

TROY TECHNICAL

PEROVSKITE SOLAR CELLS

WEEKLY REPORT

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

**Bankable module performance, durability,
manufacturing yield and market entry**

16

ANALYZED ARTICLES

10

PRIORITY THEMES

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



Perovskite Solar Cells: the boundary moved from isolated claims to qualification evidence

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

SIGNAL 01 | PRECURSORS

Renshuo Photovoltaic: Series B Funding and Perovskite Roadmap 2026

Renshuo Photovoltaic has secured over 100 million yuan in Series B funding to accelerate the mass production of all-perovskite tandem cells and expand into space-based photovoltaics.

SIGNAL 02 | CELL STACK

Riyao Solar: Perovskite SAM Materials and Pilot Line Roadmap

Riyao Solar has secured several tens of millions of yuan in Pre-Series A funding to establish a pilot production line for perovskite materials with an annual capacity of 100 kilograms.

SIGNAL 03 | MODULE PROCESS

BOE Strategy: 8.6G AMOLED, Glass Core Substrates and Perovskites

BOE is diversifying into glass-based advanced packaging and perovskite solar cells to offset a projected decline in 2026 AMOLED and LCD panel demand.

SIGNAL 04 | QUALIFICATION

Perovskite Solar Cells: NEDO Design and Installation Guidelines

NEDO has released design and installation guidelines for flexible solar cells, including perovskite technology, to ensure safety and reliability during deployment.

DECISION

Focus this week's management attention on bankable module performance, durability, manufacturing yield and market entry. Move only when the linked evidence can be reproduced under your own operating conditions.

THREE MANAGEMENT MOVES

- 1. Buyers: compare certified performance with field-relevant lifetime, degradation and warranty evidence.
- 2. Suppliers: connect precursor and coating control to module yield, encapsulation, lead management and scale.
- 3. Executives: track stability, area, certification, yield, capex, lead control 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

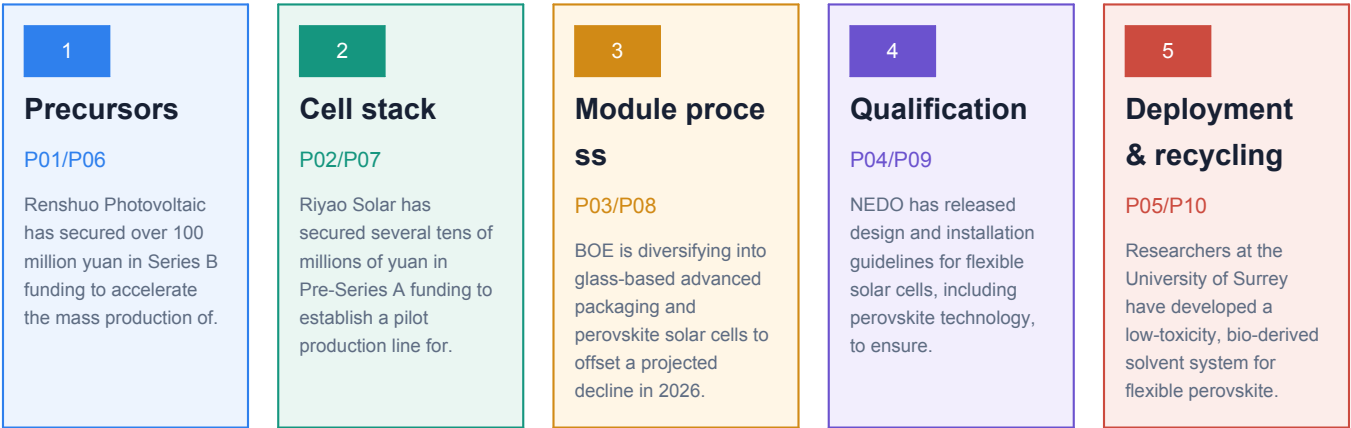
100 milli on A08	SOURCE-BOUND CONDITION Renshuo Photovoltaic has secured over 100 million yuan in Series B funding to accelerate the mass production of all-perovskite tandem cells and expand into space-based photovoltaics.
20GW A11	SOURCE-BOUND CONDITION The initiative supports government targets to establish mass production and achieve domestic installations of approximately 20GW by 2040.
18.2% A07	SOURCE-BOUND CONDITION Researchers at the University of Surrey have developed a low-toxicity, bio-derived solvent system for flexible perovskite solar modules, achieving 18.2% power conversion efficiency.
26% A15	SOURCE-BOUND CONDITION UC San Diego scientists have achieved 24-26% energy conversion efficiency in perovskite solar cells using a temporary salt-melting technique to eliminate structural defects.
27.2% A04	SOURCE-BOUND CONDITION Researchers have achieved a certified power conversion efficiency of 27.2% in inverted perovskite solar cells by reducing energy losses at the C60 electron-selective contact.

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

Precursors to Cell stack	Transfer test conditions, acceptance criteria, failure data, owner and decision date. Recheck stability, area, certification, yield, capex, lead control and warranty.
Cell stack to Module process	Transfer test conditions, acceptance criteria, failure data, owner and decision date. Recheck stability, area, certification, yield, capex, lead control and warranty.
Module process to Qualification	Transfer test conditions, acceptance criteria, failure data, owner and decision date. Recheck stability, area, certification, yield, capex, lead control and warranty.
Qualification to Deployment & recycling	Transfer test conditions, acceptance criteria, failure data, owner and decision date. Recheck stability, area, certification, yield, capex, lead control and warranty.

COMMON CONTROL POINT

No theme moves to a commercial commitment until a named owner has reproduced the relevant evidence and documented stability, area, certification, yield, capex, lead control and warranty.

Priority map: maturity and next decision locus



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

P01

Renshuo Photovoltaic: Series B Funding and Perovskite Roadmap 2026

A08 | Precursors | Scale-up

Date not stated

FACT

Renshuo Photovoltaic has secured over 100 million yuan in Series B funding to accelerate the mass production of all-perovskite tandem cells and expand into space-based photovoltaics. The company has achieved a certified steady-state power conversion efficiency of 30.8% and is currently planning GW-level production lines.

WHY IT MATTERS

The decision relevance is bankable module performance, durability, manufacturing yield and market entry. 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 precursor and coating control to module yield, encapsulation, lead management and scale.

ACTION

Within 30 days, compare certified performance with field-relevant lifetime, degradation and warranty evidence; record the evidence and owner against P01.

UNKNOWN

Still unproven or incompletely stated: stability, area, certification, yield, capex, lead control and warranty.

EDITORIAL SCORE 22/25 | MATURITY 5/5 | DECISION LOCUS: BUSINESS / RULES

P02

Riyao Solar: Perovskite SAM Materials and Pilot Line Roadmap

A09 | Cell stack | Product adoption

Date not stated

FACT

Riyao Solar has secured several tens of millions of yuan in Pre-Series A funding to establish a pilot production line for perovskite materials with an annual capacity of 100 kilograms. The company is leveraging a proprietary radical self-assembled monolayer (SAM) to reduce manufacturing costs and target the automotive and aerospace markets.

WHY IT MATTERS

The decision relevance is bankable module performance, durability, manufacturing yield and market entry. 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 precursor and coating control to module yield, encapsulation, lead management and scale.

ACTION

Within 30 days, compare certified performance with field-relevant lifetime, degradation and warranty evidence; record the evidence and owner against P02.

UNKNOWN

Still unproven or incompletely stated: stability, area, certification, yield, capex, lead control and warranty.

EDITORIAL SCORE 22/25 | MATURITY 4/5 | DECISION LOCUS: SYSTEM / ADOPTION

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

P03

BOE Strategy: 8.6G AMOLED, Glass Core Substrates and Perovskites

A10 | Module process | Research

Date not stated

FACT

BOE is diversifying into glass-based advanced packaging and perovskite solar cells to offset a projected decline in 2026 AMOLED and LCD panel demand. The company has successfully sampled 24-layer glass core substrates and is conducting extreme-environment outdoor testing for its perovskite components.

WHY IT MATTERS

The decision relevance is bankable module performance, durability, manufacturing yield and market entry. 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 precursor and coating control to module yield, encapsulation, lead management and scale.

ACTION

Within 30 days, compare certified performance with field-relevant lifetime, degradation and warranty evidence; record the evidence and owner against P03.

UNKNOWN

Still unproven or incompletely stated: stability, area, certification, yield, capex, lead control and warranty.

EDITORIAL SCORE 21/25 | MATURITY 1/5 | DECISION LOCUS: TECH / PROCESS

P04

Perovskite Solar Cells: NEDO Design and Installation Guidelines

A11 | Qualification | Scale-up

Date not stated

FACT

NEDO has released design and installation guidelines for flexible solar cells, including perovskite technology, to ensure safety and reliability during deployment. The initiative supports government targets to establish mass production and achieve domestic installations of approximately 20GW by 2040.

WHY IT MATTERS

The decision relevance is bankable module performance, durability, manufacturing yield and market entry. 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 precursor and coating control to module yield, encapsulation, lead management and scale.

ACTION

Within 30 days, compare certified performance with field-relevant lifetime, degradation and warranty evidence; record the evidence and owner against P04.

