TROY TECHNICAL

NEXT-GENERATION ENERGY STORAGE WEEKLY REPORT

November 8 - November 14, 2026 | Issue 2026-W45

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

11	10
ANALYZED ARTICLES	PRIORITY THEMES

Issued 2026-11-14 | English edition | fixed approved cover artwork



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

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

SIGNAL 01 | ACTIVE MATERIALS

Grepow Sodium-Ion Pouch Cells: Specs and Cold-Weather Performance

Grepow has launched a commercial sodium-ion pouch-cell platform featuring five models with capacities from 2.0 Ah to 7.0 Ah. These cells demonstrate superior low-temperature pulse discharge compared to LFP and a projected cycle life exceeding 4,000 cycles.

SIGNAL 02 | CELL DESIGN

Sb@HC Core-Shell Anodes: Sodium-Ion Battery Capacity and Stability

A core-shell structured antimony (Sb) and hard carbon (HC) nanocomposite anode has demonstrated enhanced electrochemical performance for sodium-ion batteries.

SIGNAL 03 | MANUFACTURING

Aqueous Iodine Batteries: UCL's Halogen-Free 4-Electron Design

Researchers at University College London (UCL) developed a " KA-PA-Nuc" electrolyte framework that enables reversible 4-electron redox reactions in aqueous iodine batteries without relying on corrosive halide salts.

SIGNAL 04 | SYSTEM VALIDATION

PHEV-ReGrid Platform: Sodium-Ion Hybrid Specs and Grid Impact

A proposed PHEV-ReGrid architecture combining a 30 kWh sodium-ion battery with a compact combustion generator reduces vehicle mass by roughly 210 kg and manufacturing costs by $8,500 to $9,500.

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.

Numbers and evidence anchors that require conditions

000 cycles
A09

SOURCE-BOUND CONDITION
These cells demonstrate superior low-temperature pulse discharge compared to LFP and a projected cycle life exceeding 4,000 cycles.

95.4%
A03

SOURCE-BOUND CONDITION
The Sb@HC/HC composite achieved a charge capacity of 482.4 mAh g-1 and 95.4% capacity retention after 100 cycles, offering a viable path to overcome the stability and capacity trade-offs of individual anode materials.

96%
A08

SOURCE-BOUND CONDITION
The system maintained 96% capacity after 1,000 cycles at 1 A g-1, potentially doubling theoretical capacity to 422 mAh g-1 compared to traditional 2-electron systems.

30 kW
A11

SOURCE-BOUND CONDITION
A proposed PHEV-ReGrid architecture combining a 30 kWh sodium-ion battery with a compact combustion generator reduces vehicle mass by roughly 210 kg and manufacturing costs by $8,500 to $9,500.

109 nm
A04

SOURCE-BOUND CONDITION
Researchers have developed a method to produce silica nanoparticles averaging 109 nm from end-of-life solar cell powder to enhance battery anodes.

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.

1

Active materials

P01/P06

Grepow has launched a commercial sodium-ion pouch-cell platform featuring five models with capacities from 2.0 Ah to 7.0 Ah.

2

Cell design

P02/P07

A core-shell structured antimony (Sb) and hard carbon (HC) nanocomposite anode has demonstrated enhanced electrochemical.

3

Manufacturing

P03/P08

Researchers at University College London (UCL) developed a "KA-PA-Nuc" electrolyte framework that enables reversible.

4

System validation

P04/P09

A proposed PHEV-ReGrid architecture combining a 30 kWh sodium-ion battery with a compact combustion generator reduces vehicle.

5

Deployment & recycling

P05/P10

Researchers have developed a method to produce silica nanoparticles averaging 109 nm from end-of-life solar cell powder to.

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



P01	Grepow Sodium-Ion Pouch Cells: Specs and Cold-Weather Performance System / adoption | cue: launched
P02	Sb@HC Core-Shell Anodes: Sodium-Ion Battery Capacity and Stability Business / rules | cue: Capacity
P03	Aqueous Iodine Batteries: UCL's Halogen-Free 4-Electron Design Business / rules | cue: capacity
P04	PHEV-ReGrid Platform: Sodium-Ion Hybrid Specs and Grid Impact System / adoption | cue: Platform
P05	Solar Panel Waste: Silica Nanoparticles for Battery Anodes Business / rules | cue: capacity
P06	Li-S Energy: High-power lithium-sulfur cell specs and applications Tech / process | cue: no system/business cue
P07	UNSW Battery Health Test: 3-Minute Lithium-Ion Diagnostics System / adoption | cue: platform
P08	Invinity Endurium VFB: Upgrade to Energy Capacity and Peak Power Business / rules | cue: Capacity
P09	Vitamin B12 Zinc-Air Battery: Rechargeable Prototype Specs Tech / process | cue: no system/business cue
P10	Electroactive Fiber Optics: Real-Time Ion Transport Probing System / adoption | cue: integrates

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 Grepow Sodium-Ion Pouch Cells: Specs and Cold-Weather Performance

A09 | Active materials | Joint evaluation

2026-11-12

FACT

Grepow has launched a commercial sodium-ion pouch-cell platform featuring five models with capacities from 2.0 Ah to 7.0 Ah. These cells demonstrate superior low-temperature pulse discharge compared to LFP and a projected cycle life exceeding 4,000 cycles. The platform targets reliability-critical applications in frigid climates and cost-sensitive industrial sectors.

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 3/5 | DECISION LOCUS: SYSTEM / ADOPTION

P02 Sb@HC Core-Shell Anodes: Sodium-Ion Battery Capacity and Stability

A03 | Cell design | Product adoption

2026-11-10

FACT

A core-shell structured antimony (Sb) and hard carbon (HC) nanocomposite anode has demonstrated enhanced electrochemical performance for sodium-ion batteries. The Sb@HC/HC composite achieved a charge capacity of 482.4 mAh g-1 and 95.4% capacity retention after 100 cycles, offering a viable path to overcome the stability and capacity trade-offs of individual anode 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 P02.

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.

P03 Aqueous Iodine Batteries: UCL's Halogen-Free 4-Electron Design

A08 | Manufacturing | Product adoption

2026-11-14

FACT

Researchers at University College London (UCL) developed a " KA-PA-Nuc" electrolyte framework that enables reversible 4-electron redox reactions in aqueous iodine batteries without relying on corrosive halide salts. The system maintained 96% capacity after 1,000 cycles at 1 A g-1, potentially doubling theoretical capacity to 422 mAh g-1 compared to traditional 2-electron systems.

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 4/5 | DECISION LOCUS: BUSINESS / RULES

P04 PHEV-ReGrid Platform: Sodium-Ion Hybrid Specs and Grid Impact

A11 | System validation | Research

2026-11-12

FACT

A proposed PHEV-ReGrid architecture combining a 30 kWh sodium-ion battery with a compact combustion generator reduces vehicle mass by roughly 210 kg and manufacturing costs by $8,500 to $9,500. This configuration eliminates long-distance highway range limitations while transforming personal vehicles into distributed grid 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 P04.

