PerovskiteSolarCells

Weekly Intelligence Report

2026-09-06 | 38 articles | 9 countries

troy-technical.jp

This Week's Keyword

Perovskite Commercialization

Efficiency, stability & scale drive market entry

38	9	35.5	73
articles	countries	%	B USD
Total Articles Analyzed	Source Countries/Regions	Record Efficiency (LONGi)	Market Forecast by 2035

All 38 Articles This Week — 5-Axis Evaluation Matrix

How to read columns — Tech Novelty: degree of breakthrough Market Proximity: closeness to commercialization Market Impact: industry-wide effect Data Reliability: quantitative data & peer review US/EU Relevance: direct impact on US/European companies & supply chains

#	Article Title	Type	Tech Novelty	Market Proximity	Market Impact	Data Reliability	US/EU Relevance	Summary
#01	Solvent-Free Tandem Cell	Research	●●●●○	●●●○○	●●●●○	●●●●○	●●●●●	German researchers achieve 27.1% efficiency, 6800-hour stability with solvent-free perovskite-silicon tandem cell.
#02	China 24% Large-Area Module	Research	●●●●○	●●●○○	●●●●○	●●●●○	●●●●○	Chinese team sets world record 24.0% efficiency on 810 cm² perovskite module, enhancing durability.
#03	Australia 500MW Factory	Corporate Strategy	●●○○○	●●●●○	●●●●○	●●●○○	●●●○○	Australian manufacturer plans 500MW perovskite-silicon tandem solar module factory with university partnership.
#04	Oxford PV 26.6% Large Mod	New Product	●●●●○	●●●●○	●●●●○	●●●●○	●●●●●	Oxford PV & Sunmaxx achieve 26.6% world record efficiency for large perovskite-silicon tandem module.
#05	Perovskite Connect 2026	Market Overview	●●●○○	●●●●○	●●●●○	●●●○○	●●●●●	Conference preview highlights manufacturing, reliability, sustainability for perovskite solar commercialization.
#06	EneCoat 30%+ Efficiency	Corporate Strategy	●●●●○	●●●●○	●●●●○	●●●●○	●●●○○	Kyoto University spinoff EneCoat achieves >30% tandem cell efficiency with Toyota, targets 200-300 MW by 2030.
#07	Japan Quadruples Support	Corporate Strategy	●●○○○	●●●●●	●●●●●	●●●●○	●●●●○	Japan quadruples perovskite solar cell support to JPY 28B for FY2027, ending silicon subsidies.
#08	US/Japan Curb China	Corporate Strategy	●●○○○	●●●●●	●●●●●	●●●○○	●●●●●	US and Japan move to curb China's electrification influence; Japan prioritizes next-gen perovskite solar cells.
#09	LONGi 35.5% Record	Research	●●●●○	●●●●○	●●●●●	●●●●○	●●●●●	LONGi achieves 35.5% world-record efficiency; Sekisui Chemical and Tandem PV boost manufacturing investment.
#10	Perovskite-Si Tandem Accel	Market Overview	●●○○○	●●●●●	●●●●○	●●○○○	●●●●●	Perovskite-silicon tandem solar cells accelerate future of solar power with high efficiency breakthroughs.
#11	10-15 Year Lifespan Target	Research	●●●○○	●●●○○	●●●●○	●●●○○	●●●●○	Perovskite solar cells target 10-15 year operational lifespan with material substitution and encapsulation.
#12	KIER 26.7% Perovskite/CIGS	Research	●●●●○	●●○○○	●●●●○	●●●●○	●●●○○	Korean KIER achieves world-record 26.7% efficiency in perovskite/CIGS tandem solar cells.

#	Article Title	Type	Tech Novelty	Market Proximity	Market Impact	Data Reliability	US/EU Relevance	Summary
#13	27.3% Solvent-Free Tandem	Research	●●●●○	●●●○○	●●●●○	●●●●○	●●●●●	Fraunhofer ISE and University of Freiburg achieve 27.3% efficiency with first fully solvent-free tandem cell.
#14	Interfacial Engineering	Research	●●●●○	●●○○○	●●●○○	●●●●●	●●●●●	Novel interfacial engineering achieves 21.34% efficiency and superior defect passivation in IPSCs.
#15	Japan ¥28B Support	Corporate Strategy	●●○○○	●●●●●	●●●●●	●●●●○	●●●●○	Japan to quadruple perovskite solar cell support to ¥28B in FY2027, phasing out silicon subsidies.
#16	China 24% Large-Area Mod	Research	●●●●○	●●●○○	●●●●○	●●●●○	●●●●○	Chinese researchers achieve world record 24.0% efficiency for 810 cm² large-area perovskite solar modules.
#17	BN Boosts QLED Stability	Research	●●●●○	●●○○○	●●●○○	●●●●○	●●●○○	Ultrathin boron nitride boosts perovskite QLED stability and efficiency, extending lifespan to 25,263 hours.
#18	Lead-Free Sn Perovskite	Research	●●●●○	●●○○○	●●●○○	●●●●○	●●●○○	Japanese researchers boost tin perovskite solar cell efficiency to 9.07% and longevity with novel additive.
#19	LONGi 35.5% Efficiency	Research	●●●●●	●●●○○	●●●●●	●●●●○	●●●●○	LONGi achieves world-record 35.5% conversion efficiency for 2-terminal perovskite-silicon tandem solar cell.
#20	China 27.39% IPSC, 5000h	Research	●●●●○	●●●○○	●●●●○	●●●●○	●●●●○	Chinese researchers achieve 27.39% efficiency in IPSCs with SGDC, demonstrating over 5,000 hours stability.
#21	Perovskite Connect GW-Scale	Market Overview	●●●○○	●●●●○	●●●●○	●●●○○	●●●●●	Perovskite Connect 2026 to discuss equipment, processes, and applications for gigawatt-scale production.
#22	Semi-Transparent OPV	Research	●●●○○	●●●○○	●●●○○	●●●●○	●●●●●	Freiburg/Fraunhofer ISE develop semi-transparent OPV modules with industrial process, hinting at perovskite.
#23	US DOE Space PV Funding	Corporate Strategy	●●○○○	●●●●○	●●●●○	●●●●○	●●●●●	US DOE announces $12M funding for space photovoltaics, prioritizing perovskite technology.
#24	Roll-Coated Flexible PSCs	Research	●●●●○	●●○○○	●●●○○	●●●●●	●●●●●	Roll-coated flexible perovskite solar cells achieve 21% efficiency with atmospheric processing.
#25	Deep-Blue PeLEDs	Research	●●●●○	●●○○○	●●●○○	●●●●●	●●●●●	Deep-blue perovskite LEDs achieve 5.2% EQE and enhanced spectral stability with novel dopant strategy.
#26	Open-Air Screen-Printed	Research	●●●●○	●●●○○	●●●●○	●●●●○	●●●○○	Nanjing Tech achieves 22.41% efficiency in open-air screen-printed perovskite solar cells.
#27	PXP Perovskite-Chalcopyrite	Corporate Strategy	●●●●○	●●●●○	●●●●○	●●●○○	●●●○○	PXP to mass produce world's first perovskite-chalcopyrite tandem solar cells by 2028, targeting 28% efficiency.
#28	U Sydney A$7.25M Funding	Research	●●●○○	●●●●○	●●●●○	●●●●○	●●●○○	University of Sydney secures A$7.25M to accelerate commercialization of perovskite-silicon tandem cells.
#29	GIST Commercialization	Corporate Strategy	●●○○○	●●●●○	●●●●○	●●●○○	●●●○○	South Korea's GIST establishes council, targets 30% efficiency for large-area tandem modules by 2030.
#30	Perovskite Stock Watch	Market Overview	●●○○○	●●●●●	●●●●●	●●●●○	●●●●●	Sekisui, Oxford PV, Hanwha accelerate production and achieve certifications, driving commercialization.
#31	HTL Regulation 25.39%	Research	●●●●○	●●○○○	●●●○○	●●●●●	●●●○○	Hole transport layer regulation of polaron formation achieves 25.39% average efficiency in perovskite cells.

#	Article Title	Type	Tech Novelty	Market Proximity	Market Impact	Data Reliability	US/EU Relevance	Summary
#32	China 24% Large-Area Mod	Research	●●●●○	●●●○○	●●●●○	●●●●○	●●●●○	Nanjing University and Renshine Solar set world record with 24.0% certified efficiency for 810 cm² modules.
#33	32.66% Tandem, 1000h Stab	Research	●●●●○	●●○○○	●●●●○	●●●●●	●●●○○	Highly efficient and stable perovskite/silicon tandem cells achieve 32.66% efficiency and 91% retention after 1000h.
#34	AI for Perovskite Dev	Research	●●●●○	●●○○○	●●●●○	●●●○○	●●●○○	Becquerel and Ximu Technology partner to accelerate perovskite material development with AI.
#35	NREL Certified Efficiencies	Market Overview	●●○○○	●●●○○	●●●○○	●●●○○	●●●●●	Perovskite solar cells achieve 25.7% single-junction and 29.8% tandem efficiencies certified by NREL.
#36	GCL Perovskite BIPV Partner	Corporate Strategy	●●○○○	●●●●○	●●●●○	●●●○○	●●●○○	GCL Perovskite and Wuhan Lingyun partner for joint development of BIPV curtain walls and PV windows.
#37	SNS Insider Market Report	Market Report	●○○○○	●●●●●	●●●●●	●●●○○	●●●●●	Perovskite solar cell market projected to reach $73 billion by 2035 with 69.45% CAGR.
#38	Oxford PV 26.9% Residential	New Product	●●●●○	●●●●○	●●●●○	●●●●○	●●●●●	Oxford PV achieves 26.9% efficiency in residential panels; UQ sustains 16.65% lead-free perovskite for 1000+ hours.

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

Three Questions That Demand Your Decision This Week

❶ Is your solar strategy adapting to Japan's pivot?

Japan is quadrupling perovskite support to ¥28B while ending silicon subsidies by FY2027. This aggressive national strategy aims for 20 GW perovskite deployment by 2040. Are US/EU companies positioned to capitalize on this shift or risk losing market share in a key economy?

❷ Can your R&D; match new efficiency and stability benchmarks?

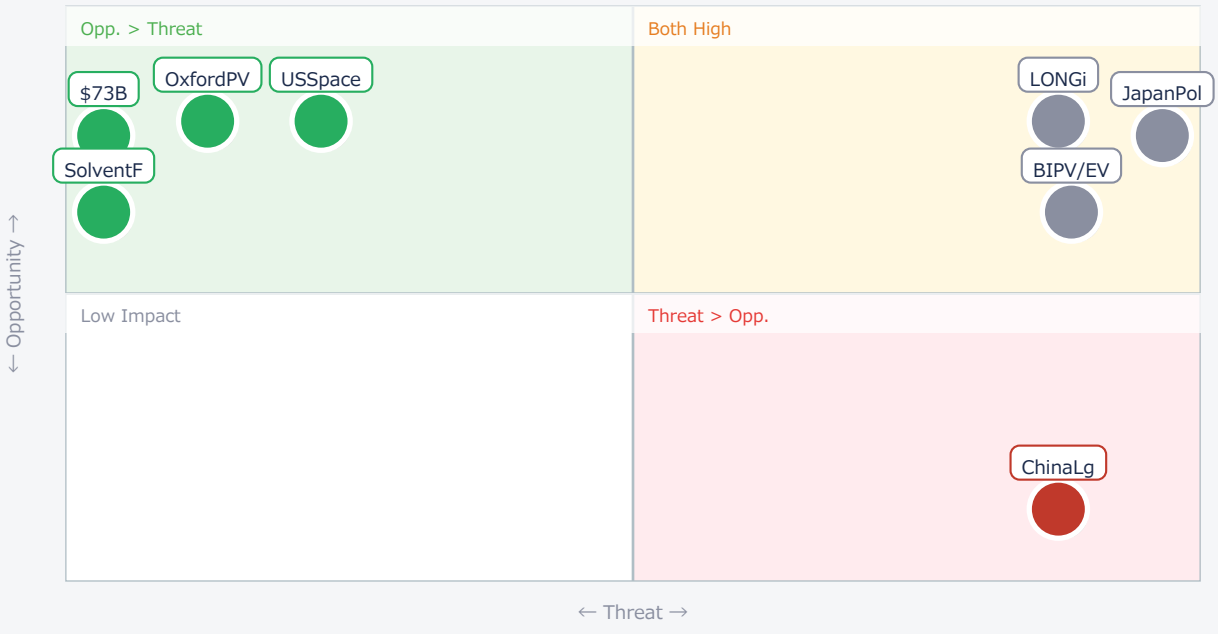
LONGi's 35.5% tandem efficiency and China's 27.39% IPSC with >5,000 hours stability set new global benchmarks. Are your R&D; roadmaps sufficiently ambitious and funded to compete with these rapid advancements in both performance and durability?

❸ Are you prepared for perovskite's market entry and diversification?

Oxford PV is shipping commercial modules, and the market is projected to hit $73B by 2035. New applications like BIPV, EVs, and space PV are emerging. Do you have a clear strategy to integrate perovskite into your product lines or supply chains, or will Asian competitors dominate these new segments?

Opportunities vs. Threats for US/European Companies

Opportunity vs. Threat Matrix for US/European Companies



Item	Quadrant	↑ Opportunity	↓ Threat
LONGi	Critical	New efficiency bar	China tech lead
OxfordPV	Opp.	EU market entry	Competition intensifies
JapanPol	Critical	New market access	Shift in supply
ChinaLg	Threat	—	China scale lead
$73B	Opp.	Massive market	Intense competition
SolventF	Opp.	Sustainable prod	—
USSpace	Opp.	Niche market	—

BIPV/EV	Critical	New applications	Asian lead

Deep Dive ① — LONGi Sets New Tandem Efficiency Record

#19 | 2026/08/31 | LONGi (Official News) | Tech Novelty●●●●● Proximity●●●○○ Market Impact●●●●● Data Reliability●●●●○ US/EU Relevance●●●●○

LONGi, a global solar leader, announced a new world record of 35.5% power conversion efficiency for its 2-terminal perovskite-silicon tandem solar cell, independently certified by ESTI. This breakthrough surpasses previous records and highlights the potential of tandem cell technology to redefine solar power generation standards.

The achievement is attributed to enhanced quasi-Fermi level splitting in the perovskite layer through effective defect passivation at buried interfaces, leading to an impressive open-circuit voltage of 2V. LONGi is also investing in a 100 MW pilot production line, signaling a strong push towards mass production.

▶ Strategic Analyst's Perspective

Strategic Analyst's Perspective: LONGi's 35.5% efficiency is a significant technical benchmark, pushing the theoretical limits of solar conversion. While a lab record, LONGi's commitment to a 100 MW pilot line suggests rapid industrialization. [Opportunity] for US/EU technology licensors to partner for advanced passivation techniques. [Threat] for US/EU OEMs as China solidifies its lead in high-efficiency PV. Next actions: [R&D;] benchmark against LONGi's reported Voc and defect passivation methods by end-Q4; [Strategy] evaluate potential IP licensing or joint development opportunities with non-Chinese partners by Q1 2027.

Deep Dive ② — Oxford PV Achieves 26.6% Large Module Record

#04 | 2026/08/27 | Solar Power Portal | Tech Novelty●●●●○ Proximity●●●●○ Market Impact●●●●○ Data Reliability●●●●○ US/EU Relevance●●●●●

Oxford PV, in collaboration with Germany's Sunmaxx, achieved a world record 26.6% efficiency for a large-area (over 1.6 m²) 60-cell, double-glass perovskite-silicon tandem module, certified by Fraunhofer ISE. This positions the module as ideal for residential applications, indicating imminent market entry.

This milestone demonstrates that high efficiencies are now achievable at commercially relevant scales, addressing a key hurdle for perovskite technology. Oxford PV is actively pursuing commercialization, promising higher power output from smaller footprints and optimized installation costs for residential solar.

▶ Strategic Analyst's Perspective

Strategic Analyst's Perspective: Oxford PV's achievement is highly realistic, given their long-standing leadership and Fraunhofer's certification. The focus on large-area residential modules signals a direct path to market. Technical barriers remain in long-term outdoor stability and cost-effective mass production at scale. [Opportunity] for US/EU OEMs to integrate these high-efficiency modules, and for materials suppliers to provide stable encapsulation solutions. [Threat] for traditional silicon module manufacturers as perovskite tandems offer superior performance per footprint. Next actions: [Procurement] engage with Oxford PV for sample evaluation and supply chain discussions by Q4; [Business Dev] explore residential market partnerships for high-efficiency installations by Q1 2027.

Deep Dive ③ — Japan's Aggressive Perovskite Policy Shift

#07 | 2026/08/31 | Perovskite-Info | Tech Novelty●●○○○ Proximity●●●●● Market Impact●●●●● Data Reliability●●●●○ US/EU Relevance●●●●○

Japan's Ministry of the Environment plans to eliminate new installation subsidies for conventional silicon solar panels from FY2027, while quadrupling support for perovskite solar cells to JPY 28 billion. This aims to foster a domestic perovskite supply chain and achieve 20 GW deployment by 2040.

This strategic policy shift, including subsidies for Sekisui Chemical's JPY 315 billion manufacturing investment, reflects Japan's strong commitment to establishing international competitiveness and reducing reliance on China in electrification, leveraging its domestic iodine supply.

▶ Strategic Analyst's Perspective

Strategic Analyst's Perspective: This policy shift is a clear, aggressive move by Japan to establish leadership in next-gen solar, driven by both economic and geopolitical motives. The numbers are concrete and backed by government action. [Opportunity] for US/EU materials & component suppliers to engage with Japanese manufacturers like Sekisui Chemical for new supply chain opportunities. [Threat] for US/EU silicon PV manufacturers losing access to the Japanese market and facing increased competition from Japanese perovskite exports. Next actions: [Strategy] conduct a comprehensive market analysis of Japan's new solar policy and its impact on global supply chains by end-Q4; [Business Dev] initiate dialogues with Japanese perovskite players to understand collaboration potential by Q1 2027.

Other Notable Articles

Kyoto University Spinoff EneCoat Achieves Over 30% Tandem Cell Efficiency with Toyota, Aims for 200-300 MW Production by 2030 (Perovskite-Info)
TN●●●●○ P●●●●○ MI●●●●○

Japanese firm EneCoat/Toyota targets 30%+ efficiency and 200-300MW production by 2030, leveraging roll-to-roll tech.

Korean KIER Achieves World-Record 26.7% Efficiency in Perovskite/CIGS Tandem Solar Cells (EurekAlert!)
TN●●●●○ P●●○○○ MI●●●●○

KIER's 26.7% Perovskite/CIGS tandem record opens new high-efficiency pathways beyond silicon, but scale-up is key.

Roll-Coated Flexible Perovskite Solar Cells Achieve 21% Efficiency with Atmospheric Processing: A Fully Scalable Manufacturing Route (The Royal Society of Chemistry)
TN●●●●○ P●●○○○ MI●●●○○

UK research demonstrates scalable, low-temp, atmospheric roll-coating for flexible 21% perovskite cells, crucial for mass production.