UNKNOWN

Still unproven or incompletely stated: stability, area, certification, yield, capex, lead control and warranty.

EDITORIAL SCORE 21/25 | MATURITY 5/5 | DECISION LOCUS: SYSTEM / ADOPTION

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

P05

Perovskite Solar Modules: 18.2% Efficiency via Bio-Derived Solvents

A07 | Deployment & recycling | Product adoption

Date not stated

FACT

Researchers at the University of Surrey have developed a low-toxicity, bio-derived solvent system for flexible perovskite solar modules, achieving 18.2% power conversion efficiency. By replacing hazardous chemicals with a greener formulation compatible with roll-to-roll printing, the method enables scalable, eco-friendly industrial production.

WHY IT MATTERS

The decision relevance is bankable module performance, durability, manufacturing yield and market entry. 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 precursor and coating control to module yield, encapsulation, lead management and scale.

ACTION

Within 30 days, compare certified performance with field-relevant lifetime, degradation and warranty evidence; record the evidence and owner against P05.

UNKNOWN

Still unproven or incompletely stated: stability, area, certification, yield, capex, lead control and warranty.

EDITORIAL SCORE 20/25 | MATURITY 4/5 | DECISION LOCUS: SYSTEM / ADOPTION

P06

Perovskite Solar Cells: UC San Diego's Salt-Melting Process for 26% Efficiency

A15 | Precursors | Research

Date not stated

FACT

UC San Diego scientists have achieved 24-26% energy conversion efficiency in perovskite solar cells using a temporary salt-melting technique to eliminate structural defects. The treated cells maintained consistent power output after eight weeks of simulated sunlight, addressing critical stability and degradation issues.

WHY IT MATTERS

The decision relevance is bankable module performance, durability, manufacturing yield and market entry. 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 precursor and coating control to module yield, encapsulation, lead management and scale.

ACTION

Within 30 days, compare certified performance with field-relevant lifetime, degradation and warranty evidence; record the evidence and owner against P06.

UNKNOWN

Still unproven or incompletely stated: stability, area, certification, yield, capex, lead control and warranty.

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

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

P07

Perovskite Solar Cells: C60 Contact Optimization for 27.2% Efficiency

A04 | Cell stack | Pilot

Date not stated

FACT

Researchers have achieved a certified power conversion efficiency of 27.2% in inverted perovskite solar cells by reducing energy losses at the C60 electron-selective contact. The team identified that band-like states from C60's LUMO drive interfacial recombination and mitigated this using a vapor-phase molecular passivation strategy.

WHY IT MATTERS

The decision relevance is bankable module performance, durability, manufacturing yield and market entry. 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 precursor and coating control to module yield, encapsulation, lead management and scale.

ACTION

Within 30 days, compare certified performance with field-relevant lifetime, degradation and warranty evidence; record the evidence and owner against P07.

UNKNOWN

Still unproven or incompletely stated: stability, area, certification, yield, capex, lead control and warranty.

EDITORIAL SCORE 20/25 | MATURITY 2/5 | DECISION LOCUS: TECH / PROCESS

P08

China PV Export Controls: Perovskite and Tandem Tech Bans 2026

A06 | Module process | Product adoption

Date not stated

FACT

China's Ministry of Commerce and Ministry of Science and Technology have proposed banning the export of high-efficiency perovskite and tandem solar manufacturing technologies. The measures target specific production processes and equipment, potentially limiting international access to next-generation PV manufacturing know-how.

WHY IT MATTERS

The decision relevance is bankable module performance, durability, manufacturing yield and market entry. 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 precursor and coating control to module yield, encapsulation, lead management and scale.

ACTION

Within 30 days, compare certified performance with field-relevant lifetime, degradation and warranty evidence; record the evidence and owner against P08.

UNKNOWN

Still unproven or incompletely stated: stability, area, certification, yield, capex, lead control and warranty.

EDITORIAL SCORE 20/25 | MATURITY 4/5 | DECISION LOCUS: TECH / PROCESS

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

P09

Fiber-Based Perovskite Solar Cells: POE Encapsulation vs Pb Leakage

A02 | Qualification | Research

Date not stated

FACT

A bioindicator study using *Pogonatherum crinitum* demonstrates that POE encapsulation reduces bioavailable Pb leakage from fiber-based perovskite solar cells to approximately 0.5 mg/mL after 90 days. This represents a reduction to around 10% of the levels found in unencapsulated control groups. The findings provide preliminary evidence that POE effectively retards the migration of lead into the surrounding environment.

WHY IT MATTERS

The decision relevance is bankable module performance, durability, manufacturing yield and market entry. 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 precursor and coating control to module yield, encapsulation, lead management and scale.

ACTION

Within 30 days, compare certified performance with field-relevant lifetime, degradation and warranty evidence; record the evidence and owner against P09.

UNKNOWN

Still unproven or incompletely stated: stability, area, certification, yield, capex, lead control and warranty.

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

P10

Flexible Perovskite Solar Cells: 20.2% Efficiency for Large Modules

A14 | Deployment & recycling | Pilot

Date not stated

FACT

Researchers at Soochow University have achieved a certified power conversion efficiency of 20.2% for large-area flexible perovskite solar modules with a substrate area of 1050 cm². By implementing a decoupled self-assembled monolayer (SAM) and perovskite co-deposition strategy, the team overcame efficiency losses typically associated with scaling from lab-scale cells to large-area flexible components.

WHY IT MATTERS

The decision relevance is bankable module performance, durability, manufacturing yield and market entry. 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 precursor and coating control to module yield, encapsulation, lead management and scale.

ACTION

Within 30 days, compare certified performance with field-relevant lifetime, degradation and warranty evidence; record the evidence and owner against P10.

UNKNOWN

Still unproven or incompletely stated: stability, area, certification, yield, capex, lead control and warranty.

EDITORIAL SCORE 20/25 | MATURITY 2/5 | 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 certified performance with field-relevant lifetime, degradation and warranty evidence	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 precursor and coating control to module yield, encapsulation, lead management and scale	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 stability, area, certification, yield, capex, lead control 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 01-08

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	Perovskite/Si Tandems: Co-evaporation for 30.93% Efficiency	https://doi.org/10.21203/rs.3.rs-11237567/v1
A02	Fiber-Based Perovskite Solar Cells: POE Encapsulation vs Pb Leakage	https://doi.org/10.21203/rs.3.rs-11411695/v1
A03	Perovskite Solar Cells: Volatile Eutectics for Defect Reduction	https://bioengineer.org/chemical-mixture-erases-crystal-defects-to-boost-perovskite-solar-cell-power/
A04	Perovskite Solar Cells: C60 Contact Optimization for 27.2% Efficiency	https://www.perovskite-info.com/cutting-energy-losses-c60-contact-enables-perovskite-solar-cells-272-efficiency
A05	Hemispherical Perovskite Solar Cells: Angle-Robust Design Specs	https://www.pv-magazine.com/2026/10/23/hemispherical-perovskite-solar-cell-design-reduces-sensitivity-to-sunlight-angle/
A06	China PV Export Controls: Perovskite and Tandem Tech Bans 2026	https://www.pv-magazine.com/2026/10/16/china-proposes-ban-on-exports-of-perovskite-tandem-solar-manufacturing-technology/
A07	Perovskite Solar Modules: 18.2% Efficiency via Bio-Derived Solvents	https://interestingengineering.com/innovation/perovskite-solar-modules-reach-18-efficiency-safer-solvents
A08	Renshuo Photovoltaic: Series B Funding and Perovskite Roadmap 2026	https://view.inews.qq.com/a/20261023A04HVQ00

ANALYZED ARTICLES | ITEMS 09-16

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
A09	Riyao Solar: Perovskite SAM Materials and Pilot Line Roadmap	https://36kr.jp/501479/
A10	BOE Strategy: 8.6G AMOLED, Glass Core Substrates and Perovskites	https://finance.sina.com.cn/tech/roll/2026-10-16/doc-inivmiip8371716.shtml
A11	Perovskite Solar Cells: NEDO Design and Installation Guidelines	https://www.kankyo-business.jp/column/07a21a12-8869-4722-891a-465c912efa65
A12	Perovskite Semiconductor Thin Films: Low-Defect Fabrication for Solar Cells and LEDs	https://www.lecturenews.com/news/articleView.html?idxno=212158
A13	Prussian Blue in Perovskite Solar Cells: Efficiency and Stability	https://www.stdaily.com/web/gdxw/2026-10/23/content_601751.html
A14	Flexible Perovskite Solar Cells: 20.2% Efficiency for Large Modules	https://m.163.com/dy/article/L9TMREI605329TW8.html
A15	Perovskite Solar Cells: UC San Diego's Salt-Melting Process for 26% Efficiency	https://www.ecoportal.net/en/san-diego-solar-cells-efficiency/43547/
A16	Dual-Purpose Solar Film: 22% Efficiency and NIR Emission Specs	https://www.ecoportal.net/en/miami-engineers-thin-solar-cell/43484/

PerovskiteSolarCells — Selected Articles

Date: 2026-10-25

Articles: 16

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- #15 Perovskite Solar Cells: UC San Diego's Salt-Melting Process for 26% Efficiency
- #16 Dual-Purpose Solar Film: 22% Efficiency and NIR Emission Specs

#01 Perovskite/Si Tandems: Co-evaporation for 30.93% Efficiency

Published October 21, 2026 Research Square (preprint)



OVERVIEW

Researchers have achieved a 30.93% efficiency in monolithic perovskite/textured Si tandem solar cells using solvent-free co-evaporation to create compositionally modulated interfaces. This method improves stability, retaining 90% of initial performance after 1,820 hours of maximum-power-point tracking under one-sun illumination in nitrogen.

