Perovskite solar

Weekly Intelligence Report

2026-09-13 ¦ 24 articles ¦ 6 countries

troy-technical.jp

This Week's Keyword

Perovskite Solar

Efficiency & Stability Records, Commercialization Push

24	6	35.5	20
articles	countries	%	GW
Total Articles Analyzed	Source Countries	Highest Efficiency Record	Japan Perovskite Target

All 24 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	Japan Pivots Solar Strategy	Corp. Strategy	3	4	4	3	4	Japan shifts subsidies from silicon to perovskite, targeting 20 GW by 2040, leveraging iodine.
#02	Lead-Free Tin Perovskite	Research	4	2	3	4	4	UW-Madison develops lead-free tin perovskite cells with 16.2% efficiency and intrinsic stability.
#03	Chinese Perovskite-Org	Research	4	2	3	4	3	Nanjing University achieves 27.35% efficiency for perovskite-organic tandem cell with 744h stability.
#04	KIER Perovskite/CIGS	Research	4	2	4	4	4	KIER sets world record 26.7% efficiency for perovskite/CIGS tandem cells, verified by Fraunhofer.
#05	Tin-Based Perovskite Review	Review	2	1	2	4	3	Review synthesizes advancements in tin-based perovskites, addressing stability for lead-free PV.
#06	Lead-Free Layered Perov	Review	2	1	2	4	3	Review provides structural roadmap for developing stable, high-performance lead-free layered perovskites.
#07	Solar Funding Priorities	Market Overview	1	3	3	3	4	Solar research funding priorities for 2026-27 focus on 25%+ perovskite tandem efficiency and scalable manufacturing.
#08	China Large-Area Perov	Research	4	3	4	4	4	Nanjing Uni/Renshine Solar achieve 24.0% efficiency for 810 cm^2 perovskite module via passivation.
#09	RenShine All-Perov Tandem	New Product	4	3	4	4	4	RenShine Solar sets 26.4% efficiency record for 809 cm^2 all-perovskite tandem module from pilot line.
#10	China Tax Exemption	Corp. Strategy	3	4	4	3	4	China exempts perovskite and tandem solar cells from consumption tax until 2028, boosting commercialization.
#11	LONGi 35.5% Tandem Record	New Product	4	4	4	4	4	LONGi sets 35.5% perovskite-silicon tandem cell record, approves 100MW pilot line for production.
#12	LONGi/Soochow 34.0% Stab	Research	4	2	4	4	3	LONGi/Soochow Uni achieve 34.0% perovskite-silicon tandem efficiency with 2,000h stability via ZrO_2 interface.
#13	Nanjing Perovskite-Org	Research	4	2	3	4	3	Nanjing University achieves 27.35% efficiency for perovskite-organic tandem cell with 744h stability.
#14	HZB All-Perovskite Triple	Research	4	2	4	4	4	HZB achieves 27.3% efficiency, 770h 90% stability in all-perovskite triple-junction cell with graphene oxide interface.

#	Article Title	Type	Tech Novelty	Market Proximity	Market Impact	Data Reliability	US/EU Relevance	Summary
#15	Nanjing/Renshine Large	Research	●●●●	●●●○	●●●●	●●●●	●●●●	Nanjing Uni/Renshine Solar achieve 24.0% efficiency for 810 cm² perovskite module via LCPs passivation.
#16	KIER Perovskite/CIGS	Research	●●●●	●●○○	●●●●	●●●●	●●●●	KIER sets world record 26.7% efficiency for perovskite/CIGS tandem cells, targeting flexible applications.
#17	Japan Tin Perovskite Dur	Research	●●●●	●●○○	●●●○	●●●●	●●●○	Japanese researchers boost tin perovskite durability to 84.94% retention after 100 days with 9.07% PCE.
#18	China Inverted Perovskite	Research	●●●●	●●○○	●●●○	●●●●	●●●○	Chinese researchers achieve 27.39% efficiency for inverted perovskite solar cell via novel molecular design.
#19	Nanjing/Renshine Large	Research	●●●●	●●●○	●●●●	●●●●	●●●●	Nanjing Uni/Renshine Solar set 24.0% efficiency record for 810 cm² perovskite module.
#20	Oxford PV Commercializes	New Product	●●●●	●●●●	●●●●	●●●●	●●●●	Oxford PV secures $239M, ships commercial tandem modules to US, and licenses tech to Trinasolar/First Solar.
#21	German Credoxys p-Dopant	Corp. Strategy	●●●○	●●●○	●●●○	●●●○	●●●●	German firm Credoxys secures Series A funding for p-dopant tech for OLEDs and perovskite solar cells.
#22	US DOE Perovskite Storage	Research	●●●●	●●○○	●●●○	●●●○	●●●●	US DOE project uses perovskite particles for cost-effective thermochemical solar energy storage in CSP systems.
#23	Dinto Solar HJT & Perov	Corp. Strategy	●●●●	●●●●	●●●●	●●●○	●●●●	Dinto Solar targets 30%+ HJT/perovskite-HJT tandem efficiency, secures major Chinese power procurement wins.
#24	German Quantum Perovskite	Research	●●●●	○○○○	●●○○	●●●○	●●●●	German funding supports LMU's quantum research on perovskite modules, exploring applications beyond solar cells.