Highly Efficient and Stable Perovskite/Silicon Tandem Solar Cells Achieve 32.66% Efficiency and 91% Output Retention After 1000 Hours via Surface-Initiated Gradient Doping (Energy & Environmental Science)
TN●●●●○ P●●○○○ MI●●●●○

New doping strategy yields 32.66% efficiency and 1000h stability in tandem cells, addressing key degradation issues.

GCL Perovskite and Wuhan Lingyun Partner for Joint Development of BIPV Curtain Walls and PV Windows (Perovskite-Info)
TN●●○○○ P●●●●○ MI●●●●○

Chinese partnership targets BIPV curtain walls and PV windows, accelerating perovskite integration into construction.

Recommended Actions This Week

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

Immediate (this week)

- [Executive] Review strategic implications of Japan's policy shift on global solar market and supply chains.
- [R&D;] Initiate competitive analysis of LONGi's 35.5% efficiency and China's 5000h stability data for tandem cells.
- [Procurement] Assess current and future supply chain exposure to Asian perovskite manufacturing advancements.

Short-term (1 month)

- [R&D;] Evaluate solvent-free manufacturing processes (Germany) for environmental and cost benefits in future product development.
- [Business Dev] Engage with Oxford PV and other EU perovskite leaders to explore partnership or licensing opportunities for commercial modules.
- [Strategy] Begin scenario planning for perovskite market entry into BIPV, EV, and space applications, identifying key technological gaps.

Medium-long term (quarter+)

- [Legal/IP] Develop an updated IP strategy for perovskite technologies, focusing on stability, scalability, and niche applications.
- [R&D;] Invest in long-term stability research (e.g., 10-15 year lifespan, lead-free options) to meet industry standards and expand market acceptance.
- [Executive] Formulate a comprehensive market entry strategy for perovskite solar cells, considering regional policies and competitive landscapes, targeting the $73B market by 2035.

PerovskiteSolarCells — Selected Articles

Date: 2026-09-06

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#01 German Researchers Achieve 27.1% Efficiency and 6800-Hour Stability with Solvent-Free Perovskite-Silicon Tandem Solar Cell

Published August 28, 2026 PV Magazine Germany

OVERVIEW

A team from the University of Freiburg and Fraunhofer ISE in Germany has developed a fully solvent-free perovskite-silicon tandem solar cell achieving a 27.1% power conversion efficiency. This innovative and scalable sequential evaporation method demonstrated remarkable stability, retaining 97.06% of its initial efficiency after 6800 hours of dark storage under nitrogen. This breakthrough significantly advances the potential for industrial-scale, high-throughput production of perovskite solar cells, addressing critical environmental and cost challenges.

IN DEPTH

Key Findings

Researchers from the University of Freiburg and Fraunhofer Institute for Solar Energy Systems (ISE) in Germany have reported a significant advancement in perovskite-silicon tandem solar cell technology, achieving a power conversion efficiency of 27.1% using a completely solvent-free manufacturing process. This innovative approach also demonstrated exceptional long-term stability, maintaining 97.06% of its initial efficiency after 6800 hours of dark storage in a nitrogen atmosphere.

Technical Details

- **Conversion Efficiency:** The tandem cell achieved a certified power conversion efficiency of 27.1%.
- **Manufacturing Process:** The key innovation lies in the fully solvent-free sequential evaporation method. This technique eliminates the use of organic solvents during perovskite layer formation, which not only reduces environmental impact but also simplifies the manufacturing process and potentially lowers production costs.
- **Stability:** A major challenge for perovskite solar cells has been their long-term stability. This study addresses that by demonstrating impressive stability, with the cell retaining over 97% of its original efficiency after prolonged dark storage. This level of stability is crucial for commercial viability.
- **Scalability:** The research team emphasized that this solvent-free sequential evaporation approach is inherently scalable and suitable for high-throughput industrial production, marking a critical step toward mass manufacturing.

Background & Context

Perovskite solar cells are widely recognized as a promising next-generation photovoltaic technology due due to their high power conversion efficiency and low manufacturing costs. Tandem structures, combining perovskite with conventional silicon cells, offer the potential to surpass the theoretical efficiency limits of single-junction cells. However, issues related to perovskite material stability and scalability in large-scale production have been persistent barriers to commercialization. This German research tackles these fundamental hurdles directly.

Strategic Significance & Outlook

The development of a solvent-free manufacturing method coupled with enhanced stability is a game-changer for the industrialization of perovskite-silicon tandem solar cells. This eco-friendly and cost-effective production pathway is expected to significantly accelerate the adoption of solar power, playing a vital role in the global energy transition. Future work will focus on further increasing efficiency and validating the long-term performance under real-world outdoor conditions to pave the way for widespread deployment.

Source: https://www.pv-magazine.com/2026/08/28/solvent-free-perovskite-silicon-tandem-solar-cell-achieves-27-3-efficiency/

Collected: September 04, 2026 | Automated Research System (Gemini API)

#02 Chinese Team Achieves 24.0% World Record Efficiency in Large-Area 810 cm^2 Perovskite Solar Module

Published September 03, 2026 The Cooldown China

OVERVIEW

A research team from Nanjing University and Renshine Solar in China has set a new world record for large-area perovskite solar modules, achieving a certified efficiency of 24.0% on an 810 cm^2 module. Verified by TÜV SÜD, this breakthrough was enabled by combining high-saturated-vapor-pressure (SVP) processing with chemically stable lead carboxylate passivators (LCPs), which improve charge carrier transport while enhancing durability. This achievement significantly advances the commercial viability of perovskite technology for large-scale applications.

IN DEPTH

Key Findings

A collaborative research effort between Nanjing University and perovskite specialist Renshine Solar in China has established a new world record for large-area perovskite solar modules. The team achieved a certified power conversion efficiency of 24.0% on an 810 square centimeter module, a significant milestone verified by the international certification body TÜV SÜD.

Technical Details

- **Record Efficiency:** The 24.0% efficiency on an 810 cm^2 module surpasses previous records for large-area perovskite devices, addressing a key challenge of efficiency loss when scaling from small-area research cells.
- **Certification:** The record was officially certified by TÜV SÜD, lending strong credibility to the achievement and its implications for commercialization.
- **Core Technology:** The breakthrough relies on a sophisticated passivation strategy centered around chemically stable lead carboxylate passivators (LCPs), integrated with high-saturated-vapor-pressure (SVP) processing. This combination improves the transport of charge carriers within the device.
- **Enhanced Durability:** A critical advantage of the LCPs is their ability to enhance stability, mitigating degradation issues commonly observed with traditional passivating agents, thereby improving the long-term performance and reliability of the module.

Background & Context

Perovskite solar cells are hailed as a leading next-generation photovoltaic technology due to their high power conversion efficiencies and low potential manufacturing costs. However, translating high laboratory-scale efficiencies to large-area modules with sufficient long-term stability has been a persistent hurdle for commercial deployment. This Chinese research directly addresses these crucial scale-up and durability challenges.

Strategic Significance & Outlook

The achievement of 24.0% efficiency on a large-area perovskite module provides a strong impetus for the industrialization of this technology. By demonstrating both high efficiency and improved durability at a commercially relevant scale, this research paves the way for perovskite solar cells to compete with, or complement, conventional silicon panels in a wide range of applications, from residential rooftops to utility-scale solar farms. This milestone suggests accelerated market entry for perovskite modules in the coming years.

Source: https://www.thecooldown.com/green-tech/chinese-researchers-perovskite-solar-module-efficiency/

Collected: September 04, 2026 | Automated Research System (Gemini API)

#03 Australian Manufacturer Partners with University of Sydney to Plan 500MW Perovskite-Silicon Tandem Solar Module Factory

Published September 01, 2026 pv magazine Global Australia

OVERVIEW

An Australian manufacturer, in collaboration with researchers from the University of Sydney, is planning to construct a 500 MW perovskite-silicon tandem solar module factory. This ambitious project, backed by a A$7.25 million federal government grant from the Australian Renewable Energy Agency (ARENA), aims to accelerate the commercialization of next-generation solar cell technology. This initiative positions Australia to become a key player in advanced photovoltaics, enhancing its renewable energy leadership and global competitiveness. Scaling manufacturing capacity is crucial for reducing costs and widespread adoption of perovskite technology.

IN DEPTH

Key Findings

A leading Australian manufacturer has announced plans to build a 500 MW perovskite-silicon tandem solar module factory, collaborating closely with researchers from the University of Sydney. This significant industrialization effort is supported by a A$7.25 million federal government grant from the Australian Renewable Energy Agency (ARENA), underscoring a national commitment to accelerate the commercialization of cutting-edge solar technologies.

Technical Details

The planned factory will focus on producing perovskite-silicon tandem solar modules, which integrate the high-efficiency potential of perovskite technology with established silicon solar cells. This hybrid approach aims to surpass the theoretical efficiency limits of single-junction silicon cells, offering a pathway to significantly higher power conversion rates. While specific manufacturing techniques were not detailed in the report, the project's objective is to transition laboratory-scale perovskite advancements into industrial-scale mass production. The ARENA funding will likely be allocated towards initial capital expenditure, research and development, and optimization of the manufacturing processes to ensure efficiency and cost-effectiveness at scale.

Background & Context

As the global transition to renewable energy accelerates, nations are intensifying efforts to innovate solar photovoltaic technology and bolster domestic manufacturing capabilities. Australia, with its abundant solar resources, is keen to leverage next-generation solar cells to meet its ambitious clean energy targets and establish a competitive edge in the global market. Perovskite solar cells are particularly attractive due to their lightweight, flexible, and high-efficiency potential, enabling applications beyond traditional silicon panels, such as building-integrated photovoltaics (BIPV) or deployment in structurally sensitive locations. This factory initiative is poised to enhance Australia's solar industry competitiveness and secure its position within the global renewable energy supply chain.

Strategic Significance & Outlook

The construction of a 500 MW manufacturing facility is expected to dramatically reduce the cost of perovskite-silicon tandem solar modules and accelerate their market entry. This will make high-efficiency solar power more accessible and affordable, contributing significantly to Australia's renewable energy deployment goals. Furthermore, this endeavor will elevate Australia's profile in the international solar technology development race. Beyond energy production, the factory is anticipated to create jobs, stimulate economic growth, and foster a robust domestic renewable energy sector, solidifying Australia's commitment to a sustainable future.

Source: https://www.pv-magazine.com/2026/09/01/researchers-team-with-queensland-manufacturer-to-drive-perovskite-silicon-tandem-solar-cell-development/

Collected: September 04, 2026 | Automated Research System (Gemini API)

#04 Oxford PV and Sunmaxx Achieve 26.6% World Record Efficiency for Large Perovskite-Silicon Tandem Solar Module

Published August 27, 2026 Solar Power Portal UK, Germany

OVERVIEW

Oxford PV, in collaboration with Germany's Sunmaxx, has achieved a world record power conversion efficiency of 26.6% for a large-area 60-cell, double-glass perovskite-silicon tandem module exceeding 1.6 square meters. This efficiency, independently certified by Fraunhofer ISE's PV calibration laboratory, positions the module as ideal for residential applications. Oxford PV is actively pursuing the commercialization of this high-efficiency technology, indicating imminent market entry for perovskite solar cells that promise higher power output from smaller footprints and optimized installation costs.

IN DEPTH

Key Findings

Oxford PV, a leading perovskite technology company based in the UK, in collaboration with German partner Sunmaxx, has announced a new world record for the power conversion efficiency of a large-area perovskite-silicon tandem solar module. The module, a 60-cell double-glass unit exceeding 1.6 square meters, achieved an impressive 26.6% efficiency, a feat independently certified by Fraunhofer ISE's PV calibration laboratory in Germany.

Technical Details

- **Record Efficiency:** The 26.6% efficiency is a significant benchmark, particularly because it was achieved on a large-area module suitable for practical applications, rather than small-scale laboratory cells.
- **Module Specifications:** The module consists of 60 cells in a double-glass configuration, covering an area greater than 1.6 square meters. This size is deemed ideal for residential installations, indicating direct relevance to mass market deployment.
- **Certification:** Validation by the Fraunhofer ISE PV calibration laboratory, a highly respected and independent institution, lends strong credibility to the reported efficiency figure.
- **Perovskite-Silicon Tandem Technology:** The core of this achievement is Oxford PV's advanced perovskite-silicon tandem technology. This architecture layers a perovskite solar cell atop a conventional silicon cell, enabling the capture of a broader spectrum of sunlight and thereby exceeding the theoretical efficiency limits of single-junction solar cells.

Background & Context

The global solar energy sector is witnessing increasing demand for high-efficiency technologies that can generate more power from limited installation areas. Perovskite solar cells are at the forefront of this innovation, promising high theoretical efficiencies and potentially lower manufacturing costs compared to traditional silicon cells. Tandem cells, which combine perovskites with silicon, are particularly promising for breaking current efficiency ceilings, driving intense competition among research institutions and companies worldwide. Oxford PV has been a pioneer and leader in this field for many years.

Strategic Significance & Outlook

With this world record, Oxford PV aims to accelerate the transition of its high-efficiency technology towards commercial utilization. The market introduction of these modules could substantially increase the power output of residential solar systems, enabling greater clean energy generation even in space-constrained environments. Furthermore, this development is expected to contribute to a reduction in the levelized cost of electricity (LCOE) from solar power, serving as a crucial milestone in promoting the broader adoption of renewable energy globally.

Source: #

#05 Perovskite Connect 2026 Conference Preview: Showcasing Manufacturing Technologies and Applications to Accelerate Perovskite Solar Cell Commercialization

Published September 02, 2026 Perovskite-Info Germany

OVERVIEW

The preview for the Perovskite Connect 2026 conference in Berlin highlights the latest advancements in testing, reliability, sustainability, and manufacturing processes aimed at commercializing perovskite solar cells. CubicPV will unveil a multi-factor accelerated stress testing approach for reliability, while Germany's ZSW will present an industrial-scale recycling process capable of recovering over 96% of perovskite materials. Additionally, Energy Material Corp will showcase high-speed roll-to-roll production, WonderSolar a fully printable all-wet process, and UniJet inkjet printing technology, all demonstrating pathways to large-scale manufacturing. This conference serves as a critical platform covering the current status and future outlook of perovskite industrialization.

IN DEPTH

Key Findings

The preview for the "Perovskite Connect 2026" conference, scheduled for October 21-22 in Berlin, reveals significant breakthroughs in manufacturing processes, testing, reliability, and sustainability aimed at accelerating the commercialization of perovskite solar cells. Numerous companies and research institutions are slated to present concrete technologies and strategies for mass production.

Technical Details

- **Manufacturing Technology Innovations:**
  - **Energy Material Corp:** Will present high-speed roll-to-roll production technology, enabling efficient large-area deposition of perovskite materials.
  - **WonderSolar:** Has developed a fully printable all-wet process for mesoscopic modules at a 400 MW scale, promising reduced manufacturing costs and enhanced scalability.
  - **UniJet:** Will showcase inkjet printing technology applicable to multiple functional layers, allowing for precise and efficient fabrication.
  - **Other advancements:** Companies like Power Roll, Kalpana Systems, and Bergfeld Lasertech will introduce advanced technologies such as ITO-free architectures, spatial ALD platforms, and multi-wavelength laser scribing, all designed to address challenges in large-scale production.
- **Reliability and Sustainability:**
  - **CubicPV:** Is set to unveil a multi-factor accelerated stress testing approach for evaluating the reliability of perovskite solar cells, which is crucial for ensuring long-term product performance.
  - **Germany's ZSW:** Has developed an industrial-scale recycling process capable of recovering over 96% of perovskite materials, contributing to reduced environmental impact and the establishment of a sustainable supply chain.

Background & Context

Perovskite solar cells hold immense promise as a next-generation photovoltaic technology due to their high efficiency and potential for low-cost production. However, their commercialization has been hindered by challenges related to manufacturing scalability, long-term reliability, and environmental sustainability. The technologies to be presented at this conference directly address these issues, providing tangible solutions to bridge the gap between laboratory breakthroughs and market-ready products.

Strategic Significance & Outlook

Perovskite Connect 2026 serves as a global platform where experts from the perovskite industry converge to discuss a wide range of topics, including materials, inks, manufacturing processes, commercialization strategies, PV applications, and LEDs. The innovative technologies and strategies to be presented are expected to significantly accelerate the mass production and market entry of perovskite solar cells, expanding their role in the global energy mix. The strong emphasis on sustainability and reliability will be a critical factor for investors and policymakers, driving overall industry growth.

Source: https://www.perovskite-info.com/glimpse-perovskite-connect-2026-equipment-processes-and-applications-taking

Collected: September 04, 2026 | Automated Research System (Gemini API)

#06 Kyoto University Spinoff EneCoat Achieves Over 30% Tandem Cell Efficiency with Toyota, Aims for 200-300 MW Production by 2030

Published August 28, 2026 Perovskite-Info Japan

OVERVIEW

EneCoat Technologies, a Kyoto University spinoff, has achieved over 30% power conversion efficiency in perovskite/silicon 4-terminal tandem cells in collaboration with Toyota Motor Corporation. The company plans to establish an annual production capacity of 200-300 MW by 2030, utilizing low-temperature roll-to-roll technology for uniform thin-film manufacturing. Having raised nearly JPY 20 billion and receiving subsidies from Japan's METI, EneCoat is aggressively pushing for the commercialization of perovskite solar cells. This dual achievement of high efficiency and scalable production technology is critical for Japan's leadership in the next-generation solar market.

IN DEPTH

Key Findings

EneCoat Technologies, a startup spun off from Kyoto University, has announced a significant breakthrough in perovskite solar cell development: achieving over 30% power conversion efficiency in perovskite/silicon 4-terminal tandem cells through a joint development effort with Toyota Motor Corporation. Furthermore, the company aims to establish an annual production capacity of 200-300 MW by 2030, leveraging low-temperature roll-to-roll technology for uniform thin-film manufacturing.

Technical Details

- **Conversion Efficiency:** The collaboration with Toyota has resulted in a perovskite/silicon 4-terminal tandem cell exceeding 30% efficiency. This level of performance has the potential to redefine solar power generation standards, pushing past the conventional limits of single-junction silicon cells.
- **Manufacturing Technology:** EneCoat is focusing on a low-temperature roll-to-roll coating process for manufacturing uniform perovskite thin films. This technology is crucial for achieving cost-effective, large-scale production while reducing the energy consumption associated with manufacturing.
- **Production Capacity Goal:** The target of 200-300 MW annual production capacity by 2030 outlines a clear roadmap for the full-scale commercialization of perovskite solar cells.
- **Funding and Support:** The company has successfully secured nearly JPY 20 billion (approximately $127 million USD) from investors and receives subsidies from Japan's Ministry of Economy, Trade and Industry (METI), alongside Panasonic and Ricoh. This substantial financial backing underscores confidence in EneCoat's technology and business model, as well as robust national support.