Key Findings

The study demonstrates a monolithic perovskite/textured Si tandem solar cell with an efficiency of 30.93%. By utilizing solvent-free co-evaporation, the researchers established a vertical compositional modulation that significantly enhances long-term stability. The device retained 90% of its initial performance after 1,820 hours of maximum-power-point tracking under one-sun illumination in a nitrogen environment.

Technical Details

The co-evaporation process creates a specific architecture consisting of a formamidinium iodide (FAI)-rich mixed two/three-dimensional (2D/3D) seed layer paired with a stoichiometric wide-bandgap absorber. Unlike conventional 2D passivation, this approach avoids bulky organic cations that typically impede vertical charge transport.

Low-dose atomic-resolution transmission electron microscopy confirmed the following structural characteristics:

- Coherence and continuous corner-sharing lead-halide octahedral connectivity within the 2D/3D seed layer.
- Continuous connectivity across the interface between the seed layer and the absorber.

This native-cation architecture suppresses the formation of halide vacancies and formamidinium, prevents light-induced segregation, and inhibits photocarrier-mediated redox reactions.

Background & Context

Perovskite/silicon tandem solar cells are a primary route for next-generation photovoltaics, but their operational lifespan is often limited by degradation at buried interfaces. In these areas, photocarriers, mobile ions, and defects tend to accumulate. While solution processing is widely used, it often fails to provide precise interface control because subsequent deposition steps can reconstruct or dissolve the underlying materials.

Significance & Outlook

The use of co-evaporation allows for the programming of compositional evolution and precise control over crystal growth and carrier transport. By enabling efficient out-of-plane carrier transport without the disruption caused by foreign bulky cations, this method addresses critical stability and efficiency bottlenecks in perovskite optoelectronics.

Source: <https://doi.org/10.21203/rs.3.rs-11237567/v1>

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

#02 Fiber-Based Perovskite Solar Cells: POE Encapsulation vs Pb Leakage

Published October 20, 2026 Research Square (preprint)



OVERVIEW

A bioindicator study using *Pogonatherum crinitum* demonstrates that POE encapsulation reduces bioavailable Pb leakage from fiber-based perovskite solar cells to approximately 0.5 mg/mL after 90 days. This represents a reduction to around 10% of the levels found in unencapsulated control groups. The findings provide preliminary evidence that POE effectively retards the migration of lead into the surrounding environment.

Key Findings

The study confirms that POE encapsulation significantly mitigates the release of Pb from fiber-based perovskite solar cells (PSCs). After 90 days of exposure across three different spatial configurations, the Pb concentration in plant-derived extracts for encapsulated groups was approximately 0.5 mg/mL. This value is roughly 10% of the concentration measured in unencapsulated control devices, indicating a strong protective effect provided by the POE layer.

Technical Details

Researchers utilized *Pogonatherum crinitum*, a perennial grass known for Pb tolerance and enrichment capacity, as a bioindicator. The experimental setup involved bundles of 30 PSC devices placed in three configurations: on the soil surface, at a depth of 15 cm near the pot base, or 25 cm from the plant in an elongated container. Samples of the inflorescence and leaf mixture were collected every 5 days, and Pb content was determined using Flame Atomic Absorption Spectroscopy (FAAS).

The effectiveness of the POE barrier is attributed to its nonpolar polyolefin backbone, which creates a low-dielectric and low-free-volume environment. Because the polymer consists mainly of saturated C-C and C-H σ bonds, it lacks the active sites, electron donor-acceptor interactions, or Lewis acid-base coordination required to facilitate the hopping or stabilization of Pb 2+.

Background and Context

The use of *Pogonatherum crinitum* allows for the detection of "bioavailable" Pb signals rather than simple soaking solution measurements. The plant responds to Pb stress through rhizosphere activation—altering acid phosphatase and urease activities—and intracellular complexation via organic acids. However, the study notes that Pb uptake is influenced by soil pH, organic matter, and microbial communities, meaning the assay serves as a laboratory bioindicator rather than a full ecotoxicological assessment.

Significance and Outlook

This methodology converts the technical question of device leakage into a measurable environmental exposure scenario. While the POE layer is not absolutely impermeable, it substantially retards Pb migration over the experimental timescale, reducing the risk of lead accumulating in the surrounding ecosystem.

Source: <https://doi.org/10.21203/rs.3.rs-11411695/v1>

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

#03 Perovskite Solar Cells: Volatile Eutectics for Defect Reduction

Published October 17, 2026 BIOENGINEER.ORG USA



OVERVIEW

Researchers have developed a chemical mixture of zinc bromide and methyl ammonium chloride that erases atomic-scale crystal defects in perovskite solar cells. This technique extends electron energy retention up to 300 microseconds, potentially increasing power generation by one percent.

Key Findings

A research team from Princeton Engineering, the University of California-San Diego, and Sungkyunkwan University has developed a method to reduce atomic-scale defects in perovskite solar cells. By introducing a specific chemical mixture during fabrication, the team achieved a significant increase in the time electrons retain excess energy absorbed from sunlight—roughly ten times longer than in untreated materials. According to assistant professor Dane deQuilettes, this improvement could result in a one percent gain in power generation for existing cutting-edge perovskite cells.

Technical Details

The process utilizes a volatile eutectic—a mixture of zinc bromide and methyl ammonium chloride that possesses a lower melting point than either component alone. This mixture is added early in the fabrication process to alter how the perovskite crystal grows, resulting in a more ordered lattice with fewer imperfections. In treated perovskites, electrons retained their energy for up to 300 microseconds, which is approximately one hundred thousand times longer than in many other semiconductors. This prevents excited electrons from being trapped by lattice defects and dissipating their energy as heat before it can be collected as electricity.

Background & Context

Perovskites offer advantages over traditional silicon solar cells because they can be prepared from liquid precursors and printed like ink, potentially reducing costs and sustainability hurdles. Current industry trends are moving toward tandem devices, where a thin layer of perovskite is applied over a silicon cell to generate approximately 40 percent more power than single-material cells. However, the printing and layering process typically introduces the atomic-level defects that this new eutectic method aims to eliminate.

Significance & Outlook

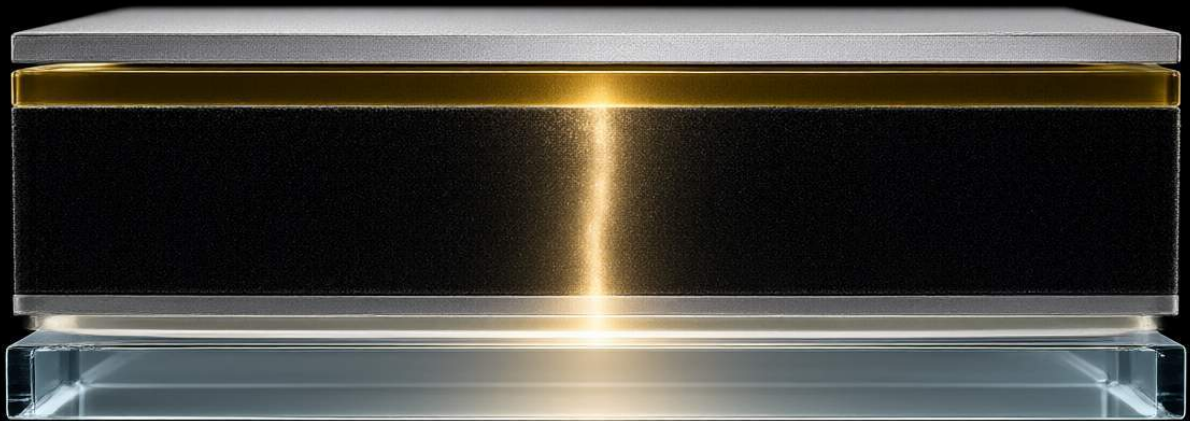
The discovery, published in the journal Science, addresses a critical bottleneck in the scalability of high-efficiency photovoltaics. With global electricity demand rising due to the growth of artificial intelligence and datacenter infrastructure, even single-digit percentage gains in power conversion are considered substantial in utility-scale solar economics, where installations cover thousands of acres.

Source: <https://bioengineer.org/chemical-mixture-erases-crystal-defects-to-boost-perovskite-solar-cell-power/>

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

#04 Perovskite Solar Cells: C60 Contact Optimization for 27.2% Efficiency

Published October 17, 2026 Perovskite-Info



OVERVIEW

Researchers have achieved a certified power conversion efficiency of 27.2% in inverted perovskite solar cells by reducing energy losses at the C60 electron-selective contact. The team identified that band-like states from C60's LUMO drive interfacial recombination and mitigated this using a vapor-phase molecular passivation strategy.