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

Three Questions That Demand Your Decision This Week

❶ Is your PV strategy ready for 35%+ efficiency?

LONGi's 35.5% perovskite-silicon tandem record and 100MW pilot line, alongside Oxford PV's commercial shipments, signal a rapid shift. Does your product roadmap incorporate next-gen tandem cells, or will you be outcompeted?

❷ How will China's PV policies impact your supply chain?

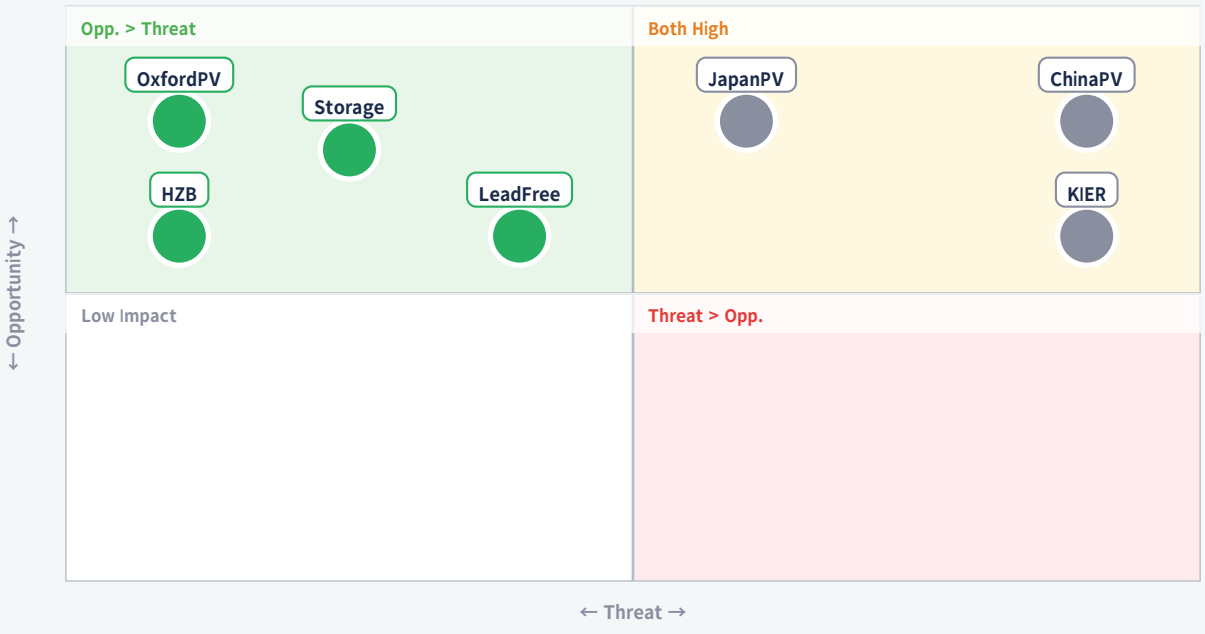
China's tax exemption for perovskite/tandem cells and aggressive domestic procurement (Dinto Solar) will accelerate their market dominance. Are your procurement and sales teams prepared for this intensified competition and potential supply chain shifts?

❸ Are you investing in lead-free perovskite alternatives?

US and Japanese breakthroughs in stable, lead-free tin perovskites address a critical environmental hurdle. Ignoring this could expose your future products to regulatory risks and limit market acceptance in sustainability-conscious regions.

Opportunities vs. Threats for US/European Companies

Opportunity vs. Threat Matrix for US/European Companies



Item	Quadrant	↑ Opportunity	↓ Threat
ChinaPV	Critical	Tech licensing	Market dominance
JapanPV	Critical	New market	Localized supply
OxfordPV	Opp.	Partner, acquire IP	Missed leadership
LeadFree	Opp.	Sustainable tech	Lagging R&D;
KIER	Critical	Partner, compete	Market share loss
HZB	Opp.	Research partner	Slow adoption
Storage	Opp.	New market, IP	Niche focus

Deep Dive ① — LONGi's 35.5% Tandem Record & Pilot Line

#11 ¦ 2026/09/03 ¦ pv magazine ¦ Tech Novelty●●●●● Proximity●●●●○ Market Impact●●●●● Data Reliability●●●●● US/EU Relevance●●●●○

LONGi achieved an ESTI-certified world record of 35.5% efficiency for its perovskite-silicon tandem solar cell, demonstrating rapid advancement. They also reported 31.4% for 0.17m ² and 29.4% for 1.7m ² modules.