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

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

P05 Solar Panel Waste: Silica Nanoparticles for Battery Anodes

A04 | Deployment & recycling | Product adoption

2026-11-09

FACT

Researchers have developed a method to produce silica nanoparticles averaging 109 nm from end-of-life solar cell powder to enhance battery anodes. Blending 5% of these particles into graphite anodes increased capacity to 370.34 mAh/g after 100 cycles, demonstrating a viable upcycling path for PV waste.

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 4/5 | DECISION LOCUS: BUSINESS / RULES

P06 Li-S Energy: High-power lithium-sulfur cell specs and applications

A06 | Active materials | Pilot

2026-11-09

FACT

Li-S Energy has developed two new Power Cell designs that deliver up to 50 times the power of traditional lithium-sulfur chemistry while maintaining an energy density approaching 400 Wh/kg. These cells target weight-critical, high-power platforms including multi-rotor drones, robotics, and communications systems.

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 19/25 | MATURITY 2/5 | DECISION LOCUS: TECH / PROCESS

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

P07 UNSW Battery Health Test: 3-Minute Lithium-Ion Diagnostics

A10 | Cell design | Joint evaluation

2026-11-14

FACT

Researchers at UNSW have developed a prototype battery health test that is 95.5% faster and over 80% cheaper than current methods. By utilizing short electrical pulses and statistical models, the platform enables rapid assessment of EV and energy storage batteries to facilitate second-life reuse and 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 P07.

UNKNOWN

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

EDITORIAL SCORE 19/25 | MATURITY 3/5 | DECISION LOCUS: SYSTEM / ADOPTION

P08 Invinity Endurium VFB: Upgrade to Energy Capacity and Peak Power

A05 | Manufacturing | Product adoption

2026-11-09

FACT

Invinity Energy Systems has upgraded its Endurium vanadium flow battery (VFB) platform, increasing energy capacity by 50% and peak power output by 33%. These enhancements reduce the number of modules required for a given installation size, lowering equipment footprint and lifecycle costs.

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 Vitamin B12 Zinc-Air Battery: Rechargeable Prototype Specs

A01 | System validation | Joint evaluation

2026-11-13

FACT

Researchers at the University of Córdoba have developed a rechargeable zinc-air battery utilizing vitamin B12 as a catalyst. The prototype has completed up to 250 charge-discharge cycles, offering a safer and more sustainable alternative to lithium-ion 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 P09.

UNKNOWN

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

EDITORIAL SCORE 19/25 | MATURITY 3/5 | DECISION LOCUS: TECH / PROCESS

P10 Electroactive Fiber Optics: Real-Time Ion Transport Probing

A02 | Deployment & recycling | Pilot

2026-11-09

FACT

Researchers have developed an electroactive fiber-optic device that integrates plasmonic sensing with electrochemical functionality to track interfacial physicochemical changes in real time. By utilizing gold-coated tilted fiber Bragg gratings as both working electrodes and optical probes, the system enables multi-scale monitoring of ion transport in aqueous and organic electrolytes.

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 18/25 | MATURITY 2/5 | DECISION LOCUS: SYSTEM / ADOPTION

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 01-11

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	Vitamin B12 Zinc-Air Battery: Rechargeable Prototype Specs	https://www.newindianexpress.com/lifestyle/science/2026/Nov/13/researchers-develop-rechargeable-battery-using-vitamin-b12
A02	Electroactive Fiber Optics: Real-Time Ion Transport Probing	https://doi.org/10.1038/s41377-026-02521-0
A03	Sb@HC Core-Shell Anodes: Sodium-Ion Battery Capacity and Stability	https://bioengineer.org/core-shell-nanoparticles-improve-sodium-ion-battery-anode-capacity-and-stability/
A04	Solar Panel Waste: Silica Nanoparticles for Battery Anodes	https://www.pv-magazine.com/2026/11/09/solar-panel-waste-yields-silica-nanoparticles-for-battery-anodes/
A05	Invinity Endurium VFB: Upgrade to Energy Capacity and Peak Power	https://uk.finance.yahoo.com/news/invinity-energy-systems-announces-endurium-074331145.html
A06	Li-S Energy: High-power lithium-sulfur cell specs and applications	https://www.prnewswire.com/news-releases/li-s-energy-finalises-new-high-power-cells-for-fast-drones-robotics-and-communications-302933718.html
A07	CATL Tener Sodium: BESS Specifications and 2027 Timeline	https://www.pv-magazine.com/2026/11/14/clarifying-the-catl-tener-sodium-with-new-specifications-and-availability/
A08	Aqueous Iodine Batteries: UCL's Halogen-Free 4-Electron Design	https://xenospectrum.com/ucl-halogen-free-four-electron-aqueous-iodine-battery/
A09	Grepow Sodium-Ion Pouch Cells: Specs and Cold-Weather Performance	https://digitalmarketreports.com/news/101812/grepow-advances-next-gen-energy-transition-with-commercial-launch-of-high-performance-sodium-ion-pouch-cell-platform/
A10	UNSW Battery Health Test: 3-Minute Lithium-Ion Diagnostics	https://www.pv-magazine.com/2026/11/14/unsw-develops-three-minute-lithium-ion-battery-health-test/
A11	PHEV-ReGrid Platform: Sodium-Ion Hybrid Specs and Grid Impact	https://bioengineer.org/sodium-battery-hybrid-platform-cuts-vehicle-mass-and-delivers-grid-storage/

NextGenEnergyStorage — Selected Articles

Date: 2026-11-15

Articles: 11

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#05 Invinity Endurium VFB: Upgrade to Energy Capacity and Peak Power