Key Findings

A collaborative research team including the National University of Singapore (NUS) and its Solar Energy Research Institute of Singapore (SERIS) has developed inverted perovskite solar cells with a certified power conversion efficiency of 27.2% (26.6% stabilized) on a 1.02 cm² active area. The cells demonstrated high stability, retaining over 98% of their initial efficiency after 1,000 hours of continuous illumination in ambient air.

Technical Details

The researchers identified that interfacial non-radiative recombination at the C60 contact is driven by band-like states derived from the C60 lowest unoccupied molecular orbital (LUMO), which result from strong intermolecular coupling within the C60 film. To suppress these losses, the team implemented a vapor-phase molecular passivation strategy using trialkylamines to disrupt the packing of C60 molecules.

This treatment significantly weakened the LUMO-derived band-like states, resulting in the following reductions in quasi-Fermi-level splitting loss after C60 deposition:

- Reduced from 89 meV to 41 meV using the trialkylamine treatment alone.
- Reduced further to 17 meV when combined with standard surface passivation.

Background & Context

Interfacial non-radiative recombination at the C60 contact has been a major bottleneck for inverted perovskite solar cells. While previous research primarily focused on passivating trap states on the perovskite surface, the specific mechanism by which fullerene-based electron transport layers induced recombination remained unclear until this study.

Significance & Outlook

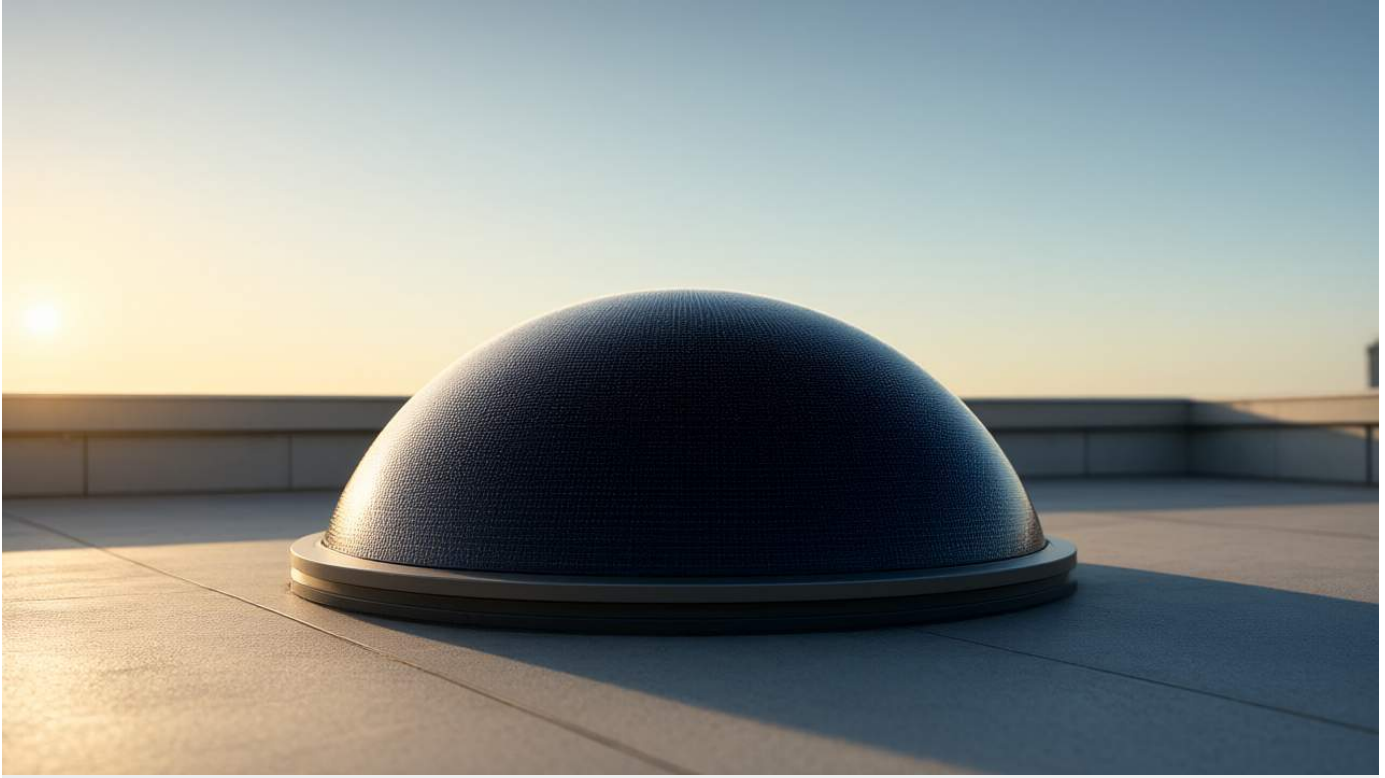
By resolving the long-standing question of why C60 induces severe interfacial recombination, this work provides a foundation for designing more comprehensive interface passivation strategies. The research involved a wide range of institutions, including Shanghai Jiao Tong University, the University of Potsdam, the Shanghai Advanced Research Institute of the Chinese Academy of Sciences, the Ningbo Institute of Materials Technology and Engineering, A*STAR's Institute of Materials Research and Engineering, and the Ningbo New Materials Testing and Evaluation Center. Corresponding author Yi Hou of NUS previously reported a certified 26.4% efficiency perovskite-organic tandem solar cell.

Source: <https://www.perovskite-info.com/cutting-energy-losses-c60-contact-enables-perovskite-solar-cells-272-efficiency>

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

#05 Hemispherical Perovskite Solar Cells: Angle-Robust Design Specs

Published October 23, 2026 pv magazine China



OVERVIEW

Researchers in China have developed a hemispherical perovskite solar cell with a textured surface that reduces power fluctuations caused by sunlight incidence angles. The textured rounded-cone design achieved an average short-circuit current density of 25.47 mA/cm^2 , significantly outperforming planar architectures. This geometry enables stable power output by decoupling device performance from the angle of incoming light.

Key Findings

The textured rounded-cone hemispherical cell demonstrated superior performance across incidence angles from 0° to 50° , achieving an average short-circuit current density of 25.47 mA/cm^2 and an average maximum power output of 28.25 mW/cm^2 . Light absorption for this design exceeded 95%. In comparison, the smooth hemispherical cell reached 24.03 mA/cm^2 and the planar device reached 22.52 mA/cm^2 for average short-circuit current density.

Technical Details

The research team modeled five distinct architectures: planar, nanowire, smooth hemispherical, and hemispherical structures featuring either rounded-cone or textured rounded-cone front surfaces. The device stack consists of the following layers:

- Indium tin oxide (ITO) electrode
- Phenyl-C61-butyric acid methyl ester (PCBM) electron transport layer
- Methylammonium lead iodide ($\text{CH}_3\text{NH}_3\text{PbI}_3$) perovskite absorber
- Nickel oxide (NiO) hole transport layer
- Silver (Ag) rear electrode

Simulations were conducted using Lumerical software to analyze electromagnetic fields, scattering, and light absorption across wavelengths from 300 nm to 800 nm. The hemispherical geometry facilitates radial charge collection, while the textured surface scatters light in multiple directions to enhance absorption. Additionally, Mie resonances induced within the perovskite shell ensure efficient light trapping.

Background & Context

While perovskite solar cells are recognized for low manufacturing costs and high power conversion efficiency, conventional planar cells suffer from optical losses when the solar incidence angle varies. These losses lead to power fluctuations that compromise the viability of the technology for renewable energy generation.