The company approved a 100 MW pilot production line, signaling a critical transition from R&D; to industrial-scale manufacturing for these next-generation high-efficiency photovoltaics.

▶ Strategic Analyst's Perspective

Strategic Analyst's Perspective: Published numbers are highly credible given ESTI certification and LONGi's track record. The 1.7m ² module at 29.4% is particularly realistic for near-term commercialization. Technical barriers include long-term stability under diverse real-world conditions and further cost reduction for mass production. [Opportunity] for US/EU materials & equipment suppliers to integrate into LONGi's supply chain or license complementary IP. [Threat] for US/EU OEMs as LONGi gains a significant efficiency lead, potentially making existing silicon platforms less competitive. Next Actions: [R&D;] Benchmark LONGi's module performance and stability data. [Strategy] Evaluate licensing opportunities or M&A; targets in perovskite tandem technology. [Procurement] Assess future material needs for tandem cells.

Deep Dive ② — Oxford PV Commercializes Tandem Cells

#20 ¦ 2026/09/03 ¦ Tracxn ¦ Tech Novelty●●●●○ Proximity●●●●● Market Impact●●●●● Data Reliability●●●●○ US/EU Relevance●●●●●

UK-based Oxford PV secured $239M, began commercial perovskite-on-silicon tandem module shipments to a US customer in Sept 2024, and signed licensing deals with Trinasolar (Apr 2025) and First Solar (Feb 2026).

These milestones confirm the technology's readiness for market and Oxford PV's pivotal role in pushing solar efficiency beyond traditional silicon, especially for space-constrained applications.

▶ Strategic Analyst's Perspective

Strategic Analyst's Perspective: The reported funding and commercial activities are highly realistic and verifiable. The key technical barrier overcome is translating lab efficiency into stable, manufacturable commercial modules. Remaining challenges include scaling production volume and further reducing costs to compete broadly. [Opportunity] for US/EU OEMs to partner with or license from Oxford PV to accelerate their own tandem roadmaps. [Threat] for US/EU OEMs who lack a clear perovskite tandem strategy, risking market share loss to licensees like First Solar or Trinasolar. Next Actions: [Business Dev] Initiate discussions with Oxford PV for potential partnerships or licensing. [Strategy] Analyze competitive implications of First Solar's licensing deal. [Procurement] Evaluate Oxford PV's module performance and supply chain.

Deep Dive ③ — Japan's Perovskite Solar Policy Shift

#01 ¦ 2026/09/03 ¦ pv magazine India ¦ Tech Novelty●●●○○ Proximity●●●●○ Market Impact●●●●● Data Reliability●●●○○ US/EU Relevance●●●●○

Japan's Ministry of Environment will remove conventional silicon solar panels from new subsidy programs starting FY2027, exclusively supporting next-gen perovskite solar cells.

This strategic shift aims for 20 GW of perovskite deployment by 2040, leveraging Japan's iodine resources to bolster industrial competitiveness and environmental targets.

▶ Strategic Analyst's Perspective

Strategic Analyst's Perspective: The policy announcement is highly realistic, reflecting a clear strategic intent. The 20 GW target by 2040 is ambitious but achievable with sustained government support. Technical barriers for Japan include scaling domestic perovskite manufacturing and ensuring long-term module stability. [Opportunity] for US/EU materials suppliers to provide key components (e.g., lead-free precursors, encapsulation materials) to the emerging Japanese perovskite industry. [Threat] for US/EU silicon PV manufacturers losing access to a significant Japanese market segment and facing increased competition from Japanese perovskite firms. Next Actions: [Strategy] Assess the impact of this policy on global PV supply and demand. [Business Dev] Explore partnerships with Japanese perovskite developers. [Procurement] Diversify supply chains to mitigate risks from regional policy shifts.

Other Notable Articles

China Exempts Perovskite/Tandem PV (TaiyangNews)
Tech Novelty●●●○○ Proximity●●●●● Market Impact●●●●●

China's tax exemption until 2028 provides a massive cost advantage, accelerating domestic commercialization.

HZB 27.3% All-Perovskite Triple-Junction (physicsworld.com)
Tech Novelty●●●●● Proximity●●○○○ Market Impact●●●●○

German research sets new efficiency and stability records for all-perovskite triple-junction cells, crucial for EU innovation.

Lead-Free Tin Perovskite 16.2% (University of Wisconsin – Madison)
Tech Novelty●●●●○ Proximity●●○○○ Market Impact●●●○○

US research addresses lead toxicity and stability, a key hurdle for widespread, sustainable perovskite adoption.

KIER 26.7% Perovskite/CIGS Tandem (KIER)
Tech Novelty●●●●○ Proximity●●○○○ Market Impact●●●●○

South Korea's record for flexible perovskite/CIGS tandems opens doors for BIPV, automotive, and space applications.