Background & Context

The Japanese government is actively promoting the acceleration of renewable energy adoption and strengthening the competitiveness of its domestic industry by providing enhanced support for next-generation solar cell technologies, particularly perovskites. EneCoat Technologies' initiatives align perfectly with this national strategy, with their high-efficiency and mass production technologies expected to significantly contribute to Japan's energy self-sufficiency and international environmental goals. The partnership with Toyota further highlights potential applications in the automotive sector and broader integration within industrial supply chains.

Strategic Significance & Outlook

Should EneCoat Technologies achieve its planned 200-300 MW production capacity, it would mark the full-scale market entry of perovskite solar cells, accelerating their adoption in a wide array of applications such as building-integrated photovoltaics (BIPV), power sources for IoT devices, and flexible, lightweight power generation solutions. This technology holds the promise of creating new markets while leveraging existing infrastructure, playing a crucial role in deploying Japan's clean energy innovations globally.

Source: https://www.perovskite-info.com/enecoat

Collected: September 04, 2026 | Automated Research System (Gemini API)

#07 Japan Quadruples Perovskite Solar Cell Support to JPY 28 Billion for FY2027, Ending Silicon Subsidies

Published August 31, 2026 Perovskite-Info Japan

OVERVIEW

Japan's Ministry of the Environment plans to eliminate new installation subsidies for conventional silicon solar panels starting in fiscal year 2027, while significantly increasing support for perovskite solar cells fourfold from JPY 7 billion to JPY 28 billion. This strategic policy shift aims to foster a domestic perovskite supply chain and achieve Japan's goal of 20 GW perovskite deployment by 2040. Notably, Sekisui Chemical's JPY 315 billion perovskite manufacturing investment is also subsidized by the GX Supply Chain Support Program, signaling Japan's strong commitment to establishing international competitiveness in next-generation solar technology.

IN DEPTH

Key Findings

Japan's Ministry of the Environment has announced a decisive policy change, phasing out new installation subsidies for conventional silicon solar panels starting in fiscal year 2027. Concurrently, support for next-generation perovskite solar cells will be dramatically increased by approximately fourfold, from JPY 7 billion in FY2026 to JPY 28 billion (approximately $178 million USD). This strategic reallocation of funds is designed to bolster the domestic perovskite supply chain and vigorously support Japan's ambitious target of deploying 20 GW of perovskite solar cells by 2040.

Technical Details

The policy specifically targets the unique properties of perovskite solar cells—their lightweight, thin, and flexible nature—which enable installation in diverse locations previously unsuitable for rigid silicon panels, such as building facades, roofs with structural load limits, and curved surfaces. The increased funding will be allocated to perovskite research and development, investment in manufacturing facilities, and demonstration projects, accelerating the entire process from technological innovation to market deployment. A concrete example of this strategy is the significant investment by Sekisui Chemical in a JPY 315 billion (approximately $2 billion USD) perovskite manufacturing line, which is being subsidized by the government's Green Transformation (GX) Supply Chain Support Program.

Background & Context

Japan is pursuing a national strategy to accelerate the adoption of renewable energy and enhance the competitiveness of its domestic industries to achieve energy self-sufficiency and a decarbonized society. However, the solar photovoltaic sector has been dominated by Chinese manufacturers globally, making the strengthening of domestic industrial competitiveness an urgent priority. Perovskite solar cells are particularly advantageous for establishing a domestic supply chain, partly because Japan is a major producer of iodine, a key component in many perovskite formulations. This subsidy policy, therefore, is not merely technical support but also reflects Japan's strong geopolitical desire to reduce dependence on China in electrification and establish technological superiority.

Strategic Significance & Outlook

This concentrated support for perovskite solar cells is expected to bring about a significant transformation in Japan's photovoltaic industry. The objective is to build a gigawatt-class domestic production system by 2030, enhancing global competitiveness. The widespread adoption of lightweight and flexible film-type perovskites will increase design freedom in buildings, leading to the creation of new building-integrated photovoltaics (BIPV) markets. With robust government backing, perovskite solar cells are anticipated to accelerate their diffusion as an indispensable technology for Japan's energy security and the realization of a sustainable society.

Source: https://www.perovskite-info.com/japan-end-silicon-solar-panel-subsidies-quadruple-perovskite-support-fy2027

Collected: September 04, 2026 | Automated Research System (Gemini API)

#08 US and Japan Move to Curb China's Influence in Electrification: Japan Prioritizes Next-Gen Perovskite Solar Cells

Published August 30, 2026 Seoul Economic Daily South Korea

OVERVIEW

The Seoul Economic Daily reports that the US and Japan are taking steps to counter China's influence in the electrification sector. Japan, in particular, plans to discontinue subsidies for conventional silicon solar cells from FY2027 and significantly increase support for perovskite solar cells. This strategic shift focuses on next-generation solar technology—lightweight, thin, and flexible—to enable installation on building walls and roofs, maximizing spatial efficiency. This move aims to establish technological superiority and diversify supply chains, thereby enhancing geopolitical competitiveness.

IN DEPTH

Key Findings

According to a report by the Seoul Economic Daily, the United States and Japan are intensifying their collaboration to counter China's growing influence in the electrification sector. As part of this broader strategy, the Japanese government is set to discontinue subsidies for conventional silicon solar cells and significantly ramp up support for next-generation perovskite solar cell technology. This strategic reorientation aims to reduce over-reliance on a single country for energy technology supply chains and enhance international competitiveness through technological innovation.

Technical Details

Japan's focused support for perovskite solar cells stems from their unique characteristics: they are lightweight, thin, and flexible, unlike traditional silicon-based panels. These properties make it possible to integrate them easily into locations where solar panel installation has previously been challenging, such as building facades, curved roofs, and infrastructure with load limitations. This is expected to maximize power generation efficiency in confined spaces and accelerate the adoption of renewable energy in urban areas. While detailed technical specifications or manufacturing processes are not provided, the fact that Japan is a major producer of iodine, a key component in many perovskite materials, suggests an advantage in domestic sourcing for perovskite production.

Background & Context

China currently holds a dominant share in global production capacity and supply chains for electrification technologies, particularly in solar photovoltaics and battery manufacturing. Both the United States and Japan view this reliance on China as a source of economic and strategic vulnerability. Consequently, they are advocating for joint development of alternative technologies and the establishment of diversified supply chains among friendly nations. Japan's substantial investment in perovskite technology is an integral part of this comprehensive strategy, carrying geopolitical implications beyond mere environmental policy. Early investment and cultivation of next-generation technologies are deemed crucial for future technological leadership.

Strategic Significance & Outlook

The coordinated strategy by the US and Japan to counter China's dominance in electrification is expected to have a profound impact on the global energy technology market. Japan's strong support for perovskite solar cells, in particular, has the potential to accelerate the commercialization and widespread adoption of this technology, thereby creating new markets. In the long term, this initiative is likely to foster supply chain diversification and contribute to building a more resilient global energy system. Through international technological cooperation and investment, next-generation clean energy technologies are anticipated to be deployed more rapidly into society.

Source: #

#09 Perovskite Solar Industry Leaders Accelerate Production: LONGi Achieves 35.5% Efficiency Record, Sekisui Chemical and Tandem PV Boost Manufacturing Investment

Published September 01, 2026 Exoswan Insights Global

OVERVIEW

The perovskite solar sector is transitioning from laboratory records to industrial production, with key players accelerating investments. LONGi achieved a 35.5% world-record efficiency for crystalline silicon-perovskite tandem cells and invested in a 100 MW tandem pilot line. Tandem PV secured a $7.7 million DOE grant to accelerate commercial-scale production. Sekisui Chemical invested JPY 90 billion ($570 million) in a 100 MW roll-to-roll line and launched its 'SOLAFIL' film product for BIPV applications, backed by over JPY 150 billion in Japanese government subsidies. These initiatives are powerfully driving industry growth and commercialization.

IN DEPTH

Key Findings

The perovskite solar cell industry is actively transitioning from achieving high-efficiency records in laboratories to full-scale industrial production. Leading players such as LONGi, Tandem PV, and Sekisui Chemical are driving this transformation through distinctive technological innovations and substantial capital investments. These strategic moves strongly underscore the commercial viability and imminent market readiness of perovskite technology.

Technical Details

- **LONGi's Efficiency Record and Investment:** LONGi, a global leader in solar technology, has achieved a world-record power conversion efficiency of 35.5% for a crystalline silicon-perovskite tandem cell. Demonstrating its commitment to commercialization, the company has further invested approximately 204 million yuan (around $30 million USD) to construct a 100 MW tandem pilot production line, aiming to solidify its mass production technology.
- **Tandem PV Accelerates Commercialization:** U.S.-based Tandem PV has received a $7.7 million grant from the U.S. Department of Energy (DOE) to accelerate the commercial-scale production of its perovskite-silicon tandem solar cells. This funding will be instrumental in expanding its manufacturing capacity and advancing product development.
- **Sekisui Chemical Enters BIPV Market:** Sekisui Chemical has invested JPY 90 billion (approximately $570 million USD) to establish a 100 MW roll-to-roll manufacturing line and has launched 'SOLAFIL', its film-type perovskite product designed for building-integrated photovoltaics (BIPV) applications. This significant investment is also supported by over JPY 150 billion in Japanese government subsidies, vigorously promoting the widespread adoption of lightweight and flexible solar cells.

Background & Context

Perovskite solar cells are widely recognized as a promising next-generation technology poised to overcome the limitations of conventional silicon solar cells, owing to their high conversion efficiency, low manufacturing costs, lightweight nature, and flexibility. However, challenges related to stability, scalability, and the establishment of mass production infrastructure have been significant hurdles for commercialization. Governments worldwide are accelerating investments in perovskite technology to achieve energy security and decarbonization goals, prompting companies to shift their strategies from pure R&D to production and market entry.

Strategic Significance & Outlook

The actions of these key industry players suggest that perovskite solar cells are on the cusp of entering a full-fledged market competition phase. The entry of established giants like LONGi is expected to rapidly expand the credibility and market size for perovskite technology. Specialized companies such as Tandem PV and Sekisui Chemical, bolstered by strong government support, are introducing products tailored for specific applications (e.g., BIPV), which will stimulate new market demand. Perovskite solar cells are thus poised to play an indispensable role in the global energy transition, fulfilling their promise as a transformative clean energy solution.

Source: https://exoswan.com/perovskite-stocks

#10 Perovskite-Silicon Tandem Solar Cells Accelerate Future of Solar Power with High Efficiency Breakthroughs

Published August 28, 2026 Medium USA

OVERVIEW

Perovskite solar cells are poised to revolutionize solar power due to their exceptional efficiency and potential for low manufacturing costs. Tandem cells, combining perovskite with silicon, are expected to significantly boost power generation beyond traditional silicon-only designs. Companies like Oxford PV are already beginning commercial shipments of these tandem cells, signaling accelerated practical adoption of the technology.

IN DEPTH

Key Findings

Perovskite solar cells are emerging as a major disruptor in the photovoltaic sector, primarily due to their remarkable power conversion efficiency and the potential for reduced manufacturing costs compared to traditional silicon-based technologies. Notably, perovskite-silicon tandem solar cells hold the promise of dramatically increasing energy yield, as their theoretical efficiency limits far surpass those of single-junction cells. The initiation of commercial shipments of these tandem cells by companies such as Oxford PV indicates a swift transition from laboratory research to practical application, accelerating the future of solar power.

Technical & Clinical Details

The core appeal of perovskite solar cells lies in their excellent light absorption properties and superior charge transport capabilities. By efficiently utilizing different parts of the solar spectrum, particularly in multi-junction configurations like perovskite-silicon tandems, significant efficiency gains are anticipated. Theoretically, tandem solar cells can exceed the ~29% efficiency limit of single-junction silicon cells, with predictions of achieving over 35% power conversion efficiency. This is attributed to the perovskite layer absorbing shorter-wavelength light, while the silicon layer captures longer wavelengths, enabling more comprehensive utilization of the solar spectrum. Furthermore, the technology's potential for thin-film and flexible designs enhances its applicability across diverse installation environments, from building-integrated photovoltaics (BIPV) to portable devices.

Background & Context

As global energy demand continues to rise and climate change mitigation becomes increasingly urgent, the significance of renewable energy sources, especially solar power, is paramount. While conventional silicon solar cells are a mature technology, there's a continuous drive to increase power generation per unit area. Perovskite solar cells, with their high efficiency and potential for low-cost manufacturing, represent a promising solution to this challenge. The intense research and development activity, coupled with commercialization efforts by companies like Oxford PV, suggest a narrowing gap between discovery and market deployment. This shift is poised to fundamentally alter the competitive landscape of the solar industry.

Strategic Significance & Outlook

The outlook for perovskite solar cell technology is exceptionally bright. Beyond continuous improvements in conversion efficiency, establishing long-term stability and scalable manufacturing techniques are critical next steps. Achieving a performance guarantee of over 25 years in outdoor environments, comparable to conventional silicon panels, is essential for ensuring robust reliability. As the technology matures, perovskite solar cells are expected to find widespread adoption in various applications, from residential and industrial settings to BIPV and flexible devices. This expansion will significantly accelerate the integration of renewable energy, contributing to a more sustainable global energy infrastructure.

Source: https://medium.com/@balanspen/perovskite-solar-panels-the-technology-that-could-transform-solar-power-5c5e8271cdb1

Collected: September 05, 2026 | Automated Research System (Gemini API)

#11 Perovskite Solar Cells Target 10-15 Year Operational Lifespan with Material Substitution and Multi-Layer Encapsulation for Enhanced Stability

Published August 31, 2026 Medium USA

OVERVIEW

Perovskite solar cells, despite high efficiencies, face long-term durability challenges regarding humidity, heat, and UV light. Researchers are advancing stability by substituting methylammonium cations with formamidinium or cesium and utilizing effective additives. Crucially, multi-layer encapsulation compliant with IEC 62788 is being implemented, with a current target of demonstrating 10-15 years of operational lifespan, comparable to conventional silicon panels.

IN DEPTH

Key Findings

Significant progress is being made on both chemical optimization at the material level and physical protection in device architecture to overcome the long-term durability issues, which represent one of the primary barriers to the widespread commercialization of perovskite solar cells. Specifically, the partial substitution of methylammonium cations with more stable formamidinium or cesium has enhanced the intrinsic robustness of the perovskite crystal structure. The adoption of multi-layer encapsulation techniques, compliant with international standards such as IEC 62788, further strengthens protection against external environmental factors like humidity, heat, and UV radiation, making the achievement of a 10-15 year demonstrated operational lifespan—comparable to the 25-30 year warranties of silicon panels—a realistic and imminent goal.

Technical & Clinical Details

The technical strategies for improving perovskite solar cell stability are diverse. From a materials science perspective, replacing some or all of the A-site cations (typically methylammonium) within the perovskite composition with thermally and chemically more stable formamidinium or cesium is highly effective. This increases the phase stability of the crystal structure and suppresses decomposition caused by heat and humidity. Furthermore, adding organic amines or polymers as additives to the perovskite precursor solution can control crystal growth and reduce defect density. In terms of device architecture, multi-layer encapsulation is paramount. Multi-layer barrier structures using glass or polymers, and encapsulants like epoxy resins, are employed to prevent the ingress of moisture and oxygen. These measures are validated through accelerated aging tests and long-term field trials, directly contributing to enhancing the reliability of future commercial products.

Background & Context

Perovskite solar cells have garnered significant attention as a next-generation photovoltaic technology due to their high power conversion efficiency and potential for low-cost manufacturing. However, the early devices' vulnerability to environmental factors has been a major obstacle to their commercialization. As conventional silicon solar cells have established decades of proven reliability, it is imperative for perovskites to demonstrate comparable long-term stability to gain market acceptance. Current research and development efforts are intensely focused on overcoming this stability challenge, with rapid advancements observed across material design, process optimization, and device encapsulation technologies. These advancements are expected to enable perovskite solar cells to achieve competitiveness in a broad market and contribute to the further proliferation of solar energy.

Strategic Significance & Outlook

Research into perovskite solar cell stability will be crucial for building sustainable energy systems. Achieving the current target of a 10–15 year demonstrated operational lifespan marks a significant milestone towards commercialization. Furthermore, efforts are intensifying to extend performance guarantees to over 25 years, matching the lifetime of silicon solar cells, while maintaining cost-effective manufacturing processes. Enhancing stability is particularly critical for applications that leverage perovskites' unique advantages, such as flexible devices, transparent solar cells, and building-integrated photovoltaics (BIPV). These technological advancements will enable perovskite solar cells to establish their position in the energy mix and play an indispensable role in achieving global decarbonization goals, driving us towards a more sustainable future.

Source: https://kec.rs/en/what-are-perovskite-solar/

Collected: September 05, 2026 | Automated Research System (Gemini API)

#12 Korean KIER Achieves World-Record 26.7% Efficiency in Perovskite/CIGS Tandem Solar Cells

Published September 02, 2026 EurekAlert! USA

OVERVIEW

The Korea Institute of Energy Research (KIER)'s Photovoltaic Research Department has achieved a world-record 26.7% conversion efficiency for a perovskite/CIGS (copper-indium-gallium-selenide) tandem solar cell, independently certified. This breakthrough was officially validated by Germany's Fraunhofer Institute for Solar Energy Systems (ISE) and listed on the U.S. Rockies National Laboratory's (formerly NREL) "Best Research-Cell Efficiencies Chart." This strongly indicates the potential for multi-junction solar cell technology to push the limits of energy conversion efficiency and become a dominant force in future solar power generation.

IN DEPTH

Key Findings

The Photovoltaic Research Department at the Korea Institute of Energy Research (KIER) has set a new world record in perovskite/CIGS tandem solar cell efficiency, achieving 26.7% power conversion, as independently certified by the Fraunhofer Institute for Solar Energy Systems (ISE) in Germany. This groundbreaking achievement is officially recognized on the "Best Research-Cell Efficiencies Chart" published by the U.S. Rockies National Laboratory (formerly NREL), underscoring the rapid evolution of perovskite technology and the significant synergistic potential when combined with established thin-film solar cells like CIGS.

Technical & Clinical Details

The 26.7% conversion efficiency was recorded on a small-area research cell, less than 1 cm^2. Perovskite/CIGS tandem solar cells offer similar advantages to perovskite-silicon tandem structures by efficiently absorbing different parts of the solar spectrum. CIGS solar cells are a proven thin-film technology known for high stability and power generation efficiency, already applied in industry. Combining them with perovskites allows for high-efficiency beyond the bandgap limitations of individual cells, leveraging the strengths of both technologies. The KIER research team achieved this high efficiency through advances in interface optimization and defect passivation techniques. This multi-junction architecture maximizes solar light utilization, enabling more power generation from a smaller installation footprint.