Significance & Outlook

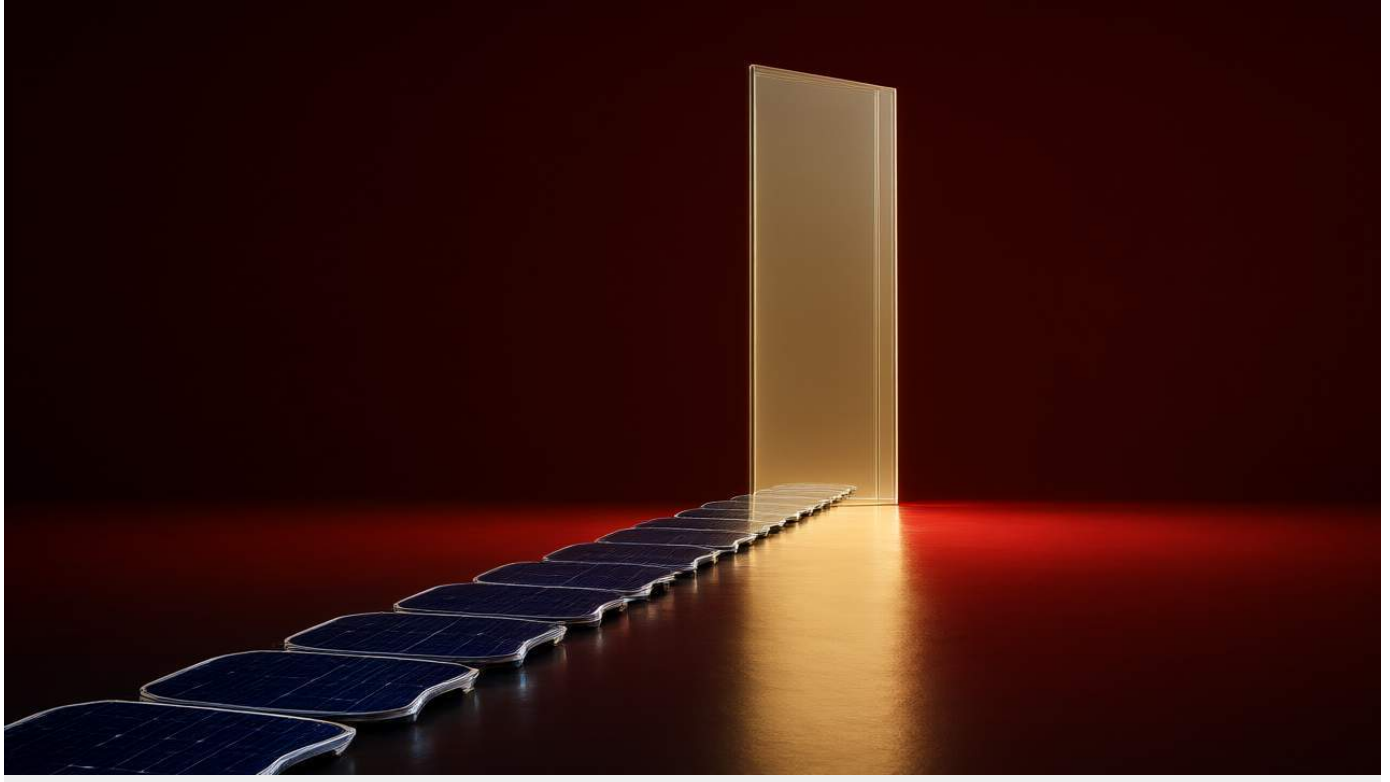
The study, published in *Solar Energy* by scientists from the Chinese Academy of Sciences and Jilin Normal University, concludes that the three-dimensional hemisphere symmetry enables balanced carrier transport. By effectively decoupling performance from the incident light angle, this design overcomes a critical challenge in maintaining stable power output for perovskite photovoltaics.

Source: <https://www.pv-magazine.com/2026/10/23/hemispherical-perovskite-solar-cell-design-reduces-sensitivity-to-sunlight-angle/>

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

#06 China PV Export Controls: Perovskite and Tandem Tech Bans 2026

Published October 16, 2026 pv magazine USA



OVERVIEW

China's Ministry of Commerce and Ministry of Science and Technology have proposed banning the export of high-efficiency perovskite and tandem solar manufacturing technologies. The measures target specific production processes and equipment, potentially limiting international access to next-generation PV manufacturing know-how.

Key Findings

China has proposed adding 12 photovoltaic technologies to its Catalogue of Technologies Prohibited or Restricted from Export. Published on Oct. 16 under Joint Announcement No. 48 of 2026, these proposals are part of a broader consultation covering 40 technologies across AI, biomedicine, and solar energy, with public consultation running until Nov. 15.

Technical Details

The proposed export bans specifically target manufacturing technologies and equipment for the following:

- Perovskite-silicon tandem solar cells based on wafers of at least 182 mm with conversion efficiencies of 30% or higher.
- Perovskite slot-die coating processes with widths of at least 1.1 meters.
- Single-junction perovskite modules of at least 1 square meter with efficiencies of 18% or higher, and tandem modules of the same area with efficiencies of at least 28%.
- Trichlorosilane production via cold-hydrogenation fluidized-bed processes (annual single-line capacity $\geq 250,000$ metric tons) and silane-based fluidized-bed processes (annual capacity $\geq 20,000$ metric tons).
- Silicon wafers no thicker than 70 micrometers and specific edge-passivation technologies for thin crystalline-silicon cells.

Additionally, the "restricted-export" category includes polysilicon plant engineering for lines with annual capacities of at least 30,000 metric tons, advanced crystal-pulling, and wafer-cutting processes. High-performance manufacturing for TOPCon, back-contact (BC), and heterojunction (HJT) cells—including deposition, passivation, diffusion, and metallization—are also listed. HJT provisions specifically include p-type technologies evaluated under air mass zero (AM0) conditions for space applications.

Background & Context

The Ministry of Commerce cited national security concerns, noting that PV technologies are increasingly used in defense and aerospace. While finished modules are not targeted, the controls apply to intellectual property transfers, licensing, and equipment exports. An interim registration requirement for these technologies took effect on Oct. 16.

Significance & Outlook

If adopted, these controls may reinforce China's dominance in advanced PV manufacturing by slowing the ability of overseas manufacturers to close the technological gap. However, the measures could also complicate the international expansion of Chinese firms and increase trade tensions.

Source: <https://www.pv-magazine.com/2026/10/16/china-proposes-ban-on-exports-of-perovskite-tandem-solar-manufacturing-technology/>

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

#07 Perovskite Solar Modules: 18.2% Efficiency via Bio-Derived Solvents

Published October 16, 2026 Interesting Engineering UK



OVERVIEW

Researchers at the University of Surrey have developed a low-toxicity, bio-derived solvent system for flexible perovskite solar modules, achieving 18.2% power conversion efficiency. By replacing hazardous chemicals with a greener formulation compatible with roll-to-roll printing, the method enables scalable, eco-friendly industrial production.

Key Findings

The University of Surrey has demonstrated flexible perovskite solar mini-modules with an active area of 11.5 square centimeters that reach power conversion efficiencies over 18.2 percent. These modules maintain stability under continuous illumination and are produced using a "Significantly Reduced-Toxicity" (SRT) ink system. This approach eliminates the need for hazardous industrial chemicals and anti-solvent processing steps, reducing energy consumption and raw material waste.

Technical Details

The SRT ink system utilizes a quick-drying formulation combining ethanol and 2-methyltetrahydrofuran, a bio-derived solvent sourced from forestry and agricultural waste. The manufacturing process employs a roll-to-roll compatible bar-coating method operated at room temperature and dried with a quick gas jet. Key technical specifications include:

- **Architecture:** Inverted structure utilizing bar-coated, self-assembled monolayers as hole-transport layers, removing the need for additional interlayers.
- **Patterning:** A laser-based P1-to-P4 scribing process is used to monolithically link individual solar cells.
- **Compatibility:** While tested via gas-blown bar-coating, the process is verified to work with standard industrial slot-die coating machines.

Background and Context

Traditional printable perovskite inks rely on toxic solvents such as dimethylformamide and acetonitrile, which pose risks to factory workers and the environment. The scale of this issue is significant; a single gigawatt-scale manufacturing line can consume over 90,000 liters of these toxic solvents. By shifting to bio-derived ingredients, the University of Surrey aims to remove the chemical barriers that have previously hindered the commercial potential of flexible perovskite cells compared to silicon panels.

Significance and Outlook

The integration of green chemistry into high-speed, high-throughput printing makes the large-scale production of flexible solar cells a practical near-term reality. This innovation reduces the need for complex solvent handling, waste treatment, and safety infrastructure. Potential applications for these lightweight, flexible arrays include portable consumer electronics, building-integrated windows, and ultra-lightweight solar arrays for space deployment.

Source: <https://interestingengineering.com/innovation/perovskite-solar-modules-reach-18-efficiency-safer-solvents>

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

#08 Renshuo Photovoltaic: Series B Funding and Perovskite Roadmap 2026

Published October 23, 2026 腾讯新闻 China



OVERVIEW

Renshuo Photovoltaic has secured over 100 million yuan in Series B funding to accelerate the mass production of all-perovskite tandem cells and expand into space-based photovoltaics. The company has achieved a certified steady-state power conversion efficiency of 30.8% and is currently planning GW-level production lines.

Key Findings

Renshuo Photovoltaic (Suzhou) Co., Ltd. completed a Series B funding round exceeding 100 million yuan on October 22, 2026. The round was led by the Jiangsu Provincial Strategic Emerging Industry Fund, with participation from the Suzhou Venture Capital Group, Huanghai Financial Holding Group, and Changshu State-owned Development Venture Capital. These funds will be allocated toward the construction of production lines, the development of core space-based photovoltaic technologies, and the optimization of mass-production processes.

Technical Details

Founded by Professor Tan Hairen's team from Nanjing University, the company focuses on all-perovskite tandem cell technology. Technical milestones include:

- **Efficiency:** A certified steady-state power conversion efficiency of 30.8% achieved in 2025.
- **Module Performance:** A 150MW pilot line is currently operational with a product yield exceeding 98%. Large-scale perovskite modules (1.2m x 0.6m) have reached a full-area certified efficiency of 22%.
- **Reliability:** Commercial modules have been delivered after passing full-sequence IEC61215 and IEC61730 reliability tests.
- **Space Validation:** In May 2026, perovskite cells were deployed to the Chinese Space Station via Shenzhou 23 for extravehicular dynamic service experiments to verify long-term performance in space environments.