US DOE Perovskite Solar Storage (Department of Energy)
Tech Novelty●●●●○ Proximity●●○○○ Market Impact●●●○○

US DOE explores novel perovskite application for thermochemical solar energy storage, addressing intermittency.

Recommended Actions This Week

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

Immediate (this week)

- [Executive] Review China's tax exemption policy (#10) and Japan's subsidy shift (#1) to understand immediate competitive impacts.
- [R&D;] Benchmark LONGi's 35.5% tandem cell data (#11) and Oxford PV's commercial module specs (#20) against internal roadmaps.

Short-term (1 month)

- [Strategy] Analyze potential licensing or M&A; opportunities with leading perovskite developers (e.g., Oxford PV, or smaller EU/US startups).
- [Procurement] Identify alternative material suppliers for lead-free perovskite components, anticipating future regulatory pressures and market demand (#2, #17).
- [Business Dev] Initiate discussions with Japanese partners regarding their 20 GW perovskite deployment plan (#1).

Medium-long term (quarter+)

- [R&D;] Investigate perovskite applications beyond PV, such as thermochemical storage (#22) or quantum technologies (#24), to diversify long-term strategy.
- [Legal/IP] Conduct a comprehensive IP landscape analysis for perovskite tandem and lead-free technologies, particularly focusing on Chinese and Korean advancements.
- [Strategy] Develop a detailed competitive response plan to counter China's aggressive commercialization of high-efficiency perovskite modules.

Topic — Selected Articles

Date: 2026-09-13

Articles: 24

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#18 Chinese Researchers Set New World Record with 27.39% Efficient Inverted Perovskite Solar Cell via Novel Molecular Design, Independently Verified

#19 Nanjing University & Renshine Solar Set World Record: 24.0% Efficiency for 810 cm² Large-Area Perovskite Solar Module

#20 Oxford PV Secures $239M in Funding, Begins Commercial Tandem Module Shipments to US, and Forms Key Licensing Partnerships with Trinasolar and First Solar

#21 German Firm Credoxys Secures Series A Funding to Advance p-Dopant Technology for OLEDs and Perovskite Solar Cells, Eyes Asian Market Expansion

#22 US DOE Project Leverages Perovskite Particles for Cost-Effective Thermochemical Solar Energy Storage System

#23 Dinto Solar Accelerates Commercialization of HJT & Perovskite-HJT Tandem Cells, Targeting Over 30% Efficiency with Major Chinese Power Procurement Wins

#24 German Funding Boosts LMU's Quantum Research on Perovskite Modules, Exploring Novel Applications Beyond Solar Cells

#01 Japan Pivots Solar Strategy: New Subsidies Exclude Silicon, Prioritizing Perovskite for 20 GW by 2040

Published September 03, 2026 pv magazine India Japan

OVERVIEW

Japan's Ministry of the Environment will remove conventional silicon solar panels from new subsidy programs starting fiscal year 2027, signaling a strategic shift to prioritize next-generation perovskite solar cells. This initiative aims to bolster industrial competitiveness and achieve environmental targets, with the country targeting approximately 20 GW of perovskite deployment by 2040. Leveraging its significant iodine resources, Japan seeks to establish a leading position in advanced solar technology.

IN DEPTH

Background

Japan has long been a key player in the global solar energy market, but with increasing competition and the need for more advanced, sustainable solutions, its Ministry of the Environment has announced a significant policy redirection. This shift reflects a global trend towards embracing next-generation renewable energy technologies.

Key Findings

Starting in fiscal year 2027, Japan's new subsidy programs for solar energy will no longer include conventional silicon solar panels. Instead, the focus will exclusively be on supporting cutting-edge solar technologies, with a strong emphasis on perovskite solar cells. This strategic move is designed to enhance Japan's industrial competitiveness in the burgeoning advanced solar sector and to accelerate the achievement of its ambitious environmental objectives. A core component of this strategy is the country's plan to deploy approximately 20 GW of perovskite technology by 2040. Japan possesses significant iodine resources, which are crucial for perovskite manufacturing, and the government intends to leverage these domestic resources to support its industrial goals.

Significance & Outlook

This policy change positions Japan at the forefront of perovskite solar cell development and deployment. By concentrating public support, the government aims to de-risk investment in these novel technologies, foster innovation, and scale up domestic manufacturing capabilities. The target of 20 GW by 2040, supported by domestic iodine supplies, demonstrates a clear commitment to establishing perovskite technology as a major contributor to Japan's future energy mix. This move could also influence other nations to re-evaluate their solar energy subsidy frameworks, potentially accelerating the global transition towards more efficient and versatile solar power solutions.

