemical reactions in batteries, reducing the usable energy available for electric vehicles. While Donut Lab previously claimed 99% capacity retention at -30°C, these VTT results provide a measured figure from a complete module rather than a single cell. Ville Piippo, Donut Lab's CTO, noted that the company intentionally eliminated all potential advantages, such as insulation, to test the cells' raw performance.

Significance & Outlook

Donut Lab reported that the module continued to charge and discharge normally following the tests, with no adverse effects observed. However, as these were controlled laboratory tests on a single module, the results do not yet establish the actual driving range of a complete electric vehicle. Donut Lab is now focusing on next-generation battery technologies and further system-level demonstrations.

Source: <https://interestingengineering.com/energy/donut-battery-cold-weather-test>

Collected: October 24, 2026 | Automated Research System (AI)

#12 cylib: EU Strategic Project status for Dormagen recycling site

Published October 15, 2026 Battery-Tech Network (cylib) Germany



OVERVIEW

The European Commission has designated cylib's battery recycling project in Dormagen, Germany, as a Strategic Project under the Critical Raw Materials Act (CRMA). The facility is designed to process up to 140,000 EV batteries annually to reduce dependence on third countries. This designation supports the EU's 2030 goal of meeting 25% of its strategic raw material consumption through recycling.

Key Findings

On October 14, 2026, cylib announced that its hydrometallurgical processing facility in Dormagen, Germany, has been selected as a Strategic Project under the European Union's Critical Raw Materials Act (CRMA). The project is intended to strengthen the European supply of strategic raw materials and contribute to the EU's 2030 objective of sourcing at least 25% of its annual strategic raw material consumption from recycling.

Technical Details

The Dormagen facility is designed to process up to 140,000 electric vehicle batteries per year. Central to the operation is the water-based OLiC (Optimized Lithium and Graphite Recovery) technology, which is capable of recovering raw materials from production scrap, black mass, and battery packs. According to cylib, this process achieves recovery rates exceeding 90% for the following materials:

- Lithium
- Graphite
- Nickel
- Cobalt
- Manganese

Additionally, the company reports that this recovery process results in a carbon footprint that is 80% lower than that of primary extraction.

Background and Context

The Dormagen site serves as the industrial-scale hydrometallurgical hub within cylib's integrated German network. This network includes the company's headquarters in Aachen, where research and development is conducted, and a site in Wernberg-Köblitz, Bavaria, which handles battery pre-processing and mechanical processing. Founded in 2022, cylib emerged from research conducted at RWTH Aachen University.

Significance and Outlook

The Strategic Project status is intended to provide partners with increased confidence in a European-based value chain that converts used batteries back into recovered raw materials for industrial use. By reducing reliance on individual third countries, the project aims to create a more resilient and circular raw materials supply for the European industry.

Source: <https://battery-tech.net/battery-markets-news/cylib-eu-strategic-recycling-project/>

Collected: October 24, 2026 | Automated Research System (AI)

#13 US Grid Batteries: Fire Risk Trends and 2025 Failure Rates

Published October 23, 2026 Canary Media USA



OVERVIEW

Annual failure rates for US grid-scale batteries fell by more than 97% between 2016 and 2025, despite a 250-fold increase in cumulative deployments. Data indicates that battery failure rates are now comparable to those of legacy oil-filled substation transformers, suggesting that public concern over fire risk is disproportionate to actual technical risk.

Key Findings

Data compiled by the nonprofit Electric Power Research Institute (EPRI) reveals that the annual failure rate of commercial and grid-scale batteries in the U.S. has plummeted as installations have grown exponentially. By 2025, the failure rate decreased by more than 97% compared to 2016 levels, while cumulative deployments increased 250-fold. Notably, there were three separate years within the last decade where no known failures occurred.

Technical Details

The EPRI report tracks global failures, including arc flash, fire, and explosion events. The decline in failure rates is attributed to several factors:

- Implementation of new safety standards since the installation of the first large-scale batteries.
- Increased sophistication in battery chemistry and design.
- Improved project layouts and safety engineering.

However, lead author Lakshmi Srinivasan notes that the dataset is limited by a small sample size because failures are relatively rare.

Background & Context

While the overall trend is downward, the raw tally does not account for event severity. Significant incidents include a 2019 fire outside Phoenix that seriously injured four emergency responders and a January 2025 blaze at California's Moss Landing facility. The Moss Landing event destroyed the power plant and required multi-day community evacuations, though no injuries were reported.

Significance & Outlook

EPRI calculations show that grid battery units now fail at a rate comparable to oil-filled transformers used in substations to convert voltage. Despite this technical parity, battery projects face significantly higher public scrutiny than legacy transformer infrastructure. Providing this data may help communities calibrate the risks of hosting battery installations against benefits such as enhanced grid reliability, tax revenue, and reduced electricity costs.

Source: <https://www.canarymedia.com/articles/batteries/us-grid-batteries-fire-risk>

Collected: October 24, 2026 | Automated Research System (AI)