Background & Context

Renshuo Photovoltaic employs a "three-in-one" energy ecosystem strategy covering ground-based solar, Building Integrated Photovoltaics (BIPV), and space photovoltaics. The company has previously secured A and A+ round funding from institutions including CICC Capital, Sequoia China, IDG Capital, and CMB International.

Significance & Outlook

Perovskite technology is targeted for space applications due to its high specific power, flexibility, and radiation resistance. While the industry faces challenges in scaling production, Renshuo Photovoltaic is differentiating itself by simultaneously pursuing ground commercialization and space-based validation. The company is now transitioning from laboratory success to GW-level industrialization to establish a first-mover advantage in the next-generation photovoltaic market.

Source: <https://view.inews.qq.com/a/20261023A04HVQ00>

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

#09 Riyao Solar: Perovskite SAM Materials and Pilot Line Roadmap

Published October 20, 2026 36Kr Japan China



OVERVIEW

Riyao Solar has secured several tens of millions of yuan in Pre-Series A funding to establish a pilot production line for perovskite materials with an annual capacity of 100 kilograms. The company is leveraging a proprietary radical self-assembled monolayer (SAM) to reduce manufacturing costs and target the automotive and aerospace markets.

Key Findings

Riyao Solar, a perovskite solar cell manufacturer founded in 2023 based on research from the Changchun Institute of Applied Chemistry (Chinese Academy of Sciences), has raised funding from Tianjin Venture Capital Management and the Jilin Provincial Science and Technology Investment Fund. The capital is earmarked for expanding development personnel and establishing a pilot production line for new materials with an annual capacity of 100 kilograms, alongside a test line for large-scale solar modules.

Technical Details

The company's core technology centers on a novel radical self-assembled monolayer (SAM) used in the hole transport layer. By incorporating functional groups and twisted structures, Riyao Solar has improved the dispersibility of the material in solution, enabling uniform coating and thin-film formation over large areas. This SAM material allows for a manufacturing process that eliminates the need for nickel oxide. According to company estimates, this simplification could reduce production line investment by approximately 20% and cell manufacturing costs by about 10%.

Additionally, the company has developed an integrated thin-film inspection device. Because SAM films are only 2 to 3 nanometers thick, they are difficult to evaluate; this new device combines multiple measurement methods to enable high-precision, short-time material selection and quality control directly on the production line.

Background & Context

Riyao Solar's SAM materials were utilized in a perovskite-crystalline silicon tandem solar cell co-developed with LONGi. This cell achieved a conversion efficiency of 34.2%, as certified by the National Renewable Energy Laboratory (NREL). The company currently collaborates with over 100 enterprises and research institutions globally regarding its SAM materials.

Significance & Outlook

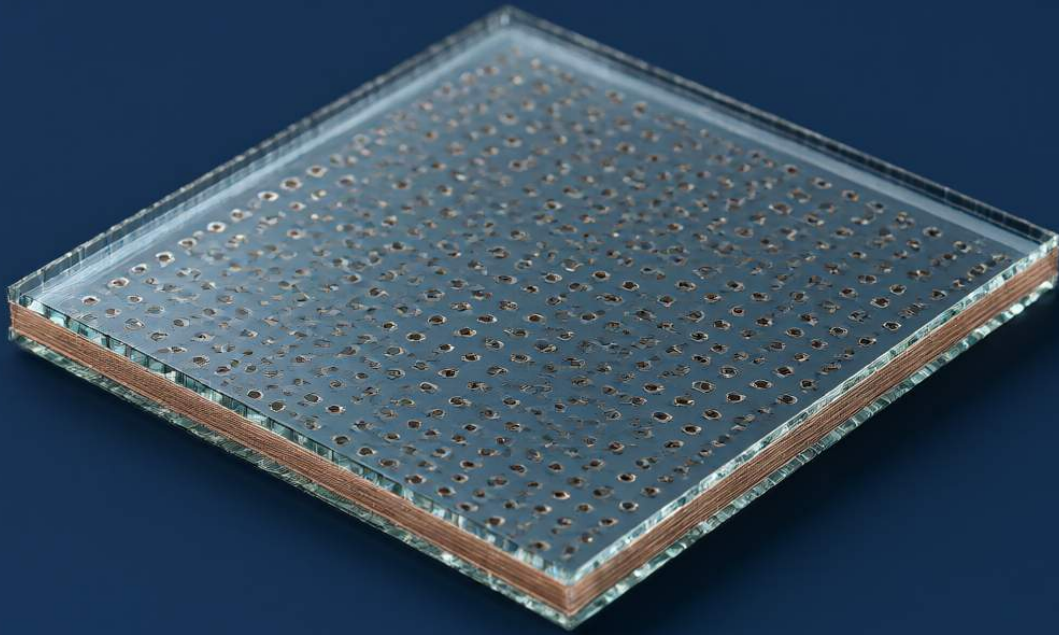
Riyao Solar is currently capable of prototyping devices up to 300 millimeters square. The company is now targeting the automotive and aerospace sectors, where the lightweight and flexible nature of perovskite cells provides a competitive advantage. Future development will focus on verifying long-term reliability and resistance to temperature fluctuations to meet the requirements of these specific markets.

Source: <https://36kr.jp/501479/>

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

#10 BOE Strategy: 8.6G AMOLED, Glass Core Substrates and Perovskites

Published October 16, 2026 新浪科技 China



OVERVIEW

BOE is diversifying into glass-based advanced packaging and perovskite solar cells to offset a projected decline in 2026 AMOLED and LCD panel demand. The company has successfully sampled 24-layer glass core substrates and is conducting extreme-environment outdoor testing for its perovskite components.

Key Findings

BOE expects a "double drop" in both volume and price for flexible AMOLED panels in 2026, driven by rising memory costs that suppress consumer electronics demand. To counter this cyclical downturn, the company is accelerating three "second curve" growth drivers: the ramp-up of 8.6-generation (8.6G) AMOLED production, the development of glass-based advanced packaging, and the commercialization of perovskite photovoltaics.

Technical Details

- **Glass Core Substrates:** BOE has completed the full process flow for glass-based packaging, including high-aspect-ratio TGV (Through Glass Via) drilling, deep-hole copper filling, and high-density routing. The company has produced and sampled 24-layer (11-2-11) substrates exceeding 100×100mm, which passed reliability tests including TCB 1000 cycles, UHAST, BHAST, HTSL, and LTSL.
- **Perovskite Solar Cells:** Development is proceeding across rigid, flexible, and tandem routes. Efficiency records reached 27.94% in glovebox tests, 21.39% on experimental lines, and 20.11% on mid-pilot lines (120×240cm), with flexible components hitting 16.6%. A 200kW outdoor demonstration base began operation in April 2026.
- **8.6G AMOLED:** The production line, which first lit up on December 30, 2025, officially began mass production in Chengdu on June 17, 2026, targeting mid-sized OLEDs for laptops and tablets.

Background and Context

Industry data supports BOE's cautious outlook; Omdia lowered 2026 smartphone AMOLED shipment forecasts to 778 million units (a 7% year-on-year decline). Meanwhile, CINNO Research predicts 6.7-inch flexible OLED prices will drop to \$18 by Q3 2026. In response, BOE is shifting from an expansion phase to a maturity phase, noting that total depreciation and capital expenditures will begin to decrease relative to 2025 levels.

Significance and Outlook

By integrating TGV glass substrates and high-efficiency perovskites, BOE is transitioning from a panel manufacturer to a platform-based technology enterprise. The company maintains a shareholder return plan for 2025–2027, pledging annual cash dividends of at least 35% of net profit and annual share buybacks of no less than 1.5 billion yuan.

Source: <https://finance.sina.com.cn/tech/roll/2026-10-16/doc-inivmiip8371716.shtml>

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

#11 Perovskite Solar Cells: NEDO Design and Installation Guidelines

Published October 23, 2026 環境ビジネスオンライン Japan



OVERVIEW

NEDO has released design and installation guidelines for flexible solar cells, including perovskite technology, to ensure safety and reliability during deployment. The initiative supports government targets to establish mass production and achieve domestic installations of approximately 20GW by 2040.

Key Findings

The New Energy and Industrial Technology Development Organization (NEDO) has published the "Design and Installation Guidelines for Flexible Solar Cells." These guidelines establish required specifications prior to actual installation examples to facilitate the safe and reliable adoption of perovskite and other next-generation solar technologies.

Technical Details and Market Potential

Film-type solar cells offer flexibility and lightweight properties, enabling installation on walls and roofs that cannot support traditional panels. The source identifies significant market potential for these technologies:

- Domestic demand in Japan is estimated at approximately 25GW.
- Overseas installation potential is estimated at approximately 500GW.

Government Roadmap and Targets

The Japanese government has outlined specific strategic goals for the deployment of perovskite solar cells:

- **Cost Reduction:** Establish mass production technology to bring power generation costs down to 14 yen/kWh or less by fiscal year 2030.
- **Installation Volume:** Reach approximately 20GW of domestic installations by 2040.
- **Public Infrastructure:** Target 5GW of installations by 2035 across public facilities and infrastructure, including airports, roads, and railways, utilizing government procurement.