Source: https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQHWaY_aFRfgCAb3fZa2b9MmSNs9cF7TJWRHi2jxnAfQKbFQbg_tSplegDxHvyLfXqTErwXkVX

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Collected: September 11, 2026 | Automated Research System (Gemini API)

#02 Lead-Free Tin Perovskite Solar Cells Achieve 16.2% Efficiency with Intrinsic Environmental Robustness

Published September 07, 2026 University of Wisconsin–Madison (news release) USA

OVERVIEW

Researchers at the University of Wisconsin–Madison have engineered tin-based perovskite solar cells with intrinsic protection against oxygen and moisture, achieving a 16.2% power-conversion efficiency. This represents one of the highest efficiencies for tin perovskites, demonstrating enhanced durability without compromising performance. Published in Nature Materials, this breakthrough offers a crucial design strategy for developing robust, non-toxic solar materials for future energy applications.

IN DEPTH

Background

Lead-halide perovskite solar cells have demonstrated remarkable efficiencies, but concerns regarding lead toxicity and stability issues in humid environments hinder their widespread adoption. Tin-based perovskites offer a promising lead-free alternative but have historically struggled with lower efficiencies and poor environmental stability due to the easy oxidation of Sn^{2+} to Sn^{4+}.

Key Findings

A collaborative team from the University of Wisconsin–Madison has successfully developed a novel tin-based perovskite solar cell that addresses these critical stability challenges. Their design incorporates inherent protection mechanisms against oxygen and moisture, which are typically detrimental to perovskite performance. These lead-free cells achieved a power-conversion efficiency of 16.2%, a significant milestone that ranks among the highest reported for tin perovskite solar cells. Crucially, this enhanced durability was achieved without any compromise on the device's photovoltaic performance. The research, published in the prestigious journal *Nature Materials*, details the material engineering strategies employed to achieve this robust performance.

Significance & Outlook

This breakthrough provides a vital new design strategy for creating robust and non-toxic solar materials. By demonstrating high efficiency coupled with intrinsic environmental protection, these tin-based perovskites pave the way for more sustainable and commercially viable next-generation solar technologies. The ability to withstand environmental degradation opens up possibilities for broader applications and accelerates the shift towards safer, high-performance photovoltaic devices, potentially reducing reliance on lead-containing materials in solar energy production.

Source: https://www.greenprophet.com/2026/09/scientists-make-lead-free-perovskite-solar-cells-that-can-weather-the-elements/

#03 Chinese Scientists Set New Record: Perovskite-Organic Tandem Solar Cell Achieves 27.35% Efficiency

Published September 11, 2026 pv magazine Global China

OVERVIEW

Researchers at Nanjing University have achieved a certified record-breaking efficiency of 27.35% for a perovskite-organic tandem solar cell. This breakthrough, detailed in *Joule*, utilized a novel low-bandgap acceptor to optimize near-infrared light harvesting and photocurrent matching, while also demonstrating promising operational stability, retaining 80% of its initial performance after 744 hours of continuous illumination. This achievement significantly advances tandem solar cell technology towards higher performance and practical viability.

IN DEPTH

Background

Tandem solar cells, which combine two different solar cell materials to capture a broader spectrum of sunlight, are a key strategy for pushing photovoltaic efficiencies beyond the limits of single-junction devices. Perovskite-organic tandems are particularly promising due to their tunable bandgaps and low-cost processing, but achieving high efficiencies with good stability remains a significant challenge.

Key Findings

A team of scientists at Nanjing University in China has announced a major breakthrough in tandem solar cell technology. They have developed a perovskite-organic tandem solar cell that achieved a certified power conversion efficiency of 27.35%. This figure represents a new world record for this specific type of tandem architecture, pushing the boundaries of what is possible with organic and perovskite materials. The key to this record-breaking performance lies in the ingenious utilization of a novel low-bandgap acceptor material. This material significantly enhances the harvesting of near-infrared light, a spectral region often underutilized by conventional solar cells. Moreover, the design effectively optimized photocurrent matching between the two sub-cells, a crucial factor for maximizing tandem efficiency. Beyond efficiency, the device also exhibited promising operational stability, maintaining 80% of its initial performance after an impressive 744 hours of continuous illumination, addressing a common concern with new solar materials.

Significance & Outlook

This achievement, published in the journal *Joule*, has profound implications for the future of solar energy. The record 27.35% efficiency demonstrates the immense potential of perovskite-organic tandem cells to surpass the performance of established silicon technologies. The improved near-infrared light harvesting is particularly important for increasing energy yield under real-world conditions, while the enhanced stability offers a clear path towards commercialization. This breakthrough could accelerate the development of next-generation solar panels that are not only more efficient but also potentially more cost-effective and versatile for various applications, contributing significantly to global renewable energy targets.