Background & Context

As the conversion efficiency of conventional single-junction solar cells approaches their physical limits, multi-junction (tandem) solar cells are gaining traction globally as the next generation of high-efficiency photovoltaics. Perovskites, with their tunable bandgap and excellent light absorption properties, are particularly promising as top cells in tandem configurations. CIGS solar cells, alongside amorphous silicon and CdTe, are a leading thin-film technology with established industrial applications. KIER's achievement demonstrates that tandem integration with various solar cell substrates beyond silicon opens new avenues for high-efficiency development. This expands the diverse application possibilities of perovskite technology and is expected to drive new competition and innovation across the entire solar power market.

Strategic Significance & Outlook

The KIER research team now aims to replicate this world-record conversion efficiency in large-area modules. Scaling up high efficiency from research cells to practical module sizes is always a significant challenge, but this success suggests that perovskite/CIGS tandem technology is nearing market introduction as a commercially competitive product. In the future, with sustained improvements in power conversion efficiency, cost-effective manufacturing processes, and long-term reliability, perovskite/CIGS tandem solar cells are poised to accelerate solar power adoption in diverse settings and significantly contribute to achieving a sustainable energy society. Particularly, their combination with flexible CIGS substrates holds promise for opening new markets, such as building-integrated photovoltaics (BIPV) and lightweight modules.

Source: https://www.eurekalert.org/news-releases/1142560

#13 Fraunhofer ISE and University of Freiburg Achieve 27.3% Efficiency with First Fully Solvent-Free Perovskite-Silicon Tandem Solar Cell

Published Published September 03, 2026 Perovskite-Info イスラエル

OVERVIEW

Researchers from Fraunhofer ISE and the University of Freiburg have achieved a record 27.3% peak power conversion efficiency (27.0% stabilized) with the first fully solvent-free manufactured perovskite-silicon tandem solar cell. This innovative fabrication utilizes thermal evaporation, offering an industrially compatible and environmentally clean pathway for perovskite film deposition. Notably, the device demonstrates exceptional long-term stability, retaining 97.06% of its initial efficiency after 6800 hours of dark storage in a nitrogen atmosphere.

IN DEPTH

Background

Perovskite solar cells have been widely heralded as a next-generation photovoltaic technology, primarily due to their high efficiency and potential for low-cost manufacturing. However, two significant hurdles to their commercialization have been the reliance on toxic solvents in their fabrication processes and the persistent challenge of ensuring long-term device stability. The solvents traditionally used in wet processing raise considerable concerns regarding environmental impact and safety in industrial settings. The development of a fully solvent-free manufacturing process represents a revolutionary approach to tackle these issues simultaneously, offering a critical pathway for perovskite solar cells to genuinely compete with, or complement, established technologies like conventional silicon solar cells in the energy market. Establishing environmentally friendly and scalable manufacturing techniques is indispensable for accelerating the widespread adoption of perovskite solar cells.

Key Findings

A collaborative research team, including the University of Freiburg and Fraunhofer ISE, has announced a groundbreaking achievement: a peak power conversion efficiency of 27.3% (stabilized at 27.0%) for a perovskite-silicon tandem solar cell fabricated entirely through a solvent-free process. This innovative approach utilizes thermal evaporation to deposit the perovskite layer, a significant departure from conventional wet processes like spin-coating that rely on toxic solvents.

Thermal evaporation, which involves the sublimation of materials in a vacuum and their subsequent deposition onto a substrate, entirely eliminates the need for solvents. This not only reduces environmental impact but also inherently enhances industrial compatibility. The method allows for precise control over film thickness and composition, resulting in high-quality, defect-free perovskite layers that contribute significantly to both high efficiency and long-term stability. This precision directly addresses key challenges of uniform film formation and scalability often associated with wet processing.

Crucially, the device demonstrated exceptional long-term stability, maintaining 97.06% of its initial efficiency after 6800 hours of dark storage under a nitrogen atmosphere. This remarkable performance retention is a major breakthrough, directly addressing the long-standing durability challenge that has historically hindered perovskite commercialization. The 27.3% efficiency, combined with this solvent-free manufacturing process and robust stability, significantly raises the technological benchmark for perovskite-silicon tandem solar cells.

This process holds considerable promise for industrial reproducibility and scalability, paving the way for larger-area module fabrication. Its solvent-free nature facilitates adoption even in regions with stringent environmental regulations, enhancing the sustainability of the entire supply chain. Furthermore, this high stability enables reliable long-term outdoor operation, decisively boosting the competitiveness of perovskite technology in the solar energy market and accelerating the transition to a sustainable society.

Source: https://www.perovskite-info.com/first-fully-solvent-free-perovskite-silicon-tandem-solar-cell-reaches-273

Collected: September 05, 2026 | Automated Research System (Gemini API)

#14 Novel Interfacial Engineering Achieves 21.34% Efficiency and Superior Defect Passivation in Inverted Perovskite Solar Cells

Published September 03, 2026 ACS Publications USA

OVERVIEW

A new interfacial engineering strategy has been developed to radically improve the performance of inverted perovskite solar cells (IPSCs) at the NiOX/perovskite interface. By incorporating phenethylammonium bromide (PEABr) into an aluminum oxide (Al2O3) matrix, a multifunctional composite interlayer was constructed, simultaneously enabling defect passivation and energy level alignment optimization. This innovative approach allowed IPSCs to achieve a peak power conversion efficiency of 21.34%, facilitating concurrent control over interfacial chemical defects and electronic properties.

IN DEPTH

Key Findings

A groundbreaking interfacial engineering strategy has been developed to significantly enhance the performance of inverted perovskite solar cells (IPSCs), specifically targeting the NiOX/perovskite interface. In this study, a multifunctional composite interlayer was meticulously constructed by incorporating phenethylammonium bromide (PEABr) into a mesoporous aluminum oxide (Al2O3) matrix. This interlayer concurrently achieved two critical functions: defect passivation and optimization of energy level alignment. As a result of this synergistic approach, IPSCs demonstrated a high power conversion efficiency of 21.34%, unequivocally proving the ability to precisely control both the chemical defects and electronic properties at the interface.

Technical & Clinical Details

The efficiency of IPSCs heavily relies on the quality of the interface between the electron transport layer (NiOX) and the perovskite active layer. Defects at this interface act as non-radiative recombination centers, significantly degrading device performance. The developed PEABr and Al2O3 composite interlayer effectively passivates defect sites by forming a quasi-2D/3D perovskite heterostructure at the interface with PEABr. The long-chain alkylammonium cation of PEABr passivates surface defects in the perovskite crystal (particularly uncoordinated lead ions and halide vacancies), suppressing non-radiative recombination of charge carriers. Simultaneously, the Al2O3 matrix optimizes electron transport pathways and improves energy level alignment, thereby enhancing charge extraction efficiency. This synergy strengthens the internal electric field and extends carrier lifetime, leading to improved open-circuit voltage (Voc) and fill factor (FF), ultimately achieving the high efficiency of 21.34%.

Background & Context

Research and development in perovskite solar cells are rapidly advancing in both efficiency and stability, yet controlling interfacial defects remains a critical determinant of device performance. Inverted IPSCs, in particular, attract attention due to specific advantages such as low-temperature processing and adaptability to flexible substrates, but interfacial defects with hole transport layers like NiOX have been a bottleneck for efficiency improvement. The multifunctional composite interlayer proposed in this study offers an effective solution to this interfacial problem, providing new design guidelines for enhancing the overall efficiency and reliability of perovskite solar cells. This marks a crucial step in accelerating the commercialization of next-generation solar cells.

Strategic Significance & Outlook

This interfacial engineering strategy paves a significant path for further performance enhancement and long-term stability assurance in IPSCs. In the future, by further optimizing the composition and structure of this composite interlayer, achieving conversion efficiencies of 25% or more becomes a tangible goal. This technology is also compatible with large-scale production processes; combining it with manufacturing techniques such as slot-die coating and inkjet printing could expand the potential for low-cost, high-efficiency IPSC manufacturing. The evolution of interfacial control technology is expected to boost the commercial competitiveness of perovskite solar cells and accelerate their application in diverse fields, including building-integrated photovoltaics (BIPV), flexible electronics, and transparent solar cells. This research lays an important foundation for perovskite solar cells to realize their full potential as a sustainable energy source.

Source: https://pubs.acs.org/aamick/article/doi/10.1021/acsami.6c13869/5399041/Defect-Passivation-of-Mesoporous-Al2O3-Based

#15 Japan to Quadruple Perovskite Solar Cell Support to ¥28 Billion in FY2027, Phasing Out Silicon Subsidies to Boost Decarbonization

Published August 31, 2026 Perovskite-Info Japan

OVERVIEW

The Japanese government announced plans to discontinue purchase subsidies for conventional silicon solar panels from FY2027, drastically increasing support for next-generation perovskite solar cells to approximately 28 billion JPY. This quadrupling of funds from FY2026 strongly advances Japan's national goal of deploying approximately 20 GW of perovskite solar cells by 2040. This bold policy shift demonstrates Japan's strong commitment to achieving a decarbonized society and enhancing energy self-sufficiency.

IN DEPTH

Key Findings

Japan's Ministry of the Environment has announced a policy to abolish purchase subsidies for conventional silicon solar panels from fiscal year 2027, while simultaneously dramatically increasing its support budget for perovskite solar cells to approximately 28 billion JPY. This represents a fourfold expansion from the approximately 7 billion JPY allocated in fiscal year 2026, clearly signaling a national shift towards next-generation solar cell technology. This move is positioned as a critical strategic transformation aimed at achieving Japan's ambitious national goal of deploying approximately 20 gigawatts (GW) of perovskite solar cells by 2040.

Technical & Clinical Details

Perovskite solar cells, compared to traditional silicon solar cells, possess characteristics such as being thin, lightweight, and flexible, and can be manufactured at lower costs. These attributes open up possibilities for applications in areas previously challenging for solar cell installation, such as building facades, windows, and even car roofs. The Japanese government's increased subsidies are intended to accelerate investment by domestic companies, including Sekisui Chemical Co., in perovskite manufacturing technologies, thereby boosting production capacity. Specifically, preferential measures such as reduced fixed asset tax rates are under consideration, aiming to strengthen the entire ecosystem from R&D to mass production and market launch. This is expected to accelerate the practical application of high-efficiency and durable perovskite solar cells, contributing to power generation in diverse environments.

Background & Context

Japan faces the dual challenges of improving energy self-sufficiency and reducing greenhouse gas emissions. Conventional silicon solar cells, which have been the mainstay of solar power generation, are now a mature technology, and further expansion requires new breakthroughs. While countries like China dominate the silicon solar cell market, Japan is strategically investing in next-generation perovskite solar cells to establish new international competitiveness. This policy shift is not merely a subsidy review but represents a national industrial policy aimed at formulating a new growth strategy based on technological innovation. It is an opportunity for domestic R&D centers and companies to collaborate and regain leadership in the international market.

Strategic Significance & Outlook

The focused investment by the Japanese government into perovskite solar cells has the potential to dramatically accelerate the social implementation of this technology. The deployment target of 20 GW by 2040 will define the presence of perovskite in Japan's energy mix. It is anticipated that these substantial funds will be allocated towards establishing mass production technologies, demonstrating long-term reliability, and strengthening cost competitiveness. Particularly, as major corporations like Sekisui Chemical embark on large-scale production, a robust supply chain will be established, paving the way for perovskite solar cells to significantly contribute to Japan's energy security and decarbonization efforts. This is a highly noteworthy development with the potential to redraw the global technological map in the solar cell industry.

Source: https://www.perovskite-info.com/japan-end-silicon-solar-panel-subsidies-quadruple-perovskite-support-fy2027

Collected: September 05, 2026 | Automated Research System (Gemini API)

#16 Chinese Researchers Achieve World Record 24.0% Efficiency for 810 cm² Large-Area Perovskite Solar Modules

Published August 31, 2026 The Cool Down USA

OVERVIEW

A research team from Nanjing University and Renshine Solar in China has set a new world record in large-area solar technology, achieving 24.0% power conversion efficiency, certified by TÜV SÜD, for an 810 cm² perovskite solar cell module. This breakthrough focused on an innovative passivation strategy using chemically stable lead carboxylate passivators (LCPs), successfully improving charge carrier transport and significantly enhancing resistance to water, heat, and UV stress.

IN DEPTH

Key Findings

A research collaboration between Nanjing University and Renshine Solar in China has established a remarkable world record in perovskite solar cell module development. They achieved an astounding 24.0% power conversion efficiency for a large-area module with an aperture area of 810 cm^2, as independently certified by TÜV SÜD. This breakthrough is epoch-making because it realizes high efficiency comparable to conventional small-area research cells in a practical, large-area module, marking a significant stride towards the commercialization of perovskite technology.

Technical & Clinical Details

This record efficiency is attributed to a unique passivation strategy developed by the research team. Specifically, chemically stable lead carboxylate passivators (LCPs) were introduced to effectively passivate defects within the perovskite film. LCPs improve carrier lifetime and transport efficiency by reducing charge carrier trapping. More importantly, this passivation layer has been demonstrated to significantly enhance the module's resistance to water, heat, and UV stress—key challenges faced by perovskite materials. This leads to improved long-term stability of the device, mitigating performance degradation under harsh outdoor conditions. The technology also considered compatibility with large-area manufacturing processes, suggesting potential applications in roll-to-roll processes and other scalable methods.

Background & Context

Perovskite solar cells have garnered substantial attention as a next-generation photovoltaic technology due to their potential for high conversion efficiency and low-cost manufacturing. However, a longstanding challenge has been the significant efficiency loss and stability issues encountered when scaling up high efficiencies from small-area laboratory cells to practical large-area modules. China leads the world in the solar power sector and has particularly focused on developing large-area module technology. This achievement by Nanjing University and Renshine Solar presents a revolutionary solution to the "scale-up problem," laying a strong foundation for perovskite technology to seriously challenge the silicon solar cell market. This advancement will further elevate the role perovskite solar cells play in the global energy transition.

Strategic Significance & Outlook

Achieving 24.0% conversion efficiency for large-area perovskite solar cell modules signifies a major leap forward for this technology towards gigawatt-scale production and market introduction. Future challenges include further optimizing the LCP-based passivation strategy and demonstrating long-term outdoor durability. Reducing manufacturing costs and integrating with existing solar cell manufacturing infrastructure are also crucial considerations. This breakthrough holds the potential to accelerate the adoption of perovskite solar cells in a wide range of applications, including residential rooftops, industrial-scale power plants, and flexible building-integrated photovoltaics (BIPV). This achievement by the Chinese research team clearly demonstrates that perovskite technology will be an indispensable component in shaping the future of renewable energy.

Source: https://www.thecooldown.com/green-tech/chinese-researchers-perovskite-solar-module-efficiency/

Collected: September 05, 2026 | Automated Research System (Gemini API)

#17 Ultrathin Boron Nitride Boosts Perovskite QLED Stability and Efficiency, Extending Lifespan from 102 to Projected 25,263 Hours

Published September 04, 2026 AZoNano Australia

OVERVIEW

Researchers have dramatically improved the stability and efficiency of perovskite quantum dot light-emitting diodes (QLEDs) by integrating ultrathin nano-layered boron nitride (BN) into the device structure. BN contributes to defect passivation, ion migration suppression, and enhanced thermal stability through interfacial engineering. This BN-optimized QLED achieved a T50 lifetime of 102 hours at an initial brightness of 2,000 cd m^{-2}, with accelerated aging tests predicting an impressive T50 lifetime of 25,263 hours at 100 cd m^{-2}, paving the way for commercial applications.

IN DEPTH

Key Findings

A groundbreaking technological advancement significantly enhancing the performance of perovskite quantum dot light-emitting diodes (QLEDs) has been announced. A team of researchers successfully integrated ultrathin nano-layered boron nitride (BN) into the QLED device structure, dramatically boosting both its stability and efficiency. This innovative approach allowed BN-optimized QLEDs to achieve a significantly extended T50 lifetime (time to half initial brightness) of 102 hours at an initial luminance of 2,000 cd m^{-2}. Furthermore, accelerated aging tests predict an astonishing T50 lifetime of 25,263 hours at a more practical luminance of 100 cd m^{-2}, addressing a major barrier to commercial application: device longevity.

Technical & Clinical Details

Boron nitride (BN), with its excellent insulating, thermal conductive, and chemical stability properties, serves as an ideal material for interfacial engineering in perovskite QLEDs. The research team introduced nano-layers of BN between the perovskite layer and other functional layers, simultaneously solving multiple challenges. Firstly, BN effectively passivates defects on the perovskite surface, suppressing non-radiative recombination and thereby increasing external quantum efficiency (EQE). Secondly, it physically blocks ion migration, a major factor in perovskite degradation, dramatically enhancing device stability. Additionally, BN's superior thermal conductivity efficiently dissipates heat generated during operation, improving the device's thermal stability. These synergistic effects led to the 102-hour T50 lifetime at a peak luminance of 2,000 cd m^{-2}, and the projected long-term lifetime of 25,263 hours represents a multi-order magnitude improvement compared to conventional perovskite QLEDs, signifying a major leap forward in display technology.

Background & Context

Perovskite QLEDs have garnered significant anticipation as a next-generation display and lighting technology due to their high color purity, wide color gamut, and potential for low-cost manufacturing. However, while organic LEDs (OLEDs) and quantum dot LEDs (QLEDs) are already prevalent in the market, the primary challenge for perovskite QLEDs has been their long-term device stability. Specifically, the inherent susceptibility of perovskite materials to moisture, oxygen, and heat has been a limiting factor for practical application. This breakthrough in stability enhancement using BN represents a critical step for perovskite QLEDs to genuinely compete with OLED technology or to carve out new niche markets by leveraging their high performance. This will accelerate technological innovation in the display industry and encourage the advent of more high-performance and efficient devices.

Strategic Significance & Outlook

The enhanced stability of perovskite QLEDs through ultrathin BN layers will significantly impact the future of display technology. The projected lifetime exceeding 25,000 hours suggests that perovskite QLEDs could be suitable not only for consumer electronics like smartphones, TVs, and wearables but also for more demanding environments such as automotive displays and flexible displays. Future research will likely focus on further optimization of the BN layer, improving manufacturing scalability, and homogenizing QLED performance across various color gamuts. If this technology gains widespread market penetration, it could provide consumers with brighter, longer-lasting, and more energy-efficient display products, potentially triggering a paradigm shift in the display industry.

Source: https://www.azonano.com/news.aspx?newsID=41815

#18 Japanese Researchers Boost Tin Perovskite Solar Cell Efficiency to 9.07% and Longevity with Novel 2-ABZ Additive

Published September 02, 2026 EurekAlert! Japan

OVERVIEW

Japanese researchers have successfully enhanced the performance of lead-free tin (Sn)-based perovskite solar cells (SnPSCs), which have lower environmental impact. By introducing a novel heteroatom additive, 2-aminobenzothiazole (2-ABZ), into quasi-2D Sn-based SnPSCs, they simultaneously improved efficiency and long-term stability. The optimized device achieved a power conversion efficiency of 9.07% and maintained approximately 89% of its initial performance after 10 hours of continuous operation, marking a significant step towards lead-free alternatives with stability comparable to lead-based devices.