Background and Support Mechanisms

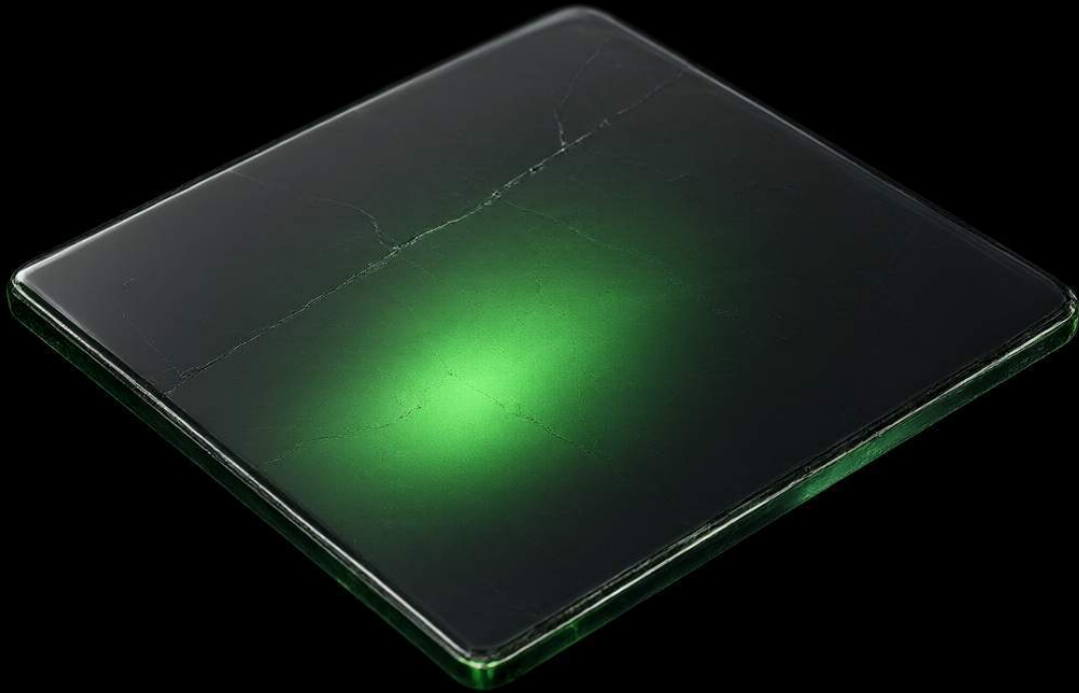
To secure mass production capabilities, the government is providing support for research, development, and capital investment through initiatives such as the Green Innovation (GI) Fund and the GX Supply Chain Construction Support Project. These measures, combined with the new NEDO guidelines, are intended to transition the technology from the research phase to widespread industrial application in public and private sectors.

Source: <https://www.kankyo-business.jp/column/07a21a12-8869-4722-891a-465c912efa65>

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

#12 Perovskite Semiconductor Thin Films: Low-Defect Fabrication for Solar Cells and LEDs

Published October 19, 2026 한국강사신문 South Korea



OVERVIEW

Professor Sung-sik Shin's team at Sungkyunkwan University has developed a low-defect perovskite semiconductor thin film using a eutectic phenomenon. The material achieved a power conversion efficiency of 26.5% in solar cells and an external quantum efficiency of 26.1% in LEDs using the same device structure.

Key Findings

Researchers have successfully fabricated high-quality perovskite semiconductor thin films that enable both high-performance solar cells and light-emitting diodes (LEDs) using a single material and identical device structures. The developed thin films exhibit a charge lifetime of approximately 295 microseconds (μs) and a surface recombination velocity of 0.3 cm/s, figures that represent some of the highest quality levels reported for perovskite materials and are comparable to top-tier silicon semiconductors.

Technical Details

The team utilized the "eutectic" phenomenon, where the melting point of a mixture is significantly lower than that of its individual components. By mixing MACl and zinc halide (ZnX_2)—both of which have high individual melting points—the team created a mixture that forms a liquid state at a much lower temperature to control crystal growth.

- **Process:** The thin film was heat-treated at approximately 100°C, converting mixtures at the grain boundaries into a thin liquid layer. This accelerated the bonding of small crystals into larger, uniform crystals with fewer defects.
- **Composition:** During heat treatment, the MACl volatilized and was removed, while the remaining zinc (Zn) gathered at the grain boundaries to suppress defects.
- **Solar Cell Performance:** The n-i-p structure solar cell achieved a power conversion efficiency of 26.5% and a record-breaking open-circuit voltage of 1.208V for that specific structure.
- **LED Performance:** The same structure yielded an external quantum efficiency of 26.1%.

Background & Context

Perovskites are valued for low manufacturing costs and simple processing. However, the transition from liquid solution to thin film typically creates grain boundaries and surface defects. These defects cause charge loss during transport, which reduces the overall efficiency and lifespan of the resulting devices.

Significance & Outlook

This research, conducted through international collaboration with the Korea Research Institute of Chemical Technology, UC San Diego, and Princeton University, demonstrates that eutectic phenomena can be used to precisely control crystal growth and defects in semiconductor thin films. The results, published in *Science*, provide a new material processing technology for next-generation optoelectronic devices.

Source: <https://www.lecturernews.com/news/articleView.html?idxno=212158>

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

#13 Prussian Blue in Perovskite Solar Cells: Efficiency and Stability

Published October 23, 2026 科技日报(中国科技网) China



OVERVIEW

Researchers have integrated Prussian Blue nanoparticles into lead halide perovskites to optimize film formation and suppress ion migration. This approach achieved a certified power conversion efficiency of 26.2% for small-area inverted cells and demonstrated high stability under extreme heat and humidity.

Key Findings

A research team led by Academician Zheng Nanfeng and Professor Wu Binghui from Xiamen University, in collaboration with Jinan University and Tsinghua University, has demonstrated that adding Prussian Blue nanoparticles to perovskite solar cells improves both efficiency and stability. The team achieved a third-party certified power conversion efficiency of 26.2% for small-area inverted cells, 23.4% for 6cm×6cm upright modules, and 22.9% for 30cm×30cm inverted modules.

Technical Details

Prussian Blue, an iron-containing compound with an open framework structure, acts as a regulator during two critical stages: film formation and device operation. During the solution-based fabrication of the perovskite light-absorbing layer, Prussian Blue nanoparticles control nucleation, intermediate phase transformation, and crystal growth. This results in films with more distinct preferential orientation and reduced local lattice deformation.

During operation, the material addresses ion migration—a primary cause of performance decay. The open framework and the redox activity of iron ions inhibit the long-range redistribution of cations, particularly cesium ions. Specifically, the iron ions facilitate the conversion of abnormal valence species, such as zero-valent lead and iodine, back into their ionic forms.

Stability and Validation

The team conducted rigorous stability tests to validate the material strategy:

- **Damp Heat Test:** 6cm×6cm upright modules retained over 90% of initial efficiency after 2500 hours at 85°C and 85% relative humidity.
- **Maximum Power Point Tracking:** Modules retained over 80% efficiency after 2200 hours at 65°C and 50% relative humidity.
- **Outdoor Testing:** 30cm×30cm inverted modules monitored in Zhuhai for 151 days showed no significant decline in relative efficiency compared to commercial silicon references.

Significance and Outlook

This research provides a methodology for screening materials that can simultaneously guide crystal growth and regulate defects and ions. Future work will focus on scaling the process for large-area coating, ensuring batch consistency, and exploring other open-framework materials or chemical modifications of Prussian Blue to further optimize charge collection and long-term reliability.

Source: https://www.stdaily.com/web/gdxw/2026-10/23/content_601751.html

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

#14 Flexible Perovskite Solar Cells: 20.2% Efficiency for Large Modules

Published October 23, 2026 网易(手机网易网) China



OVERVIEW

Researchers at Soochow University have achieved a certified power conversion efficiency of 20.2% for large-area flexible perovskite solar modules with a substrate area of 1050 cm². By implementing a decoupled self-assembled monolayer (SAM) and perovskite co-deposition strategy, the team overcame efficiency losses typically associated with scaling from lab-scale cells to large-area flexible components.

Key Findings

The research team, led by Academician Li Yongfang, Professor Li Yaowen, and Associate Professor Xu Guiying, has developed a method to produce high-performance flexible perovskite solar cells. The team achieved a certified power conversion efficiency of 26.9% for small-area flexible cells and 20.2% for large-area flexible modules with a substrate area of 1050 cm². These modules demonstrated high stability, maintaining over 92% of their initial efficiency after 1000 hours of operation at 85°C and passing reliability tests based on IEC TS 63163:2021.

Technical Details

The researchers identified a kinetic competition between the rapid desorption of hydroxyl groups on flexible PET/ITO substrates and the slow anchoring of SAM molecules. To address this, they introduced a decoupled co-deposition strategy using a 3,5-bis(methanesulfonyl)phenylammonium iodide (BSAI) molecule. BSAI possesses dual interaction sites that weaken the interaction between the perovskite precursor and the SAM molecule (Me-4PACz), allowing the SAM to anchor more quickly to the ITO surface before hydroxyl groups are lost.