#06 Li-S Energy: High-power lithium-sulfur cell specs and applications

#07 CATL Tener Sodium: BESS Specifications and 2027 Timeline

#08 Aqueous Iodine Batteries: UCL's Halogen-Free 4-Electron Design

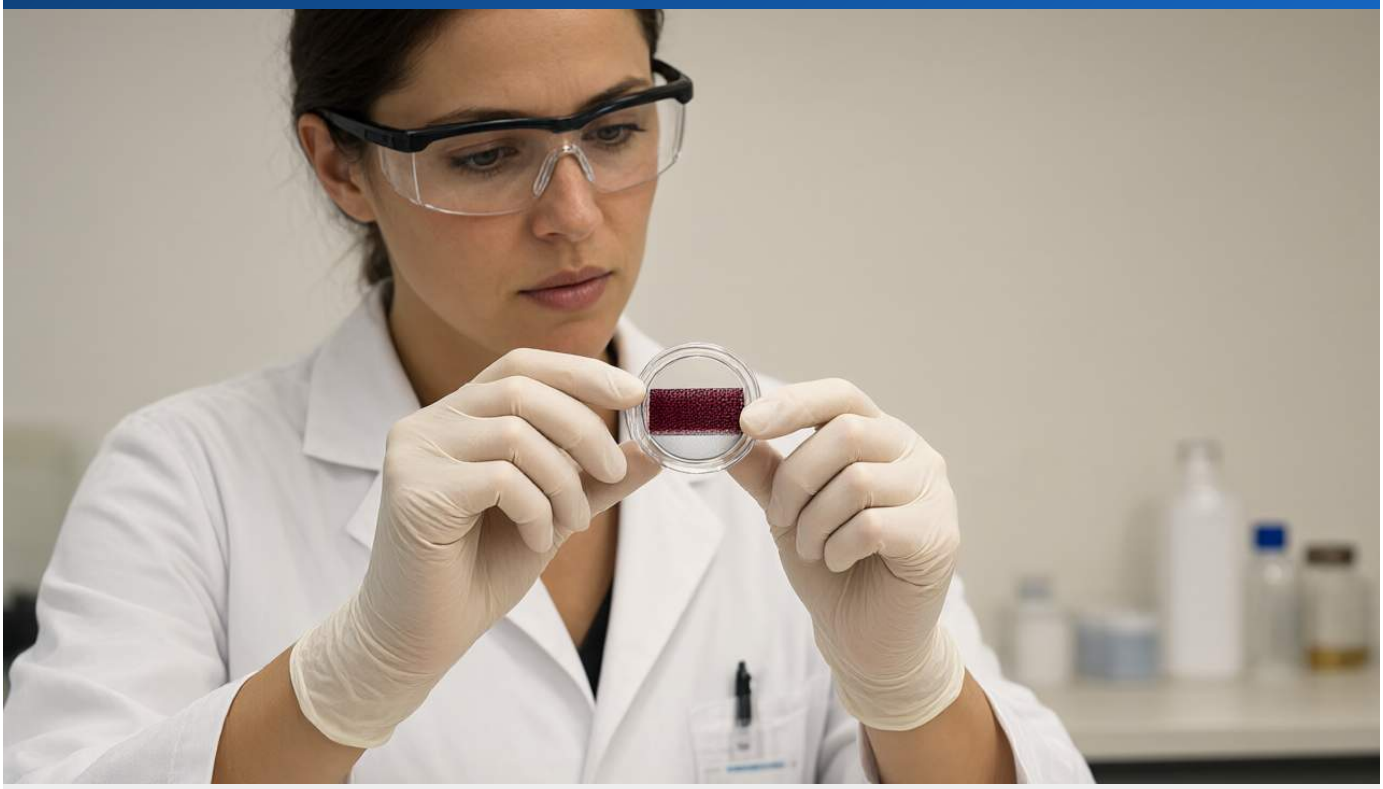
#09 Grepow Sodium-Ion Pouch Cells: Specs and Cold-Weather Performance

#10 UNSW Battery Health Test: 3-Minute Lithium-Ion Diagnostics

#11 PHEV-ReGrid Platform: Sodium-Ion Hybrid Specs and Grid Impact

#01 Vitamin B12 Zinc-Air Battery: Rechargeable Prototype Specs

Published November 13, 2026 The New Indian Express スペイン



OVERVIEW

Researchers at the University of Córdoba have developed a rechargeable zinc-air battery utilizing vitamin B12 as a catalyst. The prototype has completed up to 250 charge-discharge cycles, offering a safer and more sustainable alternative to lithium-ion batteries.

IN DEPTH

Key Findings

Researchers at the University of Córdoba in Spain have successfully developed a rechargeable zinc-air battery that uses vitamin B12 (cobalamin) as a catalyst. The prototype has demonstrated stability over up to 250 charge-discharge cycles, marking the first time the team's biomolecule-based battery research has achieved rechargeability.

Technical Details

The battery was developed by the Physical Chemistry research group (FQM-204) at the university's Chemical Institute for Energy and the Environment (IQUEMA). The technical implementation involves anchoring vitamin B12 to single-walled carbon nanotubes. This architecture was designed to prevent the vitamin from dissolving in the battery's aqueous electrolyte due to its high water solubility, a process lead author Manuel Cano Luna describes as replicating how amino acids bind in proteins.

The catalytic process relies on the cobalt (III) core of the vitamin B12 to facilitate electrochemical reactions. Specifically, the catalyst enables two critical functions:

- During use: Converting oxygen into water.
- During recharging: Releasing oxygen.

Background & Context

Prior to this development, the research group explored other biomolecules as catalysts, specifically haemoglobin and catalase, which contain iron (II) and iron (III) respectively. While these previous iterations provided insights into biomolecule catalysts, they did not achieve the rechargeability seen in the current vitamin B12 prototype.

Significance & Outlook

Zinc-air batteries provide several advantages over conventional lithium-ion systems, including the use of abundant, recyclable zinc and the intake of oxygen from the surrounding environment, which reduces the overall weight of the unit. Additionally, the use of non-flammable aqueous electrolytes improves safety.