Source: https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQEWJuZui8DOVaYCoNVqZ2kM0qPev0WDmBfzb1yGPwSmD7T6CuyqROsatJoI1ggpPBrpyTJ5qmmMt9PbrV6C6hsQNnVE0i2dV7sroSNkDZN1bXOkow_AMp_viHdAf2CgjebnzS_CKpvQEkLxUMJSDM4SZmCoIw==

#04 KIER Sets World Record: Perovskite/CIGS Tandem Solar Cells Achieve 26.7% Efficiency

Published September 04, 2026 KIER (Korea Institute of Energy Research) / News outlet covering KIER South Korea

OVERVIEW

The Korea Institute of Energy Research (KIER) has announced a certified world-record power conversion efficiency of 26.7% for perovskite/CIGS tandem solar cells. This landmark achievement was independently verified by Germany's Fraunhofer Institute for Solar Energy Systems (ISE) and recognized by the US National Laboratory of the Rockies (NLR), formerly NREL, on its Best Research-Cell Efficiencies Chart. The 26.7% efficiency marks a significant advancement for next-generation thin-film photovoltaics, offering a path to higher performance and broader applications.

IN DEPTH

Background

Tandem solar cells, which integrate two different light-absorbing materials, are pivotal for achieving efficiencies beyond the theoretical limits of single-junction devices. Perovskite solar cells, with their high efficiency and tunable bandgaps, are ideal candidates for topping traditional thin-film technologies like Copper Indium Gallium Selenide (CIGS), known for their excellent stability and absorption properties.

Key Findings

The Korea Institute of Energy Research (KIER) has made a significant leap forward in photovoltaic technology by announcing a certified world-record efficiency of 26.7% for their perovskite/CIGS tandem solar cells. This impressive figure was rigorously verified by the Fraunhofer Institute for Solar Energy Systems (ISE) in Germany, a globally recognized authority in solar cell performance validation. Further reinforcing its significance, this achievement has been officially recognized and listed in the "Best Research-Cell Efficiencies Chart" maintained by the US National Laboratory of the Rockies (NLR), formerly known as NREL (National Renewable Energy Laboratory). This dual certification from highly respected international bodies underscores the robustness and credibility of KIER's breakthrough.

Significance & Outlook

The attainment of 26.7% efficiency represents a major advancement in the field of next-generation thin-film photovoltaics. By effectively combining the strengths of perovskite and CIGS materials, KIER has demonstrated a clear pathway to overcome the efficiency limitations of conventional solar cells. This breakthrough is expected to accelerate the commercialization of high-efficiency tandem solar modules, offering enhanced energy output per unit area. This could lead to more cost-effective solar installations, expanding the utility of solar energy in diverse applications, from large-scale power generation to building-integrated photovoltaics, and reinforcing South Korea's position as a leader in advanced energy research.

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#05 Tin-Based Perovskite Solar Cells: Overcoming Stability Challenges for Lead-Free Photovoltaics through Advanced Material Engineering

Published September 10, 2026 MDPI (review article) Unknown

OVERVIEW

This review article synthesizes recent advancements in tin-based halide perovskites, highlighting their potential as a lead-free alternative for next-generation photovoltaics. It delves into fundamental structural principles, advanced material engineering strategies like additive-assisted crystallization and interface modification, and critical challenges such as Sn^{2+} to Sn^{4+} oxidation. The paper underscores tin's strategic importance for sustainable renewable energy and outlines ongoing research efforts to bridge the gap from laboratory concepts to commercial viability for these promising materials.

IN DEPTH

Background

The immense promise of perovskite solar cells is shadowed by concerns regarding the toxicity of lead, a primary component in many high-performance devices. Tin-based halide perovskites have emerged as a leading candidate for lead-free alternatives, offering comparable electronic properties but facing distinct stability challenges that hinder their widespread adoption.

Key Findings

This comprehensive review article from MDPI provides a detailed summary of the latest progress in tin-based halide perovskites, positioning them as a critical class of materials for future lead-free photovoltaic technologies. The paper meticulously covers the fundamental structural principles governing these materials, explaining how their unique crystal structures influence their optoelectronic performance. It then transitions into advanced material engineering strategies designed to overcome inherent limitations. These strategies include sophisticated techniques like additive-assisted crystallization, which helps control crystal growth and morphology, and precise interface modification, crucial for efficient charge extraction and transport. A significant portion of the review is dedicated to addressing the challenges faced by tin-based perovskites, notably the susceptibility of Sn^{2+} to oxidation into Sn^{4+}, which degrades performance and stability. The review also explores various approaches being developed to mitigate this issue.

Significance & Outlook

The article strongly emphasizes the strategic importance of tin in the pursuit of sustainable renewable energy solutions, offering a non-toxic pathway to high-efficiency solar conversion. It highlights the ongoing and intensive research efforts aimed at transitioning these promising materials from controlled laboratory environments to large-scale commercial viability. By providing a clear overview of both the scientific advancements and remaining hurdles, this review serves as a valuable resource for researchers and industry professionals alike, guiding future innovations in lead-free perovskite solar technology and accelerating their market penetration for a greener future.