IN DEPTH

Key Findings

A Japanese research team has achieved a breakthrough in significantly improving the efficiency and longevity of environmentally friendly, lead-free tin (Sn)-based perovskite solar cells (SnPSCs). In this study, a novel heteroatom additive, 2-aminobenzothiazole (2-ABZ), was introduced into quasi-2D Sn-based SnPSCs. It was demonstrated that this additive synergistically contributes to controlling crystal growth, passivating defects, and suppressing tin oxidation and iodide migration. The optimized device achieved a power conversion efficiency of 9.07% and, remarkably, maintained approximately 89% of its initial performance after 10 hours of continuous operation in stability tests, demonstrating excellent stability previously difficult for SnPSCs.

Technical & Clinical Details

While SnPSCs are attracting attention as a lead-free alternative to lead-based perovskite solar cells due to their low toxicity, the instability caused by the air oxidation of tin(II) ions and high defect density have been major challenges for efficiency and stability. The 2-ABZ introduced by the research team intervenes in the crystal growth process when added to the perovskite precursor solution. The nitrogen and sulfur atoms in 2-ABZ coordinate with tin ions, delaying crystal nucleation and forming larger, more oriented crystalline grains. This reduces defects in the film (particularly tin vacancies and iodide vacancies) and suppresses non-radiative recombination of charge carriers. Furthermore, 2-ABZ acts as a reducing agent, effectively preventing the oxidation of tin(II) ions to tin(IV) ions, thereby enhancing the long-term chemical stability of the device. Simultaneously, iodide ion migration is also suppressed, reducing current-voltage hysteresis and achieving stable operation. These mechanisms collectively resulted in a PCE of 9.07% and superior operational stability.

Background & Context

Perovskite solar cells are expected to achieve higher efficiencies than silicon solar cells, but the toxicity of lead, a component material, has raised environmental and health concerns. Consequently, research into lead-free alternative materials, particularly tin-based perovskites, has been actively pursued. However, tin-based perovskites have faced challenges of lower efficiency and stability compared to their lead-based counterparts. This research from Japan significantly enhances the performance of tin-based perovskites, holding immense importance for advancing lead-free technology. It not only points towards the direction of sustainable energy technology development but also strengthens the technical foundation for providing environmentally conscious options in the future solar cell market.

Strategic Significance & Outlook

The improvement in efficiency and stability of tin-based perovskite solar cells through 2-ABZ addition represents a significant advancement towards the commercialization of lead-free perovskites. Future research will focus on further performance enhancement by optimizing the additive concentration or combining it with other additives, as well as evaluating reproducibility in large-area devices and long-term outdoor reliability. Although the 9.07% efficiency is not yet on par with the highest efficiency of lead-based perovskites (~26%), the significant improvement in stability is an essential factor for commercial application. This technology is particularly expected to find applications in niche markets requiring flexibility or low-light performance, such as flexible electronics, IoT devices, and indoor solar cells. The progress in lead-free technology is a strategically important step, paving the way for the widespread and environmentally friendly adoption of perovskite solar cells.

Source: https://www.eurekalert.org/news-releases/1142051

#19 LONGi Achieves World-Record 35.5% Conversion Efficiency for 2-Terminal Perovskite-Silicon Tandem Solar Cell, Independently Certified

Published August 31, 2026 LONGi (Official News) China

OVERVIEW

LONGi announced its 2-terminal perovskite-silicon tandem solar cell achieved a world-record conversion efficiency of 35.5%, independently certified by the European Solar Test Installation (ESTI). This achievement surpasses the previous record of 34.85% certified by NREL, clearly demonstrating the high potential of tandem cell technology. The breakthrough is attributed to enhanced quasi-Fermi level splitting in the perovskite layer through effective defect passivation at buried interfaces, leading to an impressive open-circuit voltage of 2V.

IN DEPTH

Key Findings

LONGi, a leader in the solar photovoltaic industry, officially announced in its H1 2026 earnings report that its 2-terminal perovskite-silicon tandem solar cell has been certified by the European Solar Test Installation (ESTI) with a world-record power conversion efficiency of 35.5%. This phenomenal efficiency pushes the boundaries of next-generation solar cell technology and unlocks new possibilities for solar power generation. The achievement unequivocally demonstrates LONGi's robust research and development capabilities and its commitment to high-efficiency technologies.

Technical & Clinical Details

The 35.5% conversion efficiency was specifically achieved with a 2-terminal perovskite-silicon tandem cell structure. In this configuration, a perovskite layer is placed on top of a silicon layer, allowing each layer to absorb different wavelengths of sunlight, thus utilizing a broader spectrum more efficiently than conventional single-junction cells. The key to this high efficiency lies in effective defect passivation techniques at the buried interfaces. This significantly suppresses non-radiative recombination of charge carriers within the perovskite layer, enhancing quasi-Fermi level splitting. As a result, the device achieved a remarkably high open-circuit voltage (Voc) of 2V, contributing substantially to the overall power conversion efficiency. This technology not only improves the fundamental performance of solar cells but also holds implications for future reductions in energy costs.

Background & Context

In the solar power market, improving power conversion efficiency has always been one of the most critical challenges. Conventional silicon solar cells are now a mature technology, and their efficiency is approaching physical limits. Against this backdrop, perovskite-silicon tandem solar cells have garnered significant attention as next-generation high-efficiency solar cells, combining the stability of silicon with the tunable bandgap and high efficiency of perovskites. While research institutions and companies worldwide are intensely competing to improve tandem cell efficiency, LONGi's establishment of a new record of 35.5%, surpassing NREL's certified 34.85%, solidifies its position as a technological leader in this field. This holds the potential to further expand the role of solar power in global energy supply.

Strategic Significance & Outlook

LONGi's achievement of 35.5% conversion efficiency marks a significant milestone towards the commercialization of perovskite-silicon tandem solar cells. The future outlook will focus on scaling up these laboratory-level achievements to larger-area mass-produced modules and establishing cost-effective manufacturing processes. If high efficiency and stability can be achieved simultaneously, tandem solar cells will be adopted in a wide range of applications, from residential use to large-scale solar power plants and building-integrated photovoltaics (BIPV). This will significantly increase power generation per unit area, accelerating the adoption of solar power even in regions with land-use constraints. LONGi's breakthrough represents a crucial step towards achieving global decarbonization goals and realizing a sustainable energy future.

Source: https://eu.longi.com/press/longi-reports-125-growth-in-bc-module-sales-in-h1-2026-as-overseas-business-expands

Collected: September 05, 2026 | Automated Research System (Gemini API)

#20 Chinese Researchers Achieve 27.39% Efficiency in Inverted Perovskite Solar Cells with Novel 'SGDC' Molecular Design, Demonstrating Over 5,000 Hours of Stability

Published September 03, 2026 PV Magazine Germany

OVERVIEW

A Chinese research group developed a new molecular design approach, the "Stereo-Gated Dual-Site Chelation (SGDC)" strategy, achieving an exceptionally high power conversion efficiency of 27.39% in inverted perovskite solar cells (IPSCs). This strategy effectively reduces defects within the perovskite film while providing robust passivation without hindering charge transport. Furthermore, bifacial mini-modules incorporating this technology demonstrated over 22% efficiency and an impressive 99.6% power retention after more than 5,000 hours of continuous operation, showcasing superior stability.

IN DEPTH

Key Findings

A Chinese research group has developed an innovative molecular design approach, the "Stereo-Gated Dual-Site Chelation (SGDC)" strategy, achieving an exceptionally high power conversion efficiency of 27.39% in inverted perovskite solar cells (IPSCs). This breakthrough successfully overcomes the previous challenge of simultaneously suppressing defects within the perovskite film and preserving efficient charge transport pathways. Moreover, bifacial mini-modules employing the SGDC strategy maintained over 22% efficiency while demonstrating an astounding 99.6% power retention after more than 5,000 hours of continuous operation, establishing a new benchmark for the long-term stability of perovskite solar cells.

Technical & Clinical Details

The core of the SGDC strategy lies in using specialized molecules to precisely passivate defects at the interface between the perovskite layer and the charge transport layer. These molecules stereospecifically bind to particular sites within the perovskite crystal lattice, chemically passivating defect sites while simultaneously acting as a "gate" that does not impede charge carrier movement. This significantly reduces non-radiative recombination losses, improving the device's open-circuit voltage (Voc) and fill factor (FF), ultimately leading to the high efficiency of 27.39%. Additionally, this passivation layer enhances the perovskite film's stability against external environmental factors, particularly heat and moisture. The 99.6% power retention after more than 5,000 hours of continuous operation provides strong data supporting the practical utility of this SGDC strategy for outdoor installations, indicating its potential to dramatically extend the lifetime and reliability of perovskite solar cells.

Background & Context

Perovskite solar cells have garnered significant interest as a next-generation photovoltaic technology due to their high efficiency and low manufacturing costs. However, the long-term stability of the devices, particularly degradation caused by interfacial defects, has been one of the main challenges for commercialization. China leads the world in R&D of solar power technology and has been actively investing in perovskite technology. The SGDC strategy is groundbreaking because it achieves both defect passivation and charge transport efficiency, addressing a trade-off that conventional passivation techniques often faced where they impeded charge transport. This breakthrough paves the technological path for perovskite solar cells to genuinely compete with conventional silicon solar cells and be widely adopted in various markets.

Strategic Significance & Outlook

The 27.39% efficient inverted perovskite solar cell based on the SGDC strategy will be a powerful driver accelerating the commercialization of this technology. The future outlook involves further optimizing this molecular design approach and scaling it up to large-area module manufacturing processes. Furthermore, the stability data, demonstrating 99.6% power retention after over 5,000 hours of continuous operation, provides strong validation for ensuring long-term reliability in outdoor environments. If this technology becomes widespread, it will accelerate the adoption of perovskite solar cells in diverse applications such as building-integrated photovoltaics (BIPV), flexible devices, and even IoT power sources. This breakthrough by the Chinese research team makes the future, where perovskite solar cells play an indispensable role in the global energy transition, more tangible.

Source: https://www.pv-magazine.com/2026/09/03/chinese-scientists-build-27-39-efficient-inverted-perovskite-solar-cell-based-on-new-molecular-design/

#21 Perovskite Connect 2026 to Discuss Equipment, Processes, and Applications for Gigawatt-Scale Production

Published Published September 02, 2026 Perovskite-Info イスラエル

OVERVIEW

The upcoming Perovskite Connect 2026 conference in Berlin this October will be a pivotal event, dedicated to accelerating the commercialization of perovskite solar cells by focusing on equipment, processes, and applications for gigawatt-scale production. Discussions will center on crucial manufacturing innovations such as roll-to-roll processing, inkjet printing, and laser scribing, aiming to drastically improve cost-efficiency and productivity. The summit will also unveil strategic industrial visions, including building-integrated photovoltaics (BIPV) glass and comprehensive value chain integration, paving a clear path for perovskite technology from lab to market.

IN DEPTH

Background

Perovskite solar cells have demonstrated remarkable progress in conversion efficiency over recent years, achieving record-breaking levels in laboratory settings that even surpass those of conventional silicon cells. However, unlocking their full potential hinges on their ability to be produced stably, at a large scale, and at low cost, all while maintaining high efficiency. The global solar power market is currently dominated by silicon technology. For perovskites to penetrate and compete effectively in this established market, overcoming manufacturing cost and scalability challenges is paramount. Conferences like Perovskite Connect 2026 are therefore critical, serving as a vital platform for researchers, engineers, investors, and industry leaders to converge, foster a shared understanding of these hurdles, and forge essential collaborations. This collaborative environment is indispensable for perovskite technology to secure a central role in the global energy transition.

Key Findings

The forthcoming "Perovskite Connect 2026" conference, slated for October in Berlin, Germany, is positioned as a pivotal forum dedicated to addressing the equipment, processes, and application strategies essential for achieving gigawatt-scale production of perovskite solar cells. The agenda will feature in-depth discussions on cutting-edge manufacturing technologies, including roll-to-roll manufacturing, inkjet printing, and laser scribing—all critical for enabling cost-effective, high-volume production. This event marks an indispensable milestone for perovskite solar cells, signaling their transition from laboratory breakthroughs to robust industrial manufacturing and reflecting the industry's collective anticipation for commercialization.

Technical Deep Dive

Conference discussions will hone in on specific technical challenges and innovative solutions for the mass production of perovskite solar cells. Roll-to-roll (R2R) manufacturing stands out as a highly promising technique for achieving high throughput and significant cost reductions through the continuous deposition of perovskite films on flexible substrates. Inkjet printing offers a pathway to fabricating high-efficiency modules by precisely forming intricate patterns, thereby minimizing material waste. Furthermore, laser scribing is an essential technology for creating inter-cell connections, boosting productivity through unparalleled precision and speed. These advanced manufacturing techniques represent approaches uniquely suited to perovskites, distinctly differing from conventional silicon solar cell production processes. The optimization and seamless integration of each of these technologies are paramount for realizing gigawatt-scale production capacity. Key discussions will also tackle critical measures for enhancing yield, ensuring material uniformity, and improving the long-term stability of perovskite devices.

Strategic Outlook

The dialogues at Perovskite Connect 2026 are expected to lay down a crucial blueprint for the future trajectory of perovskite solar cells. The industrial and product visions to be showcased—including building-integrated photovoltaics (BIPV) glass and the establishment of an end-to-end value chain from raw silica to finished panels—underscore perovskite technology's potential to transcend its role as merely an energy source, permeating diverse facets of social infrastructure. Achieving gigawatt-scale production capabilities will not only boost the price competitiveness of perovskite solar cells but also significantly accelerate the global adoption of renewable energy. Over the coming years, these technical and strategic discussions are anticipated to culminate in tangible product development and successful market introductions, ushering in a new era of innovation for the solar power industry. This evolution will, in turn, unlock new business opportunities for investors and provide engineers with fertile ground to conquer complex technical challenges.

Source: https://www.perovskite-info.com/glimpse-perovskite-connect-2026-equipment-processes-and-

Collected: September 05, 2026 | Automated Research System (Gemini API)

#22 University of Freiburg and Fraunhofer ISE Develop Semi-Transparent OPV Modules with Industrial Process, Hinting at Perovskite Applications

Published September 01, 2026 Fraunhofer ISE Germany

OVERVIEW

Researchers from the University of Freiburg and Fraunhofer ISE developed 14.5x14.5cm semi-transparent organic PV (OPV) modules, achieving 43.2% average transparency and 9.26% peak efficiency, by combining industrially established sputtering and slot-die coating processes. While this research focuses on OPV, the involvement of Fraunhofer ISE's Organic and Perovskite Photovoltaics division suggests that this large-area manufacturing process could contribute to solving large-scale production challenges for perovskite solar cell technology in the future.

IN DEPTH

Key Findings

Researchers from the University of Freiburg and the Fraunhofer Institute for Solar Energy Systems (ISE) have successfully developed semi-transparent organic photovoltaic (OPV) modules with excellent properties by combining industrially relevant manufacturing processes. Specifically, they utilized established techniques of sputtering and slot-die coating to produce 14.5x14.5cm OPV modules, achieving a maximum power conversion efficiency of 9.26% while maintaining an average transparency of 43.2%. This achievement demonstrates progress in OPV technology and, given the involvement of Fraunhofer ISE's Organic and Perovskite Photovoltaics division, suggests that similar manufacturing approaches could be effective for large-scale production of perovskite technology.

Technical & Clinical Details

The developed semi-transparent OPV modules were realized by integrating two key manufacturing processes: sputtering and slot-die coating. Sputtering is a vacuum process used for uniform and precise deposition of electrodes, such as transparent conductive oxide (TCO) layers, and is widely recognized in industry for its high reproducibility and film quality. Slot-die coating, on the other hand, is a high-speed and scalable wet process for applying functional layers from solution, capable of forming precise thin films over large-area substrates. By combining these technologies, they achieved a balanced performance of 43.2% average transparency and 9.26% peak efficiency on a relatively large module area of 14.5x14.5cm. This manufacturing method operates at relatively low process temperatures and has high applicability to flexible substrates, making it promising for future applications in building-integrated photovoltaics (BIPV) and transparent solar cell manufacturing processes.

Background & Context

Amidst growing demand for renewable energy, there is a need to develop new types of solar cells that offer transparency, flexibility, and aesthetic appeal, in addition to conventional opaque modules, to expand the range of solar cell applications. Semi-transparent OPVs are particularly promising for BIPV applications, transforming building surfaces such as windows and facades into power generation sources. Fraunhofer ISE has long been at the forefront of research in organic and perovskite photovoltaics. This achievement in OPV suggests that their knowledge and experience can also be applied to the mass production of perovskite solar cells. Similar to OPV, perovskite solar cells can be manufactured using solution processes, and establishing large-area coating techniques is crucial for accelerating perovskite commercialization.

Strategic Significance & Outlook

The development of this semi-transparent OPV module by the University of Freiburg and Fraunhofer ISE demonstrates that large-area, industrially scalable processes are applicable to the manufacturing of next-generation solar cells. The future outlook includes directly applying this combined sputtering and slot-die coating approach to perovskite solar cell manufacturing processes, with expectations for developing high-efficiency and stable semi-transparent perovskite modules. Transparency is a critical property that enhances perovskites' competitive advantage in specific markets (e.g., smart windows, greenhouses). Advancements in these manufacturing technologies will pave the way for widespread adoption of perovskite solar cells in the BIPV market and other specialized applications. This represents a strategic achievement that expands the diverse application possibilities of solar power and contributes to the future of sustainable architecture and energy supply.

Source: https://www.glassonweb.com/news/semi-transparent-pv-modules-developed-using-industry-ready-manufacturing-process

Collected: September 05, 2026 | Automated Research System (Gemini API)

#23 US DOE Announces $12 Million Funding Opportunity for Space Photovoltaics, Prioritizing Perovskite Technology

Published Published September 02, 2026 Perovskite-Info イスラエル

OVERVIEW

The U.S. Department of Energy (DOE) has announced a $12 million funding opportunity through its Office of Critical Minerals and Energy Innovation to accelerate space photovoltaics, with a strong emphasis on perovskite technology. This initiative targets critical challenges such as degradation mitigation, innovative multi-junction designs, and scalable manufacturing methods, aiming to bolster domestic capabilities and ensure robust power solutions for harsh space environments.

IN DEPTH

Background

The space industry is rapidly expanding, driven by the miniaturization and enhanced performance of satellites, increased deep space exploration, and the rise of commercial spaceflight. Reliable, lightweight, and highly efficient solar cells are indispensable components for supporting these activities. Traditional space solar cells have historically been expensive and reliant on specific materials, posing challenges in terms of supply stability and cost. Perovskite solar cells, with their tunable bandgap, high theoretical efficiency, and potential for relatively low-cost manufacturing, are gaining worldwide attention as an innovative alternative for space photovoltaics. The DOE's current funding signifies a clear intent to recognize the potential of perovskite technology to meet stringent space requirements and establish U.S. leadership in this domain.