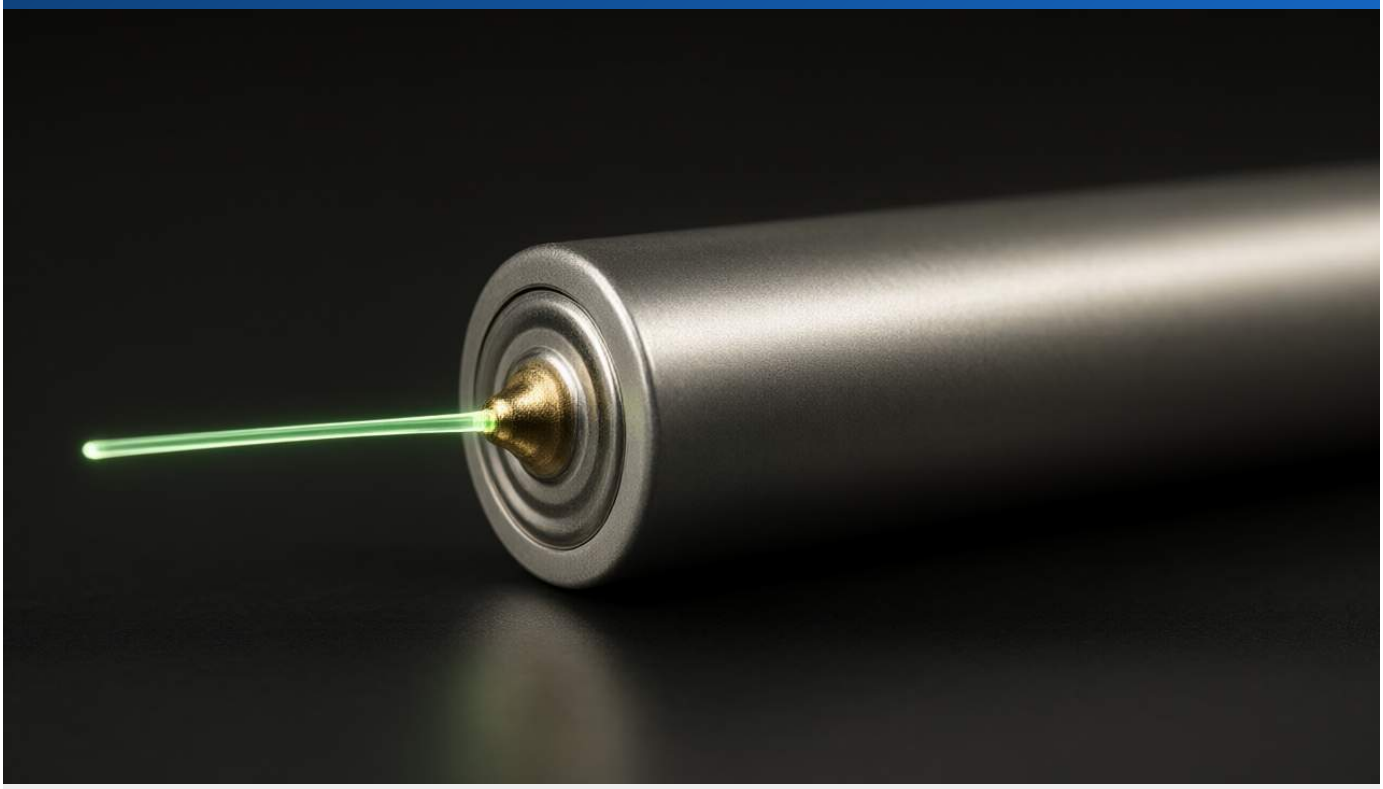
The researchers indicate that this development could lead to more cost-effective energy storage systems. Potential applications include the storage of surplus electricity generated from renewable energy sources.

Source: https://www.newindianexpress.com/lifestyle/science/2026/Nov/13/researchers-develop-rechargeable-battery-using-vitamin-b12

Collected: November 15, 2026 | Automated Research System (AI)

#02 Electroactive Fiber Optics: Real-Time Ion Transport Probing

Published November 09, 2026 Light: Science & Applications



OVERVIEW

Researchers have developed an electroactive fiber-optic device that integrates plasmonic sensing with electrochemical functionality to track interfacial physicochemical changes in real time. By utilizing gold-coated tilted fiber Bragg gratings as both working electrodes and optical probes, the system enables multi-scale monitoring of ion transport in aqueous and organic electrolytes.

IN DEPTH

Key Findings

The developed electroactive fiber-optic device enables the real-time, multi-scale tracking of interfacial physicochemical changes by integrating plasmonic sensing with electrochemical functionality. Using gold-coated tilted fiber Bragg gratings (TFBGs), the system serves a dual purpose: acting simultaneously as working electrodes and optical probes. This approach allows for the discrimination of charge transfer phenomena across multiple regimes, including double-layer formation, ionic and molecular adsorption, and faradaic reactions involving both immobilized thin solid films and soluble redox species.

Technical Details

The device utilizes a novel "optical-mass" sensitivity concept to facilitate comprehensive operando monitoring in organic and aqueous electrolytes. By coating TFBGs with thin gold layers, the system leverages surface plasmon resonance (SPR), which enhances sensitivity ten-fold compared to standard TFBGs. This configuration confines the plasmonic field at the metal/electrolyte boundary (sub-μm penetration), ensuring the optical response is predominantly sensitive to interfacial refractive index changes, charge accumulation, and adsorption rather than bulk variations. To demonstrate practical deployment, the SPR-TFBG sensor was embedded within a sealed 18650 Na-ion cell to perform simultaneous electrochemical and optical interrogation of parasitic redox processes during formation.

Background & Context

Understanding charge dynamics at electrochemical interfaces is critical for improving the safety, longevity, and performance of energy storage devices. While techniques such as NMR, cryo-electron microscopy, and IR spectroscopy provide insights, they often require complex sample preparation that limits real-time monitoring. Optical fibers with diameters below 200<0xE2><0x80><0x89>μm offer a non-invasive alternative. While standard FBG sensors can track temperature and pressure, they cannot access direct chemical or electrochemical information regarding ion movements. TFBGs improve upon this by using evanescent wave sensing, though they typically lack the intrinsic selectivity required for quantitative chemical specificity.

Significance & Outlook

This technology provides a non-invasive foundation for mechanistic studies essential to electrocatalysis, advanced materials technologies, and energy storage. By overcoming the limitation of passive sensor positioning, this electroactive fiber-optic approach allows for the resolution of localized electrode phenomena within sealed battery environments.

Source: https://doi.org/10.1038/s41377-026-02521-0

Collected: November 15, 2026 | Automated Research System (AI)

#03 Sb@HC Core-Shell Anodes: Sodium-Ion Battery Capacity and Stability

Published November 10, 2026 BIOENGINEER.ORG



OVERVIEW

A core-shell structured antimony (Sb) and hard carbon (HC) nanocomposite anode has demonstrated enhanced electrochemical performance for sodium-ion batteries. The Sb@HC/HC composite achieved a charge capacity of 482.4 mAh g−1 and 95.4% capacity retention after 100 cycles, offering a viable path to overcome the stability and capacity trade-offs of individual anode materials.

IN DEPTH

Key Findings

Experimental results published in the Journal of Materials Science indicate that a core-shell structured antimony and hard carbon nanocomposite significantly improves the performance of sodium-ion battery anodes. Specifically, the Sb@HC/HC composite prepared with a 6:4 mass ratio delivered a charge capacity of 482.4 mAh g−1 and an initial Coulombic efficiency of 79.7% at a current density of 100 mA g−1.

Technical Details

The researchers utilized a core-shell structural design combined with nanocomposite strategies to optimize the microstructural evolution of the anode. The performance stability of the 6:4 Sb@HC/HC composite was highlighted by its capacity retention; after 100 cycles, the anode maintained a charge capacity of 460.1 mAh g−1, representing a retention rate of 95.4%.

Background and Context

The study focused on antimony and hard carbon as they are both promising candidates for sodium-ion battery applications, though each possesses distinct limitations when used in isolation:

- **Antimony:** Provides high capacity but suffers from poor cycling stability.
- **Hard Carbon:** Offers an appropriate operating potential but delivers relatively low capacity.

To address these limitations, the researchers investigated the synergistic mechanisms that occur when these materials are integrated into a core-shell architecture.

Significance and Outlook

The study attributes the improved sodium storage performance primarily to the synergistic effects achieved through the core-shell architecture and nanocomposite strategies. The authors conclude that these findings demonstrate the feasibility of this approach and provide critical insights into the design and fabrication of Sb/HC composite materials, enhancing their potential for practical application in sodium-ion batteries.