Source: https://www.mdpi.com/2079-4991/16/18/1138

Collected: September 11, 2026 | Automated Research System (Gemini API)

#06 Unlocking Lead-Free Layered Perovskites: A Structural Roadmap to High-Performance Optoelectronic Devices

Published September 09, 2026 EurekAlert! Unknown

OVERVIEW

A new review by Soo-Yeon Yang and Hyojung Kim details recent advances in 2D and quasi-2D lead-free halide double perovskites for optoelectronic applications. The authors establish a framework that connects structural design to critical material properties and device performance, analyzing how organic spacer cations, crystal orientation, and interfaces impact bandgap, exciton behavior, charge transport, and stability. This comprehensive work provides a clear roadmap for engineers developing sustainable, high-performance lead-free perovskite optoelectronics.

IN DEPTH

Background

The pursuit of lead-free perovskites is a crucial endeavor in materials science, aiming to develop environmentally friendlier alternatives to lead-halide perovskites while maintaining or even surpassing their excellent optoelectronic properties. Layered, or 2D/quasi-2D, perovskites offer enhanced stability and tunability, making them particularly attractive for diverse optoelectronic applications.

Key Findings

A comprehensive review conducted by Soo-Yeon Yang and Hyojung Kim, and highlighted by EurekAlert! (referencing a publication in *Frontiers of Optoelectronics*), meticulously examines the recent advancements in 2D and quasi-2D lead-free halide double perovskites. The core contribution of their work is the establishment of a robust framework that systematically links the atomic-level structural design of these materials to their macroscopic material properties and ultimate device performance. Specifically, the review delves into how various factors profoundly influence key characteristics:

- **Organic Spacer Cations:** Their size and chemistry dictate the interlayer spacing and quantum confinement effects, significantly impacting bandgap and exciton binding energy.
- **Crystal Orientation:** Precise control over crystal growth and orientation can optimize charge transport pathways and minimize defects.
- **Interfaces:** Engineering the interfaces within the device stack is crucial for efficient charge injection, extraction, and overall stability.

The authors analyze how these factors collectively influence fundamental optoelectronic properties such such as bandgap tuning, exciton behavior, charge transport efficiency, and the long-term operational stability of the devices.