Key Findings

The U.S. Department of Energy (DOE)'s Office of Critical Minerals and Energy Innovation has announced a $12 million funding opportunity aimed at fostering innovation and strengthening domestic manufacturing capabilities for space photovoltaics. This program is designed to accelerate the development of solar cells capable of operating in the extremely harsh environment of space, with a significant emphasis placed on projects involving next-generation perovskite solar cell technology. This strategic investment has the potential to secure U.S. leadership in areas such as space exploration, satellite communication, and defense, while also contributing to global energy security.

Technical Details and Challenges

The specific research and development challenges targeted by the DOE's funding program are aimed at enhancing the performance and reliability of space-bound perovskite solar cells. Key challenges include the development of technologies to mitigate degradation under the severe conditions unique to space, such as radiation, extreme temperature fluctuations, and vacuum. This encompasses optimizing new material compositions, protective layers, and device structures. Innovative multi-junction designs (e.g., combinations of perovskites with existing space solar cell materials) for more efficient utilization of the solar spectrum are also prioritized. Furthermore, the program seeks deposition methods compatible with high-throughput and low-cost manufacturing processes (e.g., roll-to-roll processes) to promote domestic mass production. These technological advancements are directly linked to extending the duration and reducing the cost of space missions, which are essential for the future development of the space industry.

Strategic Significance and Outlook

The $12 million funding from the U.S. DOE is expected to significantly accelerate research and development in space perovskite solar cells. The future outlook anticipates this funding leading to the development of prototype devices with superior radiation resistance, thermal cycling stability, and long-term vacuum stability, paving the way for in-space validation tests. If perovskite solar cells succeed in space applications, their technological reliability will dramatically increase, potentially spurring widespread adoption in terrestrial applications as well. Furthermore, the emphasis on domestic manufacturing is important from the perspective of supply chain resilience and economic security. This investment is not just about improving the performance of space solar cells but represents a strategic step to solidify the overall maturity of perovskite technology and its position as a future energy technology.

Source: https://www.perovskite-info.com/doe-announces-12-million-space-photovoltaics-funding-opportunity-strong

#24 Roll-Coated Flexible Perovskite Solar Cells Achieve 21% Efficiency with Atmospheric Processing: A Fully Scalable Manufacturing Route

Published September 01, 2026 The Royal Society of Chemistry UK

OVERVIEW

In the fabrication of atmospherically processable roll-coated flexible perovskite solar cells (f-PSCs), 21% power conversion efficiency (PCE) was achieved by incorporating photon-cured compact SnO2 films. This innovative manufacturing method involves roll-coating SnO2 via combustion synthesis on ITO/PET substrates, combined with slot-die coated perovskites under ambient conditions, offering a scalable, low-temperature, and high-throughput production route. PCE reached 24.3% with spin-coating and 23% with roll-assisted slot-die coating, achieving the highest efficiency of 22.9% reported for photon-cured SnO2-based devices.

IN DEPTH

Key Findings

A significant breakthrough has been reported in the development of atmospherically processable roll-coated flexible perovskite solar cells (f-PSCs), achieving a power conversion efficiency (PCE) of 21% through the integration of photon-cured compact tin oxide (SnO2) films. This manufacturing method offers superior industrial scalability and cost-effectiveness, enabling high-throughput production at low temperatures. Notably, this approach has led to the highest reported efficiency of 22.9% for photon-cured SnO2-based devices using a roll-assisted slot-die coating method, marking a major step towards the mass production of perovskite solar cells.

Technical & Clinical Details

This innovative manufacturing process integrates two primary technologies. First, a SnO2 layer is roll-coated onto flexible indium tin oxide (ITO)-coated polyethylene terephthalate (PET) substrates using a combustion synthesis method. Combustion synthesis is suitable for flexible substrates as it forms oxides from metal salts at low temperatures. This SnO2 layer is then photon-cured by light irradiation, forming a compact, high-quality film that functions as an electron transport layer. Next, the perovskite layer is deposited using a slot-die coating technique under ambient conditions. Slot-die coating is a high-throughput method capable of uniformly applying solution-based materials over large-area substrates, and it is highly compatible with roll-to-roll manufacturing. The combination of these techniques enabled high efficiencies (23% with roll-assisted slot-die coating), comparable to traditional lab-scale spin-coating (24.3%), to be achieved in ambient air and on flexible substrates. The photon-curing process for the SnO2 layer reduces defect density and optimizes charge carrier transport, contributing to the overall device efficiency improvement.

Background & Context

Perovskite solar cells are garnering significant attention as a next-generation photovoltaic technology due to their high efficiency and potential for low-cost manufacturing. Their flexible nature, in particular, opens doors for diverse applications such as building-integrated photovoltaics (BIPV), wearable devices, and IoT sensors. However, traditional manufacturing methods often involve vacuum processes, organic solvents, and high-temperature treatments, posing challenges for large-scale production and application on flexible substrates. The combination of ambient roll-coating and photon-cured SnO2 offers a promising solution to these challenges. This represents a crucial step towards establishing scalable and sustainable manufacturing approaches, which are indispensable for perovskite solar cells to complement existing silicon solar cell markets or create new niche markets.

Strategic Significance & Outlook

Achieving a PCE of 21% for atmospherically processable roll-coated flexible perovskite solar cells indicates significant progress towards the commercialization of this technology. The future outlook involves further optimizing this manufacturing process to improve both efficiency and long-term stability. Demonstrating roll-to-roll manufacturing is particularly critical for achieving gigawatt-scale production capacity. As this technology matures, perovskite f-PSCs will open up innovative application areas that conventional solar cells could not address, serving as a low-cost, high-efficiency energy source. For example, their potential markets include smart textiles, lightweight mobile power sources, and even space applications. This breakthrough is a strategic achievement that reinforces the role of perovskite technology in sustainable energy production and power supply for various electronic devices.

Source: https://pubs.rsc.org/ta/article/doi/10.1039/d6ta02792j/1297147/Atmospherically-processable-roll-coated-flexible

Collected: September 05, 2026 | Automated Research System (Gemini API)

#25 Deep-Blue Perovskite Light-Emitting Diodes Achieve 5.2% External Quantum Efficiency and Enhanced Spectral Stability with Novel Dopant Strategy

Published August 31, 2026 Applied Physics Letters | AIP Publishing USA

OVERVIEW

A dynamic modulation strategy using indium chloride (InCl) as a functional dopant was proposed to revolutionize the efficiency and spectral stability of deep-blue perovskite light-emitting diodes (PeLEDs). This strategy delayed the crystallization process of mixed-halide perovskites, suppressed non-radiative recombination losses, and resolved the critical issue of halide segregation in PeLEDs. Consequently, deep-blue PeLEDs achieved a high external quantum efficiency (EQE) of 5.2% at 460 nm and significantly enhanced operational spectral stability.

IN DEPTH

Key Findings

A breakthrough in research significantly improving the performance of deep-blue perovskite light-emitting diodes (PeLEDs) has been reported. In this study, a novel "dynamic modulation strategy" employing indium chloride (InCl) as a functional dopant was introduced, successfully and dramatically enhancing both the efficiency and spectral stability of PeLEDs. This innovative approach optimized the crystallization process of mixed-halide perovskites, suppressed non-radiative recombination losses, and effectively eliminated halide segregation, a major factor affecting the operational lifetime of PeLEDs. As a result, deep-blue PeLEDs with a high external quantum efficiency (EQE) of 5.2% at 460 nm and excellent operational spectral stability were realized.

Technical & Clinical Details

Achieving deep-blue PeLEDs has been challenging due to inherent material instability, particularly halide segregation in mixed-halides (e.g., lead bromide and lead iodide). This phenomenon causes halide ions to migrate during device operation, forming phases with different bandgaps, which leads to a shift in the emission spectrum and degradation of color purity. The dynamic modulation strategy employed here deeply involves the InCl dopant in the crystallization process of the perovskite precursor solution. InCl delays crystal growth kinetics, promoting the formation of more uniform and high-quality mixed-halide perovskite films. This reduces defect density within the film, thereby decreasing non-radiative recombination centers, allowing more charge carriers to contribute to light emission and improving EQE. More importantly, InCl physically and chemically suppresses halide ion migration, effectively preventing phase segregation during device operation and dramatically improving the stability of the emission spectrum. This technology significantly surpasses the performance of conventional deep-blue PeLEDs, opening the path for commercial applications.

Background & Context

Perovskite light-emitting diodes (PeLEDs) possess attractive properties such as high color purity, low-cost manufacturing, and adaptability to flexible devices, making them highly anticipated for next-generation display and lighting technologies. Among the primary colors for displays—red, green, and blue—achieving high efficiency and stability for deep-blue PeLEDs has been one of the most difficult challenges. This is because perovskite materials emitting blue light tend to have wider bandgaps and lower stability compared to other colors. The success of this dynamic modulation strategy using InCl doping presents a groundbreaking solution to this longstanding problem, marking a crucial step for PeLED technology to genuinely compete with, or even surpass, organic light-emitting diode (OLED) technology. This will accelerate technological innovation in the display industry and drive the emergence of more high-performance and energy-efficient products.

Strategic Significance & Outlook

The dynamic modulation strategy for deep-blue PeLEDs using InCl dopant holds immense potential to revolutionize next-generation display technology. An EQE of 5.2% at 460 nm and significantly enhanced spectral stability make the adoption of perovskite QLED displays a reality for a wide range of consumer products, including smartphones, televisions, and wearable devices. Future outlooks will focus on optimizing the InCl dopant, further increasing EQE, and validating long-term operational lifetimes. Development of manufacturing processes to enhance scalability for mass production is also critical. If this technology is commercialized, it will introduce brighter, higher color purity, and longer-lasting display products to the market, offering consumers new visual experiences and potentially reshaping the competitive landscape of the display industry. This is a strategic achievement that contributes to the realization of energy-efficient lighting and displays, while accelerating the transition to a sustainable society.

Source: https://pubs.aip.org/aip/apl/article/129/9/093301/3403319/Component-homogenization-enables-spectrally-stable

#26 Nanjing Tech University Achieves 22.41% Efficiency in Open-Air Screen-Printed Perovskite Solar Cells, Breakthrough for Mass Production

Published August 28, 2026 Electronics For You India

OVERVIEW

Researchers at Nanjing Tech University developed perovskite solar cells with all functional layers screen-printed in open air, achieving a high power conversion efficiency of 22.41% (21.86% independently certified). This innovative process has the potential to reuse parts of existing silicon solar cell manufacturing ecosystems and is suitable for high-throughput production compared to traditional lab techniques like spin-coating or vacuum deposition. This breakthrough marks a significant step towards low-cost, large-scale mass production of perovskite solar cells.

IN DEPTH

Key Findings

A research team at Nanjing Tech University has announced a breakthrough in perovskite solar cell manufacturing technology. They developed perovskite solar cells where all functional layers were formed by screen-printing in an ambient air environment, achieving a high power conversion efficiency (PCE) of 22.41%. This efficiency has been independently verified as 21.86%, making it exceptionally significant for realizing performance comparable to conventional lab-scale manufacturing methods, but with a more scalable process. This technology substantially enhances the commercial viability of perovskite solar cells for low-cost, large-scale mass production.

Technical & Clinical Details

The core of this research lies in depositing all functional layers of the perovskite solar cell —the electron transport layer, perovskite active layer, hole transport layer, and electrodes—using screen printing under ambient atmospheric conditions. Screen printing is a mature industrial printing technology, which, similar to inkjet printing and slot-die coating, allows for large-area fabrication, high throughput, and cost reduction. Previous perovskite solar cell research often utilized methods like spin-coating (limited to small areas) or vacuum deposition (high cost, requires vacuum environment) to achieve high efficiencies. However, these methods are not suitable for large-scale production. Nanjing Tech University's technology achieved high-quality film formation by minimizing environmental control and optimizing the composition of printable perovskite inks and printing parameters. This process can be carried out at relatively low temperatures and is easily adaptable to flexible substrates, making it suitable for integration into existing solar cell manufacturing lines or for establishing new manufacturing platforms.

Background & Context

Perovskite solar cells are considered a strong candidate for next-generation photovoltaics due to their high conversion efficiency and low material costs. However, one of the biggest barriers to their commercialization has been maintaining efficiency and stability when scaling up laboratory achievements to large-scale industrial production. Specifically, reducing manufacturing costs is essential for ensuring competitiveness with conventional silicon solar cells. Screen printing technology, which enables low-cost and high-throughput manufacturing, is expected to be a key to solving the "last frontier" of mass production for perovskite solar cells. Nanjing Tech University's achievement presents a concrete solution to this challenge, paving the way for perovskite solar cells to play a larger role in the energy market.

Strategic Significance & Outlook

The achievement of 22.41% efficiency in open-air screen-printed perovskite solar cells marks a significant step in the commercialization of this technology. The future outlook anticipates further optimization of this printing process to improve both efficiency uniformity and long-term stability. Particularly, evaluating performance degradation in outdoor environments and establishing large-area module scale-up techniques will be the next crucial steps. If this manufacturing method is established, perovskite solar cells could accelerate adoption in diverse applications, including building facades, windows, flexible roofing materials, and even power sources for IoT devices. The establishment of low-cost, environmentally friendly mass production technology is a strategically important achievement that will accelerate the global adoption of renewable energy and significantly contribute to achieving a sustainable society.

Source: https://www.electronicsforu.com/news/screen-printed-perovskite-cells-reach-22-41-per-cent-in-open-air

Collected: September 05, 2026 | Automated Research System (Gemini API)

#27 PXP to Begin Mass Production of World's First Perovskite-Chalcopyrite Tandem Solar Cells by 2028, Targeting 28% Efficiency and One-Tenth Weight of Silicon

Published Published August 28, 2026 note (宮野宏樹) Japan

OVERVIEW

PXP, a Japanese firm, has announced its ambitious plan to commence mass production of the world's first perovskite-chalcopyrite tandem solar cells by 2028. These innovative devices are engineered for a 28% power conversion efficiency and an exceptionally low weight—under 1 kg per square meter, representing less than one-tenth the mass of conventional silicon panels. This breakthrough enables PXP to target novel markets like EV roofs and drones, where silicon's weight and rigidity are prohibitive, significantly expanding the scope of solar energy applications.

IN DEPTH

Background

The global solar energy market is predominantly driven by low-cost silicon panels, largely from China. However, for specialized applications demanding lightweight and flexible solutions, the inherent bulk and rigidity of silicon present significant challenges. PXP's tandem technology positions itself to capture high-value niche markets by offering a competitive advantage that silicon-based solar cells cannot match. In the mobility sector, such as electric vehicles (EVs) and drones, weight directly impacts range and payload capacity, creating a substantial demand for ultra-lightweight solar solutions. Furthermore, the development of advanced solar cell technologies aligns with Japan's strategic objectives for energy security and enhancing industrial competitiveness.

Key Findings

PXP, a Japanese company based in Sagamihara City, has announced its ambitious plan to commence mass production of the world's first perovskite-chalcopyrite tandem solar cells by 2028. This groundbreaking photovoltaic device is engineered to achieve a high power conversion efficiency of 28% and an exceptionally low weight of under 1 kg per square meter, making it less than one-tenth the mass of conventional silicon solar panels. PXP intends to capitalize on the lightweight and flexible attributes of this technology to penetrate novel markets, including electric vehicle (EV) roofs, drones, and other applications where the weight and rigidity of silicon modules have been prohibitive.

Technical Details

The perovskite-chalcopyrite tandem solar cell architecture involves stacking a high-bandgap perovskite layer on top of a low-bandgap chalcopyrite layer, similar to CIGS (copper indium gallium selenide) materials. This innovative configuration allows for a broader and more efficient absorption of the solar spectrum, enabling higher overall conversion efficiencies than single-junction cells. PXP's proprietary technology focuses on optimizing material composition and interface engineering within this stacked structure to achieve both high stability and cost-effective mass production. The remarkable weight reduction is primarily achieved through the meticulous use of thin-film materials and flexible substrates, offering unparalleled design freedom for product integration.

Strategic Significance and Outlook

The commencement of mass production by PXP in 2028 will mark a critical milestone for the practical implementation of perovskite technology. The company plans to initiate production at an annual capacity of several megawatts (MW), with a roadmap for expansion to gigawatt-scale (GW) based on anticipated market demand. This lightweight, high-efficiency perovskite-chalcopyrite tandem solar cell is expected to not only complement existing solar markets but also create entirely new segments, thereby accelerating the broader adoption of solar power. In the long term, its inherent flexibility lends itself to diverse applications such as building-integrated photovoltaics (BIPV) and agrivoltaics, significantly broadening the scope of solar energy deployment and underscoring its transformative potential.

Source: https://note.com/hirokimiyano/n/neaa709d5e22e?hl=en

Collected: September 05, 2026 | Automated Research System (Gemini API)

#28 University of Sydney Secures A$7.25 Million from Australian Government to Accelerate Commercialization of Perovskite-Silicon Tandem Solar Cells, Building on 30% Efficiency Toward Enhanced Reliability

Published September 02, 2026 The University of Sydney Australia

OVERVIEW

Researchers at the University of Sydney have secured A$7.25 million (approximately US$4.8 million) in funding from the Australian Renewable Energy Agency (ARENA) to accelerate R&D for the commercialization of perovskite-silicon tandem solar cells. The team has already achieved 30% efficiency and will now focus on enhancing device reliability and durability to meet industry standards. This investment significantly propels the practical application of next-generation solar cell technology.

IN DEPTH

Key Findings

A research team at the University of Sydney has been awarded a substantial A$7.25 million (approximately US$4.8 million) in funding from the Australian Renewable Energy Agency (ARENA) to fast-track the commercialization efforts for perovskite-silicon tandem solar cells. The team has already demonstrated a high power conversion efficiency of 30% at the laboratory scale. Building upon this remarkable achievement, the new funding will be directed towards rigorously improving the reliability and durability of these devices to meet stringent industry standards. This focus is a critical step in overcoming a major hurdle for perovskite technology and moving it towards real-world applications.

Technical Details

Perovskite-silicon tandem solar cells generate more electricity by stacking a high-efficiency perovskite layer on top of a conventional silicon solar cell, allowing them to capture a broader spectrum of sunlight that silicon alone cannot fully utilize. The University of Sydney team achieved its 30% efficiency through optimized interface engineering, material stabilization, and refined manufacturing processes within this stacked architecture. The ARENA funding will specifically support reliability testing, including rigorous evaluations to meet IEC (International Electrotechnical Commission) and UL (Underwriters Laboratories) certifications. This involves assessing long-term performance, identifying degradation mechanisms, and ensuring the product functions stably under diverse operational environments, all essential steps for market acceptance.