Source: https://bioengineer.org/core-shell-nanoparticles-improve-sodium-ion-battery-anode-capacity-and-stability/

Collected: November 15, 2026 | Automated Research System (AI)

#04 Solar Panel Waste: Silica Nanoparticles for Battery Anodes

Published November 09, 2026 pv magazine USA



OVERVIEW

Researchers have developed a method to produce silica nanoparticles averaging 109 nm from end-of-life solar cell powder to enhance battery anodes. Blending 5% of these particles into graphite anodes increased capacity to 370.34 mAh/g after 100 cycles, demonstrating a viable upcycling path for PV waste.

IN DEPTH

Key Findings

Integrating silica nanoparticles derived from solar panel waste into graphite anodes significantly improves battery performance. In laboratory coin half-cells, an anode composed of 95% graphite and 5% silica by weight delivered a capacity of 370.34 mAh/g after 100 cycles at 0.1 A/g, compared to 308.24 mAh/g for pure graphite. The blended anode also showed a first-cycle Coulombic efficiency of 86.17%, surpassing the 79.14% achieved by graphite alone. At a higher current of 1.0 A/g, the blended anode retained 24.6% of its capacity, which is approximately double the 12.5% retained by pure graphite.

Technical Details

The production process begins by reacting silicon-containing powder from end-of-life panels with sodium hydroxide and water to create a sodium silicate solution. This solution serves as the precursor for a modified Stöber process, where silica particles are grown in an alkaline mixture of ammonia and alcohol. Unlike previous acid precipitation methods that tend to produce clumped particles, this alkaline route yields spherical particles with limited clumping without requiring surfactants or polymer additives.

- **Particle Size:** Solar waste-derived particles averaged 109 nm, while particles from commercial sodium silicate averaged 97 nm under identical conditions.
- **Composition:** Elemental analysis showed sodium at approximately 4% and aluminum at less than 1% of the measured atoms, which the researchers attributed to precursor residue and panel waste.

Background and Context

The study, published in the *International Journal of Electrochemical Science*, was funded by the Korea Environment Industry & Technology Institute and the National Research Foundation of Korea. This research aligns with South Korea's extended producer responsibility rules for PV modules implemented in 2023, which saw 688 metric tons recycled in the first year. Other similar efforts include 2023 research in Australia and 2024 work by Gyeongsang National University to recover high-purity silicon powder for silicon oxide compounds.

Significance and Outlook

While the current study tested silica as-is, the researchers noted that converting these nanoparticles to silicon could allow for significantly higher lithium storage. Future research will focus on the reduction of these nanoparticles to silicon for use as silicon anode materials.

Source: https://www.pv-magazine.com/2026/11/09/solar-panel-waste-yields-silica-nanoparticles-for-battery-anodes/

Collected: November 15, 2026 | Automated Research System (AI)

#05 Invinity Endurium VFB: Upgrade to Energy Capacity and Peak Power

Published November 09, 2026 Yahoo Finance UK UK



OVERVIEW

Invinity Energy Systems has upgraded its Endurium vanadium flow battery (VFB) platform, increasing energy capacity by 50% and peak power output by 33%. These enhancements reduce the number of modules required for a given installation size, lowering equipment footprint and lifecycle costs.

IN DEPTH

Key Findings

Invinity Energy Systems plc (LSE:IES) has released a performance upgrade for its Endurium vanadium flow battery (VFB) platform. The updated module delivers a 50% increase in energy capacity and a 33% increase in peak power output. This upgrade is now available for general sale as part of the company's broader product development and cost reduction programme.

Technical Details

The performance gains are the result of modifications to both physical components and software-based control systems. Key technical changes include:

- Increased electrolyte capacity.
- Upgraded electrical and power distribution systems.
- Improvements to fluid management and control algorithms.

These modifications increase both power and energy density. Consequently, customers can achieve equivalent electrical performance using fewer battery modules, which reduces the required installation space and lowers associated equipment and installation costs.

Background and Context

The Endurium platform is designed for long-duration energy storage applications that require frequent charging and discharging over extended periods. The systems are engineered for operational lifespans of at least 30 years, with a specific focus on durability and fire safety. Invinity manufactures these batteries at facilities in Canada and the United Kingdom for international supply, targeting applications such as renewable energy generation and other high-throughput storage requirements.

Significance and Outlook

CEO Jonathan Marren stated that the upgrade is a milestone in the continued development of the Endurium platform, focusing on incremental performance improvements while maintaining safety and flexibility. The company views this development as progress toward previously communicated product cost reduction objectives.

Invinity intends to continue implementing its development roadmap to further reduce manufacturing costs and improve product margins. Future enhancements will focus on strengthening the competitiveness of the Endurium platform as the company scales its operations.

Source: https://uk.finance.yahoo.com/news/invinity-energy-systems-announces-endurium-074331145.html

#06 Li-S Energy: High-power lithium-sulfur cell specs and applications

Published November 09, 2026 PR Newswire Australia



OVERVIEW

Li-S Energy has developed two new Power Cell designs that deliver up to 50 times the power of traditional lithium-sulfur chemistry while maintaining an energy density approaching 400 Wh/kg. These cells target weight-critical, high-power platforms including multi-rotor drones, robotics, and communications systems.

IN DEPTH

Key Findings

Li-S Energy has completed the development and testing of two high-power lithium-sulfur cell variants. These cells achieve a continuous power density of 1700W/kg and a peak power density of 2400W/kg. This represents a significant increase in power performance—over 50 times that of traditional lithium-sulfur cells—while preserving a gravimetric energy density approaching 400 Wh/kg.

Technical Details

The company has finalized datasheets for two specific cell designs produced on its automated Phase 3 production line:

- **10Ah Power Cell:** Rated at 2C continuous (yielding 100% of total stored energy) and 5C peak. This variant is designed for systems requiring longer cycle life.
- **11Ah Power Cell:** Rated at 7C continuous (yielding 96% of total stored energy) and 10C peak. This variant is intended for single-use and low cycle life applications where high power is essential.

For comparison, traditional lithium-sulfur cells typically discharge at a continuous rate of only 0.1 to 0.2C.

Background and Context

High power delivery has historically been a limitation of lithium-sulfur chemistry. In 2024, Li-S Energy's GEN3 cell achieved 456 Wh/kg, roughly twice the energy density of lithium-ion, but was optimized for low-power, long-endurance platforms like fixed-wing drones and marine systems. The new Power Cell range complements the GEN3 by addressing the needs of platforms that require rapid energy discharge.

Significance and Outlook

The ability to combine high energy density with high power delivery opens markets for multi-rotor UAVs, soldier-carried systems, and robotics. The company utilized its Battery Test Centre and Phase 3 production line in Geelong, Victoria, to scale these concepts into commercial-sized cells. Li-S Energy intends to further increase energy density while maintaining high power performance to extend the range, operating time, and payload capacity of target platforms.