- **Interface Optimization:** BSAI prioritizes binding with the Pb-I framework (binding energy of -1.43 eV vs -0.60 eV for Me-4PACz), facilitating a more uniform and continuous SAM layer of 1–2 nm.
- **Crystallization Control:** The strategy delayed the nucleation start time of the perovskite intermediate phase from 22.1 seconds to 30.5 seconds, suppressing the δ -phase and promoting α -phase (001) preferred orientation.
- **Scaling Performance:** While traditional co-deposition resulted in a 7.95% efficiency for 1050 cm² modules, the new strategy achieved 20.2%.

Significance and Outlook

The flexible modules demonstrated mechanical durability, retaining 92.1% efficiency after 10,000 bending cycles. Practical applications were demonstrated via a 20.31 g flexible component capable of outputting 20.5 W in sunny weather. When integrated into a remote-controlled drone's curved wings, the flight endurance increased from 8 minutes to 19 minutes, and the flight distance extended from approximately 4 km to 9.5 km.

Source: <https://m.163.com/dy/article/L9TMREI605329TW8.html>

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

#15 Perovskite Solar Cells: UC San Diego's Salt-Melting Process for 26% Efficiency

Published October 22, 2026 ecoportal.net USA



OVERVIEW

UC San Diego scientists have achieved 24–26% energy conversion efficiency in perovskite solar cells using a temporary salt-melting technique to eliminate structural defects. The treated cells maintained consistent power output after eight weeks of simulated sunlight, addressing critical stability and degradation issues.

Key Findings

Researchers at UC San Diego have developed a production process that utilizes briefly melted salts to reach power conversion efficiencies of 24 to 26 percent under standard simulated sunlight. This method eliminates microscopic energy traps within the semiconductor material, preventing premature charge recombination and ensuring that photo-generated electrical current flows directly to collection contacts.

Technical Details

The process involves mixing zinc bromide and methylammonium chloride in a liquid precursor. Key technical steps include:

- **Liquid Eutectic Phase:** Heating the mixture creates a temporary molten salt phase that fills microscopic crystal interface boundaries, allowing misplaced atoms to rearrange into perfect crystalline structures.
- **Evaporation and Solidification:** Volatile methylammonium chloride evaporates from the baking membrane, causing the molten material to transform instantaneously into an organized crystal form.
- **Defect Passivation:** Zinc ions concentrate at the crystal edges, occupying empty electronic traps within grain interfaces.
- **Verification:** X-ray imaging was used to record the transition of boundaries from ordered solids to liquid phases and back again.

Background & Context

Standard halide perovskite films often feature small crystal grains with structural defects at the interfaces, which inhibit electrical charge flow and absorb moisture from the environment. These defects typically lead to rapid chemical decomposition and efficiency loss. In contrast, the liquid-grown films produced via this method feature dense packing of crystals that inhibits chemical breakdown when exposed to extended lighting.

Significance & Outlook

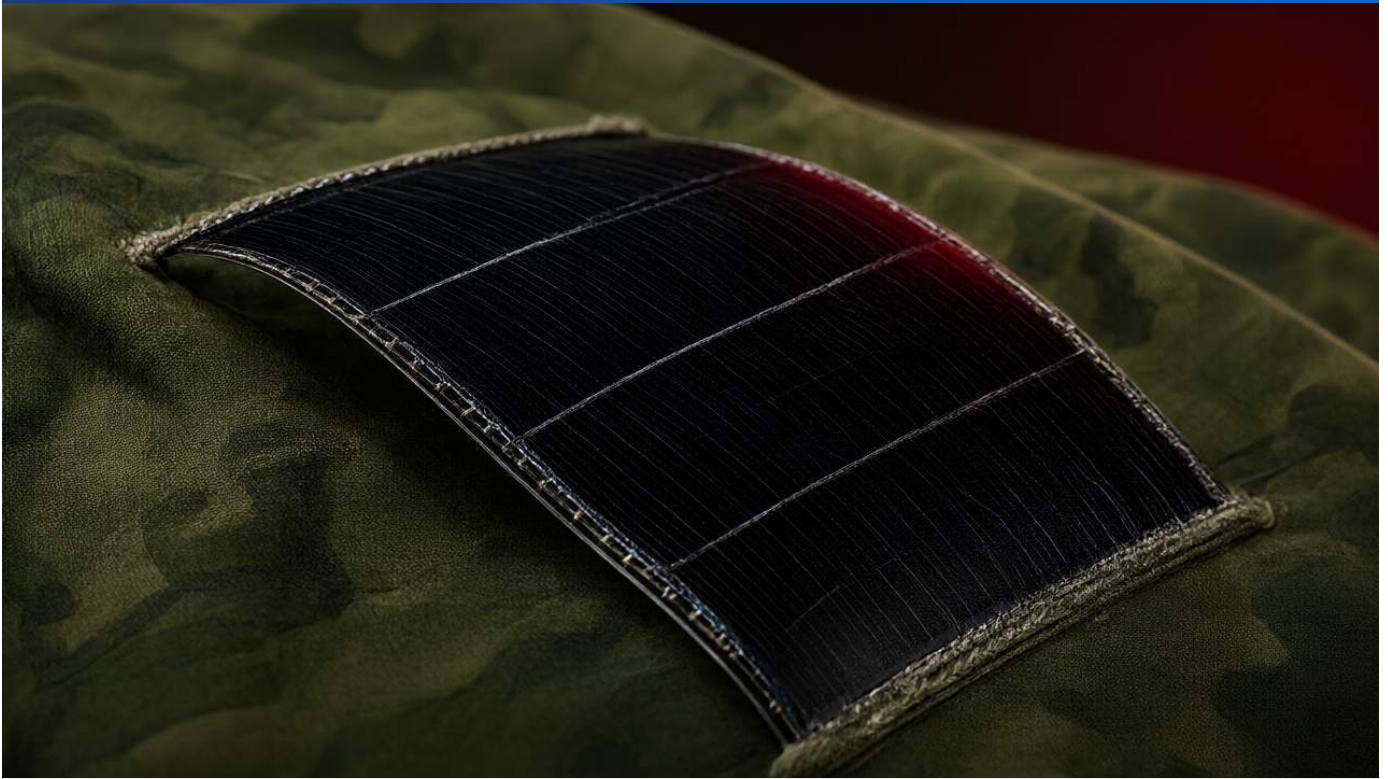
The ability to maintain power output for eight weeks of simulated sunlight indicates that this temporary liquid processing method solves significant perovskite operation stability problems. While laboratory experiments on small-scale samples are successful, industrial scaling requires precise monitoring of evaporation speeds to ensure uniformity across large glass substrates. Current trials are investigating the integration of this liquid salt technology into automated production equipment to determine its viability for the commercial market.

Source: <https://www.ecoportal.net/en/san-diego-solar-cells-efficiency/43547/>

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

#16 Dual-Purpose Solar Film: 22% Efficiency and NIR Emission Specs

Published October 21, 2026 ecoportal.net USA



OVERVIEW

Engineers at Florida International University have developed a paper-thin semiconductor film that achieves 22% power conversion efficiency and can reverse polarity to emit near-infrared light. This dual-functionality is designed to reduce the weight of battery packs for infantry soldiers by integrating power generation and signaling directly into combat uniforms.

Key Findings

Researchers at Florida International University have created an ultra-thin, flexible semiconductor film capable of dual-purpose operation: converting daylight into electricity and emitting near-infrared (NIR) light. In laboratory tests, the device achieved a power conversion efficiency of 22.02% on a 0.12 cm² cell and 20.43% on a 1.1 cm² device. This high efficiency allows the paper-thin module to serve as a viable replacement for bulky solar generators.

Technical Details

The film utilizes engineered thin semiconductor layers to increase the absorption of sunlight trapped within micro-thin boundaries, overcoming the typical efficiency losses associated with thin-film absorbers. While standard solar materials cannot emit light when biased, this active material is modified to become a light source when a reversed current is applied. This reversal produces narrow-band NIR light with a peak at 818-nm, which appears as a faint pink glow to the human eye but is detectable by night-vision devices.

To ensure durability in field conditions, the electronics feature:

- A tough polymer base that resists cracking during repeated mechanical twisting and folding.
- Encapsulation layers that protect electrical contacts from dust and water penetration during rain or mud contamination.

Background and Context

The technology targets the logistical burden on infantry soldiers, who typically carry approximately 20 pounds of lithium batteries to power GPS equipment, radios, and night-vision goggles. By integrating energy-harvesting materials into garment fabric, the uniform itself becomes an energy producer, potentially mitigating resupply delays during prolonged tactical operations.

Significance and Outlook

The transition from laboratory proof-of-concept to commercial uniform production depends on scaling the chemical deposition process. Engineers must maintain accurate temperature control across large, flexible substrate rolls to avoid inconsistent deposition and "dead spots" that would result in efficiency losses. While the rugged construction suggests suitability for harsh environments, Florida International University notes that operational suitability for wilderness combat has not yet been tested in field deployments.

Source: <https://www.ecoportal.net/en/miami-engineers-thin-solar-cell/43484/>

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