Background and Context

Australia, with its abundant solar resources, has been a global leader in solar energy adoption. However, to further accelerate its energy transition, developing next-generation solar cells that surpass the limits of existing silicon technology is imperative. Perovskite-silicon tandem technology, with its high-efficiency potential, is considered one of the most promising candidates to address this challenge. This substantial funding from the Australian government via ARENA is a strategic investment aimed at bolstering the competitiveness of the domestic solar industry and establishing global leadership in clean energy technology. Ensuring reliability for commercialization is paramount for building trust among investors and end-users.

Strategic Significance and Outlook

With this ARENA funding, the University of Sydney's research team is entering a crucial phase of bridging the gap between laboratory performance and market readiness for perovskite-silicon tandem solar cells. By resolving reliability and durability challenges, this technology has the potential to replace or complement existing solar cells in a wide range of applications, including residential rooftops, commercial buildings, and large-scale solar farms. In the future, the team aims to strengthen collaborations with manufacturing partners both in Australia and internationally to facilitate technology transfer and build an industrial ecosystem for mass production. This initiative is expected to solidify Australia's position as an innovation hub in renewable energy and contribute significantly to global decarbonization efforts.

Source: https://solarquarter.com/2026/09/02/perovskite-silicon-tandem-technology-advances-toward-commercial-scale-solar/

Collected: September 05, 2026 | Automated Research System (Gemini API)

#29 South Korea's GIST Establishes Perovskite Solar Cell Commercialization Council, Targeting 30% Efficiency for Large-Area Tandem Modules and Roll-to-Roll Manufacturing by 2030

Published August 31, 2026 The Korea Post South Korea

OVERVIEW

Gwangju Institute of Science and Technology (GIST) in South Korea has established a 'Perovskite Solar Cell Commercialization Promotion Council' to accelerate market entry. The council aims to bridge the gap between academia and industry, targeting over 23% efficiency for single-junction and over 30% for tandem perovskite solar cell modules on large areas exceeding 0.72 square meters by 2030. It will also focus on developing roll-to-roll manufacturing technology suitable for mass production, aiming for a full market launch of perovskite technology.

IN DEPTH

Key Findings

The Gwangju Institute of Science and Technology (GIST) in South Korea has announced the formation of the 'Perovskite Solar Cell Commercialization Promotion Council,' a strategic initiative designed to aggressively accelerate the market entry of perovskite solar cells. This newly established council aims to foster enhanced collaboration between academia and industry, ensuring rapid translation of research breakthroughs into marketable products. Specific targets include achieving over 23% power conversion efficiency for single-junction and over 30% for tandem perovskite solar cell modules on large areas exceeding 0.72 square meters by 2030. A key focus will also be placed on developing roll-to-roll manufacturing technologies crucial for efficient mass production.

Technical Details

The efficiency targets set by the council surpass the performance of current market-dominant silicon solar cells, underscoring the superior potential of perovskite technology. Achieving high efficiencies on large-area modules is a critical factor for practical deployment. Roll-to-roll manufacturing, a continuous thin-film deposition process on flexible substrates, holds immense promise for high-speed, low-cost production of large-scale solar cells. GIST researchers and their industrial partners will tackle technical challenges such as improving material stability, minimizing interface defects, and ensuring uniformity in large-scale manufacturing processes. This may involve the development of novel inkjet printing techniques or advanced evaporation methods.

Background and Context

Perovskite solar cells are widely regarded as the leading candidate for next-generation photovoltaics due to their high efficiency, low manufacturing cost potential, and flexibility. However, despite high efficiencies achieved at the laboratory scale, challenges in maintaining efficiency on larger areas, ensuring long-term stability, and establishing scalable manufacturing processes have been significant barriers to commercialization. The South Korean government views strengthening energy security and fostering its renewable energy industry as national strategic priorities. The establishment of the GIST council is a crucial step in realizing this strategy, aiming to resolve these challenges through academic-industrial collaboration and establish a competitive edge in the global market.

Strategic Significance and Outlook

The launch of the 'Perovskite Solar Cell Commercialization Promotion Council' signifies South Korea's serious commitment to the mass production and market introduction of perovskite solar cells. The clear goal of 2030, coupled with specific roadmaps for large-area, high-efficiency, and roll-to-roll manufacturing technologies, is highly attractive to researchers and investors worldwide. If successful, South Korea could emerge as a leading producer and technology exporter of perovskite solar cells, contributing significantly to the global energy transition. Future applications are envisioned across diverse markets, including building-integrated photovoltaics (BIPV), smart cities, and IoT devices, thereby expanding the reach of solar energy technology.

Source: https://www.koreapost.com/news/articleView.html?idxno=49430

Collected: September 05, 2026 | Automated Research System (Gemini API)

#30 Perovskite Stock Watch 2026: Sekisui Chemical Targets 100MW Line by 2027, Oxford PV Begins Commercial Shipments in Sept 2024, Hanwha Solutions Achieves IEC/UL Certification for Tandem Tech

Published September 01, 2026 Exoswan Insights Global

OVERVIEW

The perovskite sector is seeing significant commercialization strides in 2026. Japan's Sekisui Chemical aims to launch a 100MW roll-to-roll production line by 2027, scaling to GW capacity by 2030. Oxford PV, a UK pioneer, began commercial shipments of its tandem modules in September 2024, targeting 26% efficiency and a 20-year warranty by 2027. South Korea's Hanwha Solutions also secured key IEC and UL reliability certifications for its perovskite-silicon tandem technology in July 2026, demonstrating major progress towards mass production and ensuring market confidence.

IN DEPTH

Key Findings

As 2026 progresses, key players in the perovskite solar cell industry are rapidly advancing their commercialization efforts. Notable developments include those from Japan's Sekisui Chemical, the UK's Oxford PV, and South Korea's Hanwha Solutions. Sekisui Chemical has unveiled ambitious plans to commission a 100 MW per year roll-to-roll manufacturing line by 2027, with a further goal of scaling up to gigawatt (GW) capacity by 2030. Oxford PV, already a frontrunner, commenced commercial shipments of its perovskite-silicon tandem solar cell modules in September 2024 and is targeting 26% module efficiency with a 20-year product warranty by 2027. Furthermore, Hanwha Solutions announced in July 2026 that its perovskite-silicon tandem technology received crucial international reliability certifications from IEC and UL, strongly positioning its products for market trust and adoption.

Technical Details

Sekisui Chemical's roll-to-roll manufacturing line is designed for continuous printing of perovskite layers onto flexible substrates, enabling low-cost, high-volume production. This technology is essential for bringing lightweight, conformable perovskite films to market. Oxford PV's tandem modules are engineered to transcend the efficiency limits of conventional silicon solar cells, delivering significantly higher power conversion rates. The company is focusing on proprietary encapsulation techniques and material enhancements to ensure long-term device stability, supporting its ambitious 20-year warranty target. The IEC and UL certifications obtained by Hanwha Solutions are vital, as they validate that solar products meet international standards for safety, performance, and durability, thus reducing market entry barriers and fostering customer confidence.

Background and Context

Perovskite solar cells are widely acclaimed as a next-generation technology poised to replace or augment silicon photovoltaics, primarily due to their superior efficiency, potential for low-cost manufacturing, and inherent flexibility. However, scaling laboratory-level achievements to industrial production and ensuring long-term reliability, alongside obtaining international certifications, have been critical prerequisites for commercial success. The recent announcements from these leading companies clearly indicate that perovskite technology is steadily overcoming these challenges and transitioning into a full-fledged market deployment phase. The competitive landscape, where each company leverages distinct strengths (mass production technology, high-efficiency tandems, international certifications), is expected to further accelerate technological innovation.

Strategic Significance and Outlook

The concerted efforts by major corporations like Sekisui Chemical, Oxford PV, and Hanwha Solutions strongly suggest that perovskite solar cells are indeed becoming the 'new ceiling' for the photovoltaic market. Over the next few years, products aligned with these companies' roadmaps will enter the market, where their performance and cost competitiveness will be rigorously tested. Significant growth is anticipated in new application markets, including building-integrated photovoltaics (BIPV) leveraging flexibility and lightness, electric vehicles (EVs), and portable devices. The success of these companies is expected to complement existing solar markets and act as a powerful catalyst for accelerating the adoption of renewable energy globally. Investors and the energy sector will continue to closely monitor these developments.

Source: https://exoswan.com/perovskite-stocks

Collected: September 05, 2026 | Automated Research System (Gemini API)

#31 OAE Publishing Reports 25.39% Average Efficiency in Perovskite Solar Cells Through Hole Transport Layer Regulation of Polaron Formation

Published August 31, 2026 OAE Publishing Global

OVERVIEW

A new study published by OAE Publishing reveals that the chemical properties of the hole transport layer (HTL) significantly influence interface passivation, carrier migration, and polaron formation in perovskite solar cells. Specifically, using 2-PACz as the HTL achieved a high average power conversion efficiency of 25.39%. This finding clearly demonstrates that HTLs can effectively reduce non-radiative recombination losses, dramatically enhancing overall device performance.

IN DEPTH

Key Findings

In a recent study aimed at improving perovskite solar cell performance, it has been revealed that the chemical properties of the hole transport layer (HTL) exert a decisive influence on interface passivation, charge carrier migration, and the critical polaron formation mechanism. This research specifically demonstrates that by employing 2-PACz (bis(2-(diphenylphosphino)phenyl)phenylamine) as the HTL, a remarkably high average power conversion efficiency of 25.39% was achieved. This outcome highlights that precise HTL design is key to suppressing non-radiative recombination losses and significantly enhancing the overall performance of perovskite solar cells.

Technical Details

Polarons are quasiparticles formed when an electron or hole in a crystal lattice distorts its surrounding atoms; their formation and behavior directly impact charge transport and recombination. The research team discovered that 2-PACz, compared to other common HTL materials, optimally controls polaron formation at the perovskite layer interface. Due to its molecular structure and electronic properties, 2-PACz efficiently extracts holes from the perovskite layer while simultaneously passivating defect states at the interface. This passivation effect leads to ideal energy band alignment and suppresses non-radiative recombination processes. Consequently, both the open-circuit voltage (Voc) and fill factor (FF) are increased, resulting in a dramatic improvement in overall power conversion efficiency, which has been verified through consistent theoretical predictions and experimental results.

Background and Context

Perovskite solar cells are considered next-generation technology with high-efficiency potential exceeding silicon solar cells, but challenges at the interfaces between charge transport layers (ETL and HTL) and the perovskite layer have been primary limiting factors for performance and stability. The HTL, in particular, plays a crucial role in efficiently extracting holes generated in the perovskite layer and simultaneously protecting against degradation from the external environment. Previous research often required doping in many HTL materials, which presented challenges for long-term stability and manufacturing costs. This study highlights the potential of new HTL materials like 2-PACz to achieve high efficiency without doping, marking a significant step towards the practical application of perovskite solar cells.

Strategic Significance and Outlook

The successful control of polaron formation and high-efficiency achievement using 2-PACz as an HTL offers a new direction for perovskite solar cell design strategies. Future work is expected to focus on further optimizing this HTL material and applying it to large-area devices and tandem solar cells. The ability to achieve high efficiency without doping will simplify manufacturing processes and reduce costs, acting as a powerful accelerator for the commercialization of perovskite solar cells. This technology is anticipated to contribute to the realization of higher-performance and more stable solar cells, thereby promoting the global adoption of clean energy.

Source: https://www.oaepublish.com/articles/energyz.2026.27

#32 Nanjing University and Renshine Solar Set World Record with 24.0% Certified Efficiency for 810 cm^2 Large-Area Perovskite Solar Modules

Published August 31, 2026 Tech Frontier Vault China

OVERVIEW

A research team from Nanjing University and Renshine Solar in China has achieved a world-record power conversion efficiency of 24.0% for a large-area perovskite solar cell module with an aperture area of 810 cm^2. This breakthrough was realized through an effective passivation strategy utilizing a chemically stable lead carboxylate passivator (LCP). Achieving high efficiency on such a large scale significantly contributes to the practical application of perovskite solar cells and the reduction of solar power generation costs.

IN DEPTH

Key Findings

A collaborative research team from Nanjing University and Renshine Solar in China has announced a groundbreaking achievement in perovskite solar cell modules. They established a new world record in this field by achieving a certified power conversion efficiency of 24.0% on a remarkably large module with an aperture area of 810 cm^2. This record is particularly significant because it was achieved on a large-area module, closer to commercial utility, rather than small laboratory-scale cells, indicating substantial progress in the industrial application of perovskite technology.

Technical Details

The attainment of this world record was primarily enabled by an innovative passivation strategy that employed a chemically stable lead carboxylate passivator (LCP). The LCP effectively passivates defects present on the surface and at the grain boundaries of the perovskite material, thereby suppressing non-radiative recombination losses of charge carriers. This leads to an improvement in the open-circuit voltage (Voc) and fill factor (FF) of the device, minimizing the efficiency drop typically associated with scaling up to larger areas. The research team confirmed that the introduction of LCP enhances the stability of the perovskite layer and also improves the robustness of the manufacturing process. This technology is likely compatible with industrially scalable thin-film deposition techniques such as spin coating or slot-die coating.

Background and Context

Perovskite solar cells hold immense promise as a next-generation photovoltaic technology due to their high photoelectric conversion efficiency and potential for low-cost manufacturing. However, despite achieving high efficiencies in small-area cells, a long-standing challenge has been the decline in efficiency when scaling up to large-area modules. This is typically attributed to issues like non-uniformity, increased defect density, and higher resistive losses as the area grows. The achievement by Nanjing University and Renshine Solar represents a crucial technical breakthrough in overcoming this scale-up bottleneck, which is essential for accelerating the commercialization of perovskite solar cells. The Chinese government has prioritized the development of renewable energy technologies, and this achievement will contribute to strengthening the competitiveness of China's solar power industry.

Strategic Significance and Outlook

The achievement of 24.0% efficiency on an 810 cm^2 large-area module clearly paves the way for the practical application of perovskite solar cells in large-scale solar farms and building-integrated photovoltaics (BIPV). The LCP passivation strategy is likely to become a key element in future perovskite module designs. The research team aims to further optimize this technology, improve long-term reliability, and further reduce manufacturing costs. Consequently, perovskite solar cells are expected to significantly contribute to the global energy transition as a replacement or complementary technology to conventional silicon solar cells, accelerating the widespread adoption of solar power.

Source: https://www.facebook.com/PakSolarServices/posts/%EF%B8%8F-chinese-scientists-achieve-record-breaking-240-efficiency-for-large-area-perov/1624028436400540/

Collected: September 05, 2026 | Automated Research System (Gemini API)

#33 Highly Efficient and Stable Perovskite/Silicon Tandem Solar Cells Achieve 32.66% Efficiency and 91% Output Retention After 1000 Hours via Surface-Initiated Gradient Doping

Published September 03, 2026 Energy & Environmental Science Global

OVERVIEW

A surface-initiated gradient doping strategy using RbF treatment has been developed to improve the operational stability of wide-bandgap mixed-halide perovskites, achieving a high efficiency of 32.66% in perovskite/silicon tandem solar cells. This technique effectively addresses two major instability mechanisms—halide phase segregation and δ-phase impurity formation—demonstrating excellent stability with 91% retention of initial efficiency after 1000 hours of continuous maximum power point tracking (MPPT) operation.

IN DEPTH

Key Findings

To dramatically enhance the performance and stability of perovskite/silicon tandem solar cells, a novel 'surface-initiated gradient doping' strategy using RbF treatment has been developed for wide-bandgap mixed-halide perovskites. This innovative approach has enabled tandem devices to achieve an exceptionally high power conversion efficiency of 32.66%. Furthermore, the technology significantly improves operational stability, demonstrating remarkable durability with 91% retention of initial efficiency after 1000 hours of continuous maximum power point tracking (MPPT) operation under 1 sun illumination. This breakthrough addresses one of the most critical barriers to the practical application of perovskite solar cells.

Technical Details

Wide-bandgap mixed-halide perovskites are essential for achieving high efficiency as the top cell in perovskite/silicon tandem solar cells, but they have faced two major challenges: halide phase segregation and the formation of unstable δ-phase impurities under illumination. The RbF (rubidium fluoride) treatment-based gradient doping developed by the research team creates a rubidium ion concentration gradient from the surface to the interior of the perovskite layer, fundamentally resolving these instability mechanisms. Rubidium ions passivate defects within the crystal lattice and suppress halide ion migration, thereby preventing phase segregation. Additionally, the stabilization of the crystal structure inhibits δ-phase formation caused by photodegradation. This ensures the stable maintenance of the device's open-circuit voltage (Voc) and fill factor (FF), leading to a harmonious achievement of high efficiency and long-term stability.

Background and Context

Perovskite/silicon tandem solar cells are globally recognized as the most promising next-generation photovoltaic technology capable of surpassing the theoretical efficiency limits of current silicon solar cells. However, for their widespread commercialization, maintaining high efficiency while ensuring long-term operational stability in outdoor environments has been imperative. Specifically, wide-bandgap perovskites used in the top cell have been prone to instability due to their complex composition, which has been a major bottleneck for the practical deployment of tandem cells. This research offers a highly effective solution to this core challenge through precise material engineering and interface control, generating significant anticipation and impact within the solar industry.

Strategic Significance and Outlook

The 32.66% efficiency and outstanding stability achieved through this surface gradient doping strategy possess significant potential to accelerate the commercialization of perovskite/silicon tandem solar cells. The next step will involve scaling up this technology to large-area modules and conducting long-term outdoor field tests. If this breakthrough is successfully established, the cost-effectiveness of solar power generation systems will dramatically improve, fostering broader adoption of renewable energy in a wider range of regions. In the long term, it is expected to revolutionize the existing solar market and contribute substantially to the creation of a more energy-efficient and sustainable society.

Source: https://pubs.rsc.org/ee/article/doi/10.1039/d6ee04055a/1298223/Surface-initiated-gradient-doping-for-efficient?searchresult=1

#34 Becquerel and Ximu Technology Partner to Accelerate Perovskite Material Development with AI

Published August 29, 2026 Perovskite-Info China

OVERVIEW

Becquerel has formed a strategic alliance with Ximu Technology, an AI for Science (AI4S) solution provider, to collaboratively develop highly efficient and stable perovskite materials. This partnership aims to dramatically accelerate material screening and device performance optimization by integrating AI4S methodologies into perovskite solar cell technology. Following a broader trend of Chinese solar manufacturers and material developers partnering with AI4S firms, this collaboration represents a significant step towards data-driven innovation in next-generation solar cells.

IN DEPTH

Key Findings

Becquerel has entered into a strategic cooperation agreement with Ximu Technology, a leading AI for Science (AI4S) solutions provider, for the joint development of high-efficiency and stable perovskite materials. This partnership seeks to leverage the power of artificial intelligence to revolutionize the discovery and optimization processes for next-generation solar cell technologies, aiming for accelerated innovation in the field.

Technical / Clinical Details

At the core of this collaboration is the integration of AI4S methodologies into the perovskite solar cell research and development pipeline. Specifically, AI will be employed to analyze vast datasets of material properties, predicting optimal perovskite compositions and synthesis routes. This data-driven approach is expected to significantly shorten the traditional trial-and-error experimental cycles, thereby expediting material screening and accelerating the optimization of device performance. AI's capability to simultaneously consider diverse parameters, such as stability, conversion efficiency, and manufacturability, holds the potential to uncover novel material combinations and underlying mechanisms that might be overlooked by human researchers. This paradigm shift promises substantial reductions in development time and associated costs.