Source: https://www.prnewswire.com/news-releases/li-s-energy-finalises-new-high-power-cells-for-fast-drones-robotics-and-communications-302933718.html

Collected: November 15, 2026 | Automated Research System (AI)

#07 CATL Tener Sodium: BESS Specifications and 2027 Timeline

Published November 14, 2026 pv magazine International USA



OVERVIEW

CATL has detailed the specifications for its Tener Sodium battery energy storage system (BESS), which offers a rated energy of 30+ MWh per block and higher areal density than the EnerX LFP system. The system reduces footprint by approximately 32% and lowers EPC costs by 9.2% in a 500 MWh project model. Overseas delivery is expected in summer 2027.

IN DEPTH

Key Findings

The CATL Tener Sodium BESS provides a rated energy of 30+ MWh per block with a power output of 7.5 MW for four hours (0.25P). In a 500 MWh project comparison against the EnerX LFP system, the sodium-ion layout requires 6,630 m² compared to 9,700 m², representing a 32% reduction in footprint. This efficiency translates to an estimated 9.2% reduction in overall engineering, procurement, and construction (EPC) costs, with specific drops in civil works (16%) and labor (17%).

Technical Details

The system is configured in pairs of two, four, six, or eight cabinets. A full eight-cabinet block measures 18.2 m wide, 7 m deep, and 3.5 m high. Each cabinet weighs approximately 44 to 45 metric tons, contributing roughly 4 MWh per cabinet in the eight-cabinet version.

- **Electrical Specs:** Rated at 1,166.88 V DC (range: 612 V to 1,387.2 V) with 95% round-trip efficiency at 25°C.
- **Durability:** 15,000 cycles at 25°C and 10,000+ at 45°C; 70% state of health after 20 years at one cycle per day.
- **Environmental:** Liquid-cooled operation from −35°C to +55°C, IP55 protection, and operation up to 4,000 m without derating.
- **PCS:** Integrated with the Terapower 265 kW converter, which features a peak efficiency of at least 99.2% and IP66 rating.

Background & Context

Compared to the EnerX LFP system, sodium-ion cells generate 27.2% less heat at the beginning of life and 32.7% less at the end of life. For a 50 MWh station, DC-side refrigeration capacity is reduced to 490 kW from 720 kW. Auxiliary power consumption for Tener Sodium is listed at 1%, compared to a 2% industry average.

Significance & Outlook

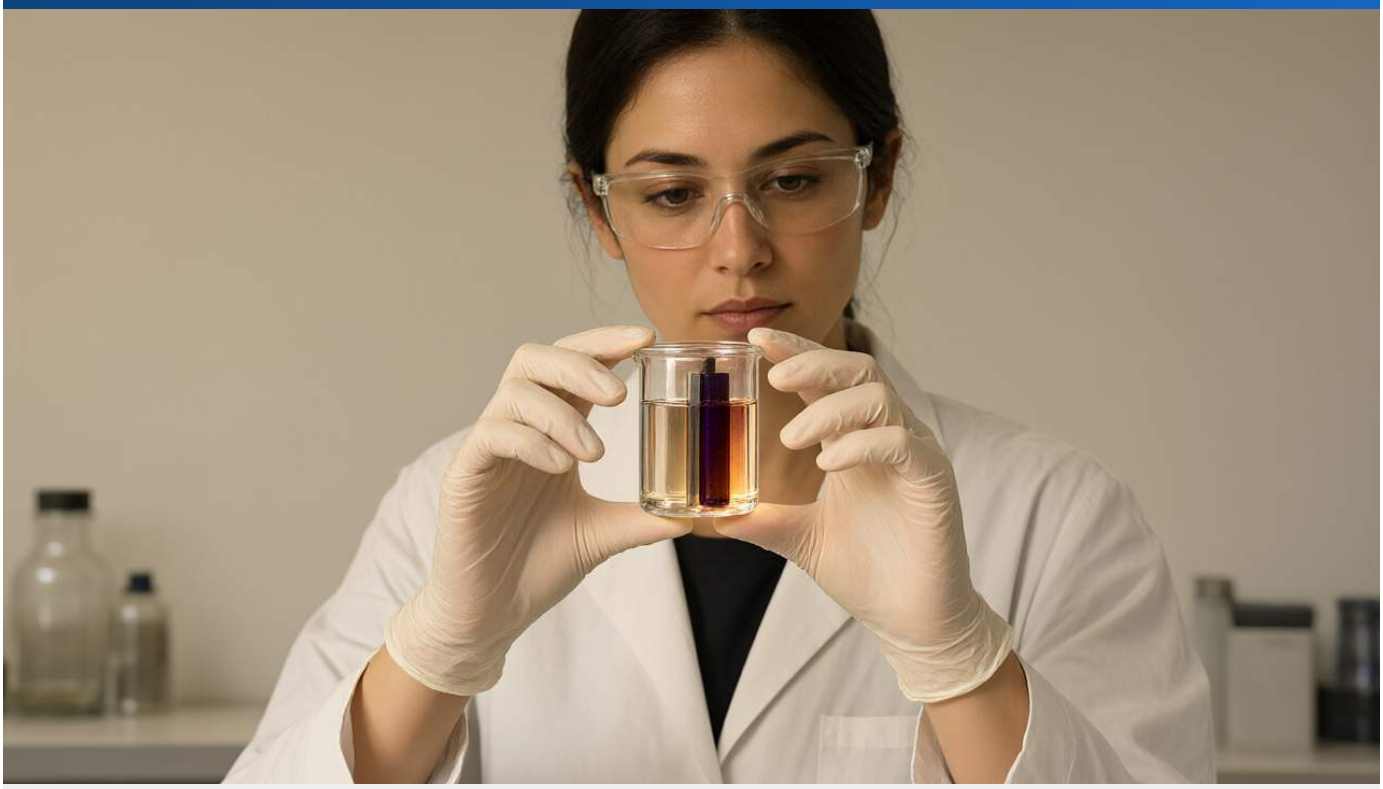
CATL is prioritizing sodium-ion certification, though it plans to offer an LFP version using the same cabinets and layout, which would provide around 50 MWh across eight cabinets. While already being delivered in China, overseas delivery is scheduled for summer 2027, following an August 2027 production window.

Source: https://www.pv-magazine.com/2026/11/14/clarifying-the-catl-tener-sodium-with-new-specifications-and-availability/

Collected: November 15, 2026 | Automated Research System (AI)

#08 Aqueous Iodine Batteries: UCL's Halogen-Free 4-Electron Design

Published November 14, 2026 XenoSpectrum UK



OVERVIEW

Researchers at University College London (UCL) developed a "KA–PA–Nuc" electrolyte framework that enables reversible 4-electron redox reactions in aqueous iodine batteries without relying on corrosive halide salts. The system maintained 96% capacity after 1,000 cycles at 1 A g^{-1}, potentially doubling theoretical capacity to 422 mAh g^{-1} compared to traditional 2-electron systems.

IN DEPTH

Key Findings

A research team led by University College London (UCL) has developed a design methodology to enable the reversible 4-electron oxidation-reduction reaction of iodine in aqueous electrolytes without using chloride or bromide salts. Published in *Nature* on November 11, 2026, the study demonstrates that this approach allows for a theoretical capacity of 422 mAh g^{-1}, double the 211 mAh g^{-1} provided by conventional 2-electron reactions. In experimental Zn-I_2 batteries, the system maintained 96% capacity after 1,000 cycles at a current density of 1 A g^{-1} and 94% after 2,000 cycles at 2 A g^{-1}.

Technical Details

The "KA–PA–Nuc" framework utilizes three components to stabilize the highly reactive iodine cation (I^+) and prevent hydrolysis:

- **Polar Anions (PA):** Such as acetate ions (CH_3COO^-), which concentrate at the electrode interface to create a local environment with fewer water molecules.
- **Kosmotropic Anions (KA):** Such as sulfate ions (SO_4^{2-}), which weaken hydrogen bonds between water and nucleophiles, facilitating the stabilization of I^+.
- **Nucleophiles (Nuc):** Including urea, acetamide, nicotinamide, or pyridine, which form a linear Nuc-I^+-Nuc structure via halogen bonding.

The team verified this mechanism using in situ ATR-IR, NMR spectroscopy, and molecular dynamics simulations. They also demonstrated the framework's versatility by applying it to Al-I_2 batteries using an Al-Zn alloy anode.

Background and Context

Traditional 4-electron iodine batteries required high concentrations of halide salts to form interhalogen complexes (e.g., ICl_2), which caused high costs and material corrosion. While previous studies in 2021 and 2024 explored 4-electron reactions using chlorides or specific organic combinations, the UCL approach focuses on a systematic framework to control the electrode interface and molecular stability.

Significance and Outlook

The research includes a prototype 1.1 Ah pouch cell with a 10×15 cm electrode, though the specific mechanical constraint pressure used during testing was not quantified. Future challenges include suppressing irreversible iodine loss at high loading levels and validating performance under actual operational conditions for large-scale energy storage.

Source: https://xenospectrum.com/ucl-halogen-free-four-electron-aqueous-iodine-battery/

Collected: November 15, 2026 | Automated Research System (AI)

#09 Grepow Sodium-Ion Pouch Cells: Specs and Cold-Weather Performance

Published November 12, 2026 DMR News



OVERVIEW

Grepow has launched a commercial sodium-ion pouch-cell platform featuring five models with capacities from 2.0 Ah to 7.0 Ah. These cells demonstrate superior low-temperature pulse discharge compared to LFP and a projected cycle life exceeding 4,000 cycles. The platform targets reliability-critical applications in frigid climates and cost-sensitive industrial sectors.

IN DEPTH

Key Findings

Grepow has transitioned from technical validation to the commercial deployment of a sodium-ion pouch-cell platform. The platform consists of five models with capacities of 2.0 Ah, 3.0 Ah, 3.5 Ah, 6.5 Ah, and 7.0 Ah, all featuring a nominal voltage of 3.0 V. These cells are engineered for high-rate pulse power, flexible integration, and resilience in extreme cold.

Technical Details

The cells support high-power demands, including discharge rates up to 45C for 30 seconds and pulse discharge rates up to 100C for 2 seconds. In internal testing at 25°C (1C charge, 30C discharge), a selected cell retained 94% capacity after 2,000 cycles; current fade curves project the cell will exceed 4,000 cycles before reaching 80% capacity retention.

To validate cold-weather performance, Grepow conducted high-rate pulse discharge trials at -20°C (28C rate). The results showed that the sodium-ion cell possessed stronger low-temperature pulse-discharge capability than the tested lithium iron phosphate (LFP) cell.

Background & Context

Sodium-ion technology is positioned as a complementary route to lithium-ion, rather than a total replacement. By utilizing more abundant sodium resources, the system reduces reliance on critical metals like cobalt and nickel, mitigating supply chain concentration risks and raw material price volatility. Additionally, the electrochemical system is more stable, reducing thermal runaway risks and improving tolerance to over-discharge, allowing cells to recover after deep discharge below the cutoff voltage.

Significance & Outlook

The platform's ability to maintain capacity and power delivery in sub-zero temperatures reduces the need for auxiliary heating in frigid climates. Grepow identifies several primary application areas for this technology:

- Cold-weather starting for commercial vehicles and construction machinery.

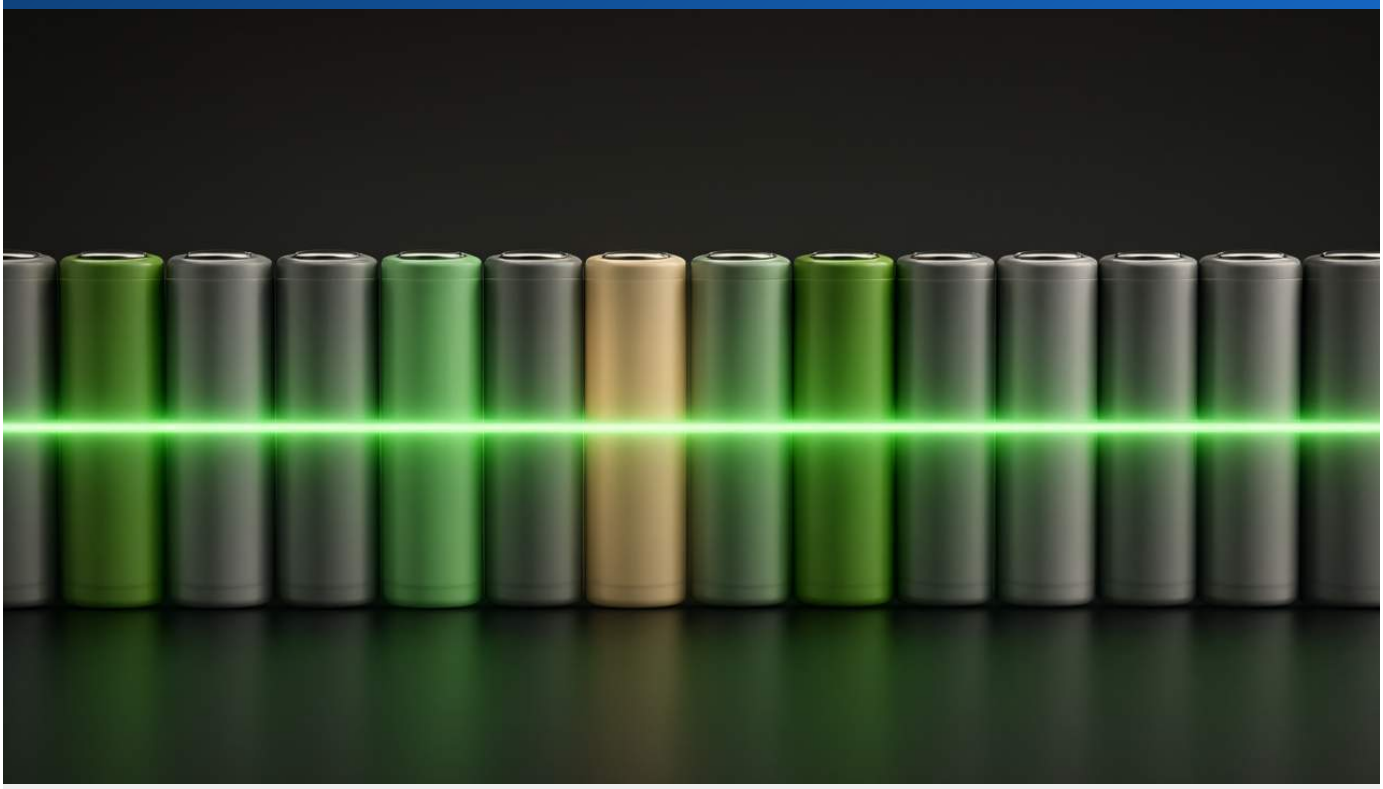
- Backup power for communication base stations and energy storage in cold regions.
- Industrial vehicles, robotics, and light electric vehicles.
- Outdoor power equipment and reliability-critical backup systems.