Background & Context

Perovskite solar cells are widely regarded as one of the most promising candidates for future energy technologies, owing to their high power conversion efficiency and potential for low-cost manufacturing. However, their commercialization has been hindered by challenges in ensuring long-term stability and the time-consuming, resource-intensive nature of material discovery and optimization. In recent years, the application of AI in materials science has rapidly advanced, particularly in China, where solar cell manufacturers and material developers are actively partnering with AI4S companies to overcome these technical hurdles. The alliance between Becquerel and Ximu Technology is a direct reflection of this growing trend towards data-driven innovation in the renewable energy sector.

Strategic Significance & Outlook

The utilization of AI in perovskite material development has the potential to dramatically enhance the efficiency of new material discovery, serving as a critical breakthrough for accelerating commercialization. If this partnership successfully brings more stable and higher-performing perovskite solar cells to market sooner, it will contribute to further cost reductions and broader adoption of solar photovoltaics. Looking ahead, there is potential for AI to facilitate fully automated R&D platforms that optimize everything from material design to manufacturing processes. This would elevate solar PV technology to a new dimension, acting as a powerful driving force for its continued evolution and wider impact on global clean energy initiatives.

Source: https://www.perovskite-info.com/becquerel-and-ximu-technology-partner-ai-driven-perovskite-material-development

Collected: September 05, 2026 | Automated Research System (Gemini API)

#35 Perovskite Solar Cells Achieve 25.7% Single-Junction and 29.8% Tandem Efficiencies Certified by NREL, Industry Focuses on Stability and Certification for Commercialization

Published Published August 31, 2026 Solar Plus Garden クロアチア

OVERVIEW

Perovskite solar cells are rapidly advancing, with NREL certifying 25.7% efficiency for single-junction cells and lab-based perovskite-silicon tandems achieving 29.8% by 2026. These breakthroughs position perovskites as a leading next-generation PV technology, despite ongoing challenges related to long-term stability. Crucially, evolving certification standards, such as IEC 61646, are adapting to perovskite's unique properties, highlighting the importance of tailored R&D and certification pathways for successful commercialization.

IN DEPTH

Background

The global photovoltaic industry is relentlessly pursuing innovation beyond conventional silicon technology to achieve superior efficiencies, substantial cost reductions, and greater adaptability across various installation environments. Perovskite solar cells, boasting high theoretical efficiency limits and the promise of low-cost, solution-based manufacturing, have rapidly emerged as a prime contender to fulfill these critical demands. Tandem architectures, especially those integrating perovskites, are strategically positioned as a transformative technology, capable of surpassing the inherent efficiency limitations of standalone silicon solar cells. The recent NREL-certified efficiency records underscore the vigorous research and development efforts in perovskite technology and the continuous stream of breakthroughs. Concurrently, establishing robust reliability is indispensable for market entry, making rigorous evaluations by independent certification bodies crucial for widespread adoption.

Key Findings

By 2026, perovskite solar cell technology has achieved remarkable advancements in efficiency. Single-junction perovskite solar cells have reached a power conversion efficiency of 25.7%, validated by the U.S. National Renewable Energy Laboratory (NREL). Moreover, tandem solar cells, which combine perovskite and crystalline silicon layers, have demonstrated even higher efficiencies, achieving 29.8% in controlled laboratory settings, unequivocally highlighting their significant potential as a transformative next-generation solar technology.

The achieved 25.7% efficiency in single-junction perovskite solar cells is a direct result of continuous breakthroughs in material science and sophisticated device architecture optimization. These advancements capitalize on perovskite materials' superior light absorption capabilities and enhanced charge carrier transport layers. For tandem solar cells, the impressive 29.8% efficiency stems from an optimized design where the perovskite top cell efficiently captures shorter-wavelength photons, while the silicon bottom cell absorbs the longer-wavelength light. This synergistic approach maximizes the utilization of the entire solar spectrum, thereby surpassing the inherent theoretical efficiency limits of single-junction devices. However, despite these significant efficiency gains, perovskite solar cells continue to grapple with critical challenges related to long-term stability against environmental stressors such as moisture, elevated temperatures, and ultraviolet (UV) radiation. These stability concerns currently impede their widespread commercial deployment. To mitigate these issues, thin-film PV module certification processes, notably IEC 61646, are undergoing continuous evolution. These updated standards now integrate rigorous testing protocols specifically tailored for perovskite material characteristics, encompassing tests for humidity-freeze resilience, mechanical load durability, and temperature cycling, alongside comprehensive electrical performance evaluations.

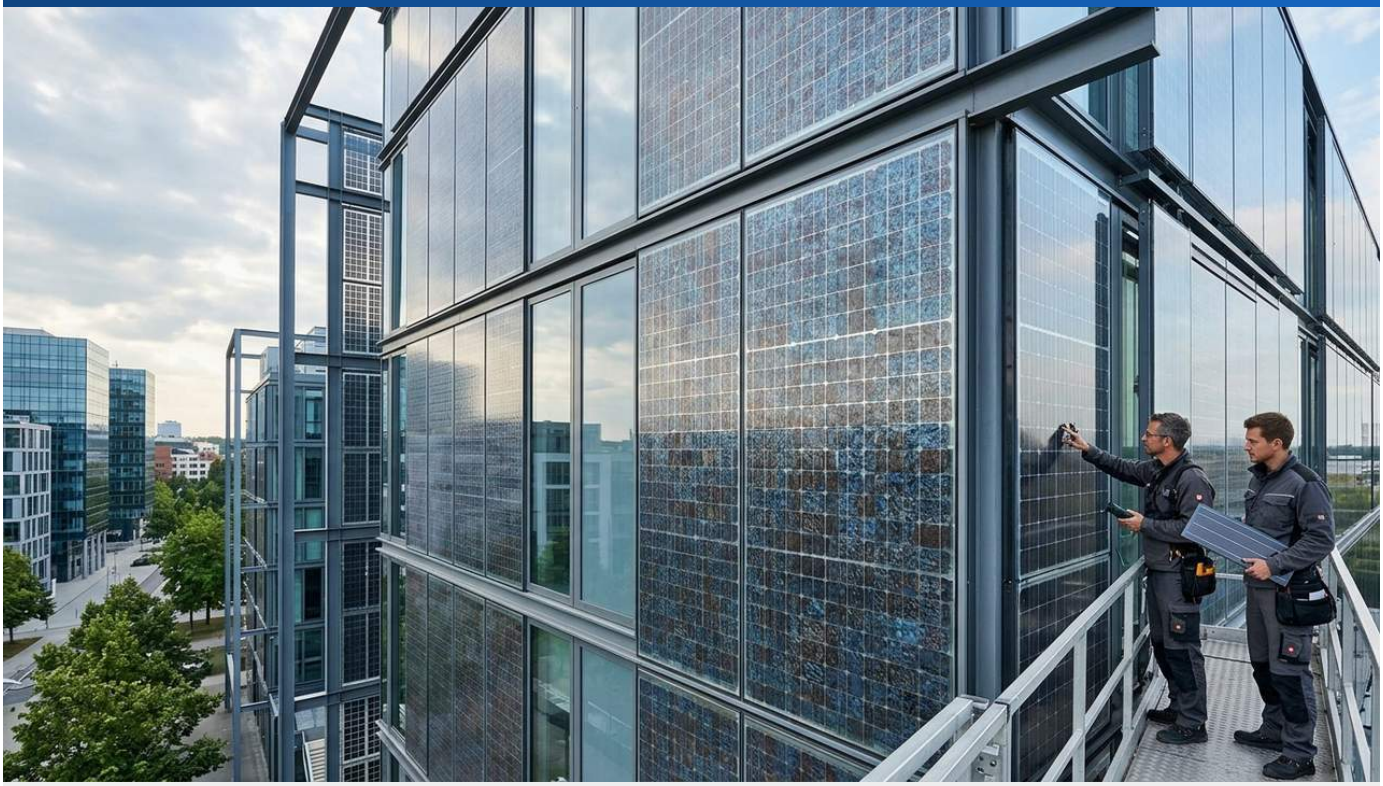
The current record-high efficiencies demonstrated in both single-junction and tandem perovskite solar cells possess the transformative potential to redefine the future landscape of solar power. Once persistent stability challenges are comprehensively addressed and perovskite-based products achieving international certification standards are ready for mass production, their applications are anticipated to extend far beyond traditional residential, commercial, and utility-scale solar farms. They are poised for integration into diverse innovative fields such as Building-Integrated Photovoltaics (BIPV), advanced flexible devices, and compact power sources for Internet of Things (IoT) applications. The ongoing evolution and adaptation of certification processes represent a pivotal stride towards establishing this technology as a safe, reliable, and commercially viable product. This trajectory suggests a high probability that perovskite solar cells will secure a significant market share in the renewable energy sector within the next few years, thereby making substantial contributions to global energy transition objectives.

Source: https://solarplusgarden.com/sr/perovskite-solar-cells/

Collected: September 05, 2026 | Automated Research System (Gemini API)

#36 GCL Perovskite and Wuhan Lingyun Partner for Joint Development of BIPV Curtain Walls and PV Windows

Published September 04, 2026 Perovskite-Info China



OVERVIEW

GCL Perovskite has signed a strategic cooperation agreement with Wuhan Lingyun Architectural Decoration Engineering to jointly develop perovskite Building-Integrated Photovoltaics (BIPV) curtain walls and PV windows. This partnership encompasses R&D, product supply, EPC contracts, and market development. Leveraging GCL Perovskite's gigawatt-scale production capacity and BIPV product portfolio with Wuhan Lingyun's expertise in architectural curtain wall design, manufacturing, and construction, the collaboration aims to accelerate the creation of innovative perovskite PV products for low-carbon public and ultra-low energy buildings, signifying a major expansion of China's perovskite BIPV market.

IN DEPTH

Key Findings

GCL Perovskite has entered into a strategic cooperation agreement with Wuhan Lingyun Architectural Decoration Engineering Co., Ltd., a major Chinese architectural decoration company. This partnership aims to jointly research and develop, supply, execute EPC (Engineering, Procurement, and Construction) contracts, and market perovskite-integrated Building-Integrated Photovoltaics (BIPV) curtain walls and PV windows. This collaboration is expected to significantly accelerate the application of perovskite technology in construction materials.

Technical / Clinical Details

Under this partnership, GCL Perovskite will contribute its expertise in perovskite solar cell technology, along with its gigawatt-scale production capacity and existing BIPV product portfolio. Wuhan Lingyun, in turn, brings its extensive experience and specialized knowledge in the design, manufacturing, and construction of architectural curtain walls. By combining their respective strengths, the two companies aim for the following product development and market expansion:

- **Perovskite BIPV Curtain Walls:** Development of architectural façade materials with power generation capabilities, designed to replace conventional glass curtain walls. These products will offer customizable light transmittance and color tones, balancing aesthetic design with energy functionality.
- **Perovskite PV Windows:** Creation of transparent or semi-transparent windows that can generate electricity. These will contribute to improving the energy self-sufficiency of buildings.
- **Joint R&D:** Collaborative efforts to advance research on the stability, durability, and aesthetic integration of perovskite materials specifically for architectural applications.
- **Market Development:** Accelerated introduction of perovskite BIPV products into high-value markets, such as low-carbon public buildings and ultra-low energy buildings.

This collaboration will enable the seamless integration of diverse perovskite solar cell forms into buildings, paving a new way to harmonize urban landscapes with energy generation.

Background & Context

With global sustainable urban development and decarbonization efforts accelerating, there is increasing demand for BIPV technologies, where buildings themselves generate energy. Perovskite solar cells are particularly well-suited for BIPV applications due to their advantages over traditional silicon PV, including lightweight properties, flexibility, tunable transparency, and color versatility. China, with its enormous construction market, is actively pursuing the development and deployment of BIPV technology. Partnerships between major players like GCL Perovskite and Wuhan Lingyun are poised to significantly drive innovation and market expansion in this sector. This move underscores the potential for perovskite solar cells to create new value as architectural materials, beyond simply being power-generating devices.

Strategic Significance & Outlook

The alliance between GCL Perovskite and Wuhan Lingyun symbolizes the anticipated take-off of the perovskite BIPV market in China. The combination of gigawatt-scale manufacturing capacity and architectural industry expertise is expected to enable the large-scale provision of high-quality and cost-effective perovskite BIPV products. This will accelerate the reduction of energy consumption and the adoption of renewable energy in urban buildings, contributing significantly to China's carbon neutrality goals. In the long term, this partnership has the potential to establish standards for perovskite technology in the global BIPV market, bringing new design possibilities and environmental value to buildings worldwide.

Source: https://www.perovskite-info.com/gcl-perovskite-partners-wuhan-lingyun-bipv-curtain-walls-and-pv-windows

Collected: September 05, 2026 | Automated Research System (Gemini API)

#37 SNS Insider Report: Perovskite Solar Cell Market Projected to Reach $73 Billion by 2035 with 69.45% CAGR

Published September 03, 2026 SNS Insider International

OVERVIEW

This article provides an overview of a market research report published by SNS Insider. The global perovskite solar cell market is projected to grow from $376.7 million in 2025 to $73 billion by 2035, exhibiting an extraordinary Compound Annual Growth Rate (CAGR) of 69.45% between 2026 and 2035. This rapid growth is driven by increasing demand for high-efficiency renewable energy technologies, superior light absorption capabilities, high energy conversion efficiency, lightweight nature, and flexibility of perovskites. In 2026, Oxford PV reportedly signed a patent licensing agreement with First Solar for perovskite technology in the U.S. market, supporting tandem solar cell commercialization.

IN DEPTH

This article provides an overview of a market research report published by SNS Insider.

Report Overview

The market research report by SNS Insider offers a detailed analysis of the current status and future growth trajectories of the global perovskite solar cell market. The study covers the forecast period from 2026 to 2035, encompassing market size, growth rates, key driving factors, and regional market dynamics.

Key Findings

- **Market Size:** The global perovskite solar cell market, valued at $376.7 million in 2025, is projected to expand significantly, reaching an impressive $73 billion by 2035.
- **Growth Rate (CAGR):** The market is anticipated to exhibit an exceptionally high Compound Annual Growth Rate (CAGR) of 69.45% over the forecast period from 2026 to 2035.
- **Growth Drivers:** Key factors fueling this growth include the escalating global demand for high-efficiency renewable energy technologies, the superior light absorption capabilities of perovskite materials, their high energy conversion efficiency compared to existing technologies, and their inherent lightweight and flexible properties.
- **Key Player Dynamics:** The report also analyzes the activities of major market players, notably highlighting that in 2026, Oxford PV entered into a patent licensing agreement with First Solar for perovskite technology tailored for the U.S. market, thereby providing robust support for the commercialization of tandem solar cells.

About the Publisher

SNS Insider is a global market research and consulting firm that provides comprehensive market intelligence reports across various industries worldwide. Their reports are based on deep market insights and data-driven analysis, offering crucial information for businesses to make strategic decisions.

Source: https://www.dqindia.com/semiconductors/perovskite-solar-cells-market-to-grow-at-6945-cagr-

to-reach-usd-73-billion-by-2035-12480005

#38 Oxford PV Achieves 26.9% Efficiency in Residential Panels; University of Queensland Sustains 16.65% Lead-Free Perovskite for Over 1000 Hours

Published August 29, 2026 Facebook UK/Australia

OVERVIEW

Oxford PV, an Oxford University spin-off, has recorded a remarkable 26.9% efficiency in residential-sized solar panels by integrating innovative perovskite with traditional silicon. Concurrently, a University of Queensland research team achieved 16.65% efficiency in tin-based, lead-free perovskite cells stabilized with antioxidants, maintaining performance for over 1,000 hours. These advancements highlight perovskite solar cells' dual evolution towards higher efficiency and reduced environmental impact, addressing key industry challenges.

IN DEPTH

Key Findings

Oxford PV, a pioneering spin-off from Oxford University, has achieved a record-breaking 26.9% conversion efficiency for residential-sized solar panels, demonstrating the practical superiority of perovskite technology. Simultaneously, a research team at the University of Queensland in Australia successfully developed a tin-based, lead-free perovskite solar cell that maintained 16.65% efficiency and stable performance for over 1,000 hours, secured through the addition of an antioxidant. These dual achievements signify that perovskite solar cells are advancing not only in efficiency but also in addressing environmental concerns and long-term reliability.

Technical / Clinical Details

Oxford PV's 26.9% efficient panel utilizes a tandem structure where a perovskite layer is stacked on top of existing silicon solar cell technology. This 'miracle material' perovskite efficiently absorbs shorter-wavelength light that silicon struggles with, dramatically boosting the overall photoelectric conversion efficiency. This approach enables the utilization of a broader portion of the solar spectrum, maximizing power generation per unit area. In parallel, the University of Queensland's research focused on lead-free perovskites, primarily using tin (Sn), which are crucial for addressing environmental toxicity concerns. The main challenge with tin-based perovskites has been their susceptibility to oxidation, leading to stability degradation. The research team successfully mitigated this by incorporating antioxidants (e.g., specific organic molecules or inorganic salts), which inhibited tin oxidation and significantly improved cell stability. This resulted in a breakthrough for lead-free perovskites, demonstrating 16.65% efficiency while maintaining nearly initial performance for over 1,000 hours.

Background & Context

Perovskite solar cells are considered a next-generation technology with the potential for higher efficiency and lower manufacturing costs than silicon PV. Oxford PV's achievement proves that this technology can deliver high performance not just at a laboratory scale but also in practical residential applications. Research into lead-free perovskites is essential to alleviate concerns about the toxicity of lead traditionally used in perovskite materials. The University of Queensland's breakthrough represents a crucial step towards developing environmentally friendly yet commercially viable perovskite solar cells. These advancements collectively underscore the evolution of solar PV technology in both efficiency and sustainability, influencing the overall direction of the industry.

Strategic Significance & Outlook

Oxford PV's 26.9% efficient residential panels will contribute to reducing the installation footprint of solar power systems and increasing energy yield, thereby improving the cost-effectiveness of home energy solutions. This could accelerate the adoption of residential solar PV. The enhanced stability of the University of Queensland's lead-free technology addresses environmental concerns surrounding perovskite solar cells, fostering broader market acceptance. As these technologies scale up for mass production and become cost-competitive, perovskite solar cells are expected to play a significant role as an alternative or complement to conventional silicon solar cells in the renewable energy market. Particularly, the dual achievement of lead-free composition and high efficiency will be a powerful driver toward realizing a sustainable energy future.

Source: https://www.facebook.com/61568056864905/posts/lead-free-perovskite-solar-cells-are-proving-they-can-compete-with-toxic-version/122112687080601895/

Collected: September 05, 2026 | Automated Research System (Gemini API)