Source: https://digitalmarketreports.com/news/101812/grepow-advances-next-gen-energy-transition-with-commercial-launch-of-high-performance-sodium-ion-pouch-cell-platform/

Collected: November 15, 2026 | Automated Research System (AI)

#10 UNSW Battery Health Test: 3-Minute Lithium-Ion Diagnostics

Published November 14, 2026 pv magazine Global Australia



OVERVIEW

Researchers at UNSW have developed a prototype battery health test that is 95.5% faster and over 80% cheaper than current methods. By utilizing short electrical pulses and statistical models, the platform enables rapid assessment of EV and energy storage batteries to facilitate second-life reuse and recycling.

IN DEPTH

Key Findings

UNSW researchers in Sydney have developed a prototype diagnostic platform capable of assessing lithium-ion battery health in under three minutes per cell. The system is reported to be 95.5% faster and more than 80% cheaper than existing testing methods, with lab tests demonstrating over 90% accuracy. The researchers are targeting a cost of under AUD 25 per test.

Technical Details

The platform is designed to be compatible with existing management systems used by energy storage operators and recyclers. It supports the three primary lithium-ion chemistries used in energy storage and electric vehicles: lithium iron phosphate (LFP), nickel cobalt aluminum (NCA), and nickel manganese cobalt (NMC).

Unlike current testing methods, which require a full charge-discharge cycle taking approximately 10 hours, the UNSW prototype sends short electrical pulses through each cell and measures the response. Statistical models then estimate the battery's health. This approach mitigates the risks associated with high-stress cycling in damaged batteries, such as overheating and fire.

Background & Context

Current industry testing costs approximately AUD 120 ($85) per EV battery pack. To move the technology toward commercial application, UNSW has partnered with DY New Energy, a Malaysia-headquartered lifecycle management company, on an AUD 1.3 million project. This collaboration involves testing the technology on more than 500 batteries under real-world conditions.

The project includes the development of a machine-learning decision engine to determine whether retired batteries should be reused or recycled. These insights will be integrated into a battery management system module called iBMS for real-time monitoring.

Significance & Outlook

The technology aims to support a circular battery economy by increasing the use of second-life batteries for grid and community energy storage. According to associate professor Huadong Mo, up to 95% of battery components can be recovered, though currently only a small fraction of lithium-ion batteries in Australia are collected for recycling. The project is supported by the Trailblazer for Recycling and Clean Energy (TRaCE) Lab to Market Fund.

Source: https://www.pv-magazine.com/2026/11/14/unsw-develops-three-minute-lithium-ion-battery-health-test/

Collected: November 15, 2026 | Automated Research System (AI)

#11 PHEV-ReGrid Platform: Sodium-Ion Hybrid Specs and Grid Impact

Published November 12, 2026 BIOENGINEER.ORG USA



OVERVIEW

A proposed PHEV-ReGrid architecture combining a 30 kWh sodium-ion battery with a compact combustion generator reduces vehicle mass by roughly 210 kg and manufacturing costs by $8,500 to $9,500. This configuration eliminates long-distance highway range limitations while transforming personal vehicles into distributed grid storage.

IN DEPTH

Key Findings

Engineering modeling published in Discover Vehicles indicates that the PHEV-ReGrid platform can reduce the overall mass of a mid-size passenger electric vehicle by roughly 210 kg. The study finds that this configuration lowers vehicle manufacturing costs by between $8,500 and $9,500 and reduces annual electric energy consumption by 11% to 13%.

Technical Details

The researcher, Luis Juanicó, modeled the platform by redesigning a 2025 Tesla Model 3 Long-Range Rear-Wheel Drive sedan. The baseline vehicle's 82 kWh nickel-manganese-cobalt lithium-ion battery (approximately 500 kg) was replaced with a 30 kWh sodium-ion battery pack weighing approximately 210 kg. This pack is based on 2025 to 2026 CATL Naxtra technology, featuring a cell-level energy density of 175 Wh/kg and a pack-level density of 150 to 160 Wh/kg.

To maintain highway range, the platform utilizes a lightweight motorcycle-derived internal combustion engine acting strictly as an electrical generator. Modeling showed that at a steady-state highway velocity of 120 km/h, the baseline sedan requires 23.8 kW of tractive power. A small engine operating at optimum thermal efficiency can provide sufficient electrical output to offset battery depletion, removing the need for commercial fast-charging stops during long trips.

Background and Context

The study addresses the strain that high-power public charging networks place on electrical grids. Current station outputs have risen from 50 kW to 350 kW, with some approaching 1 MW per dispenser. A single 1 MW charger exerts a demand equivalent to 300 to 400 residential households. Upgrading 250,000 public charging ports in the U.S. and Canada to support megawatt-scale equipment would require tens of billions of dollars in infrastructure reinforcements.

Significance and Outlook

By pairing a sodium-ion battery sized for daily driving with an on-board generator, the PHEV-ReGrid platform resolves the conflict between rapid electrification and grid stability. This approach mitigates the temporal imbalance between midday solar generation and evening peak charging demand, potentially reducing the need for utility operators to expand fossil-fueled peaker plants.

Source: https://bioengineer.org/sodium-battery-hybrid-platform-cuts-vehicle-mass-and-delivers-grid-storage/

Collected: November 15, 2026 | Automated Research System (AI)