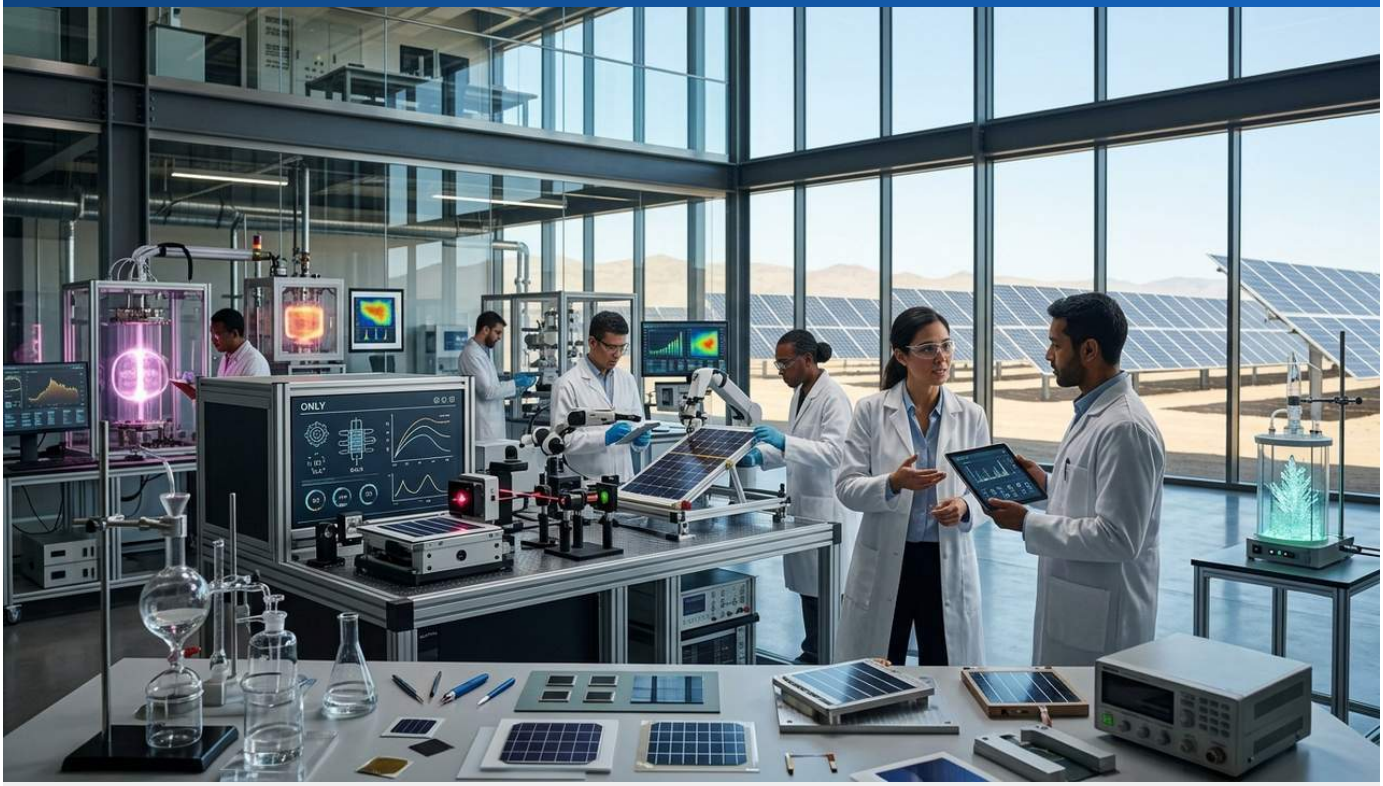
Significance & Outlook

This review article provides an invaluable roadmap for researchers and engineers dedicated to developing sustainable, high-performance lead-free perovskite optoelectronics. By systematically dissecting the interplay between material structure and device function, it offers clear guidelines for targeted material design and optimization. This work is pivotal for accelerating the transition from lab-scale demonstrations to commercially viable lead-free optoelectronic devices, paving the way for environmentally responsible innovations in fields ranging from solar cells to LEDs and photodetectors.

Source: https://www.eurekalert.org/news-releases/1143230

#07 2026-2027 Solar Research Funding Priorities: Driving 25%+ Efficiency with Perovskite Tandems and Scalable Manufacturing

Published September 05, 2026 Research Funding Portal/Blog Unknown



OVERVIEW

This article outlines key solar research funding priorities for 2026-2027, with a strong emphasis on achieving over 25% efficiency in commercial solar modules through advanced tandem solar cell designs, particularly perovskite/silicon heterojunctions. It also highlights the strategic focus on scalable and cost-effective manufacturing methods, such as thin-film deposition and roll-to-roll processes. The report stresses that collaborative partnerships are crucial for successful grant applications, fostering innovation and accelerating market adoption.

IN DEPTH

Background

The global energy landscape is rapidly evolving, with an increasing demand for higher efficiency, lower cost, and more sustainable solar energy solutions. Research funding bodies are aligning their priorities to support breakthrough innovations that can meet these critical objectives, particularly as the industry pushes towards next-generation photovoltaic technologies.

Key Findings

For the 2026-2027 funding cycle, solar research initiatives will heavily prioritize projects aimed at achieving significant performance milestones. A primary focus is on developing commercial solar modules with power conversion efficiencies exceeding 25%. This ambitious target is expected to be met through the advancement of sophisticated tandem solar cell designs, with particular attention given to perovskite/silicon heterojunction architectures. These tandem cells are capable of capturing a broader spectrum of sunlight, thereby increasing overall efficiency.

Beyond efficiency, the funding priorities also underscore the importance of scalable and cost-effective manufacturing methods. Technologies such as thin-film deposition and roll-to-roll processes are highlighted as key areas for investment, as they enable high-throughput, low-cost production essential for widespread commercialization. Furthermore, the article explicitly states that collaborative partnerships—between academic institutions, industry players, and governmental research bodies—will be a critical factor for successful grant applications, recognizing that interdisciplinary cooperation is vital for accelerating research and development into practical applications.

Significance & Outlook

These funding priorities reflect a strategic push to solidify the next generation of solar technology, particularly perovskites, as a dominant force in renewable energy. By targeting high efficiencies and scalable manufacturing, the funding aims to bridge the gap between laboratory breakthroughs and industrial deployment. The emphasis on collaboration ensures that research efforts are well-integrated and geared towards real-world impact, ultimately leading to more powerful, affordable, and accessible solar energy solutions globally.

Source: https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQE1GGemfJvJQK7GjvNe5G3puzBbBaVYDu4rGPiUwR1yfMlVEqJAGsRk8dUG9-5y0qDEP0NsEsXsoJ2nA7Wksh0woD_ZT5wWoevHTeM-fTwA615F3nbBOIL69dC-2JYvO2j8tDPjX_BeOZXhp5z8jamzZg==

#08 Chinese Researchers Achieve World Record 24.0% Efficiency for Large-Area Perovskite Solar Module

Published September 03, 2026 The Cool Down (citing PV Magazine, Renshine Solar) China

OVERVIEW

A research team led by Nanjing University and Renshine Solar in China has achieved a certified world-record efficiency of 24.0% for a large-area perovskite solar module, measuring 810 cm². This breakthrough was realized through a novel passivation strategy employing chemically stable lead carboxylate passivators, which significantly improved charge-carrier transport and device durability. This achievement represents a major step towards commercializing high-performance, large-scale perovskite solar technology.

IN DEPTH

Background

Perovskite solar cells have rapidly advanced in laboratory-scale efficiencies, but scaling these high performances to larger modules, which is essential for commercial viability, remains a significant challenge. Enhancing both efficiency and stability in large-area devices is crucial for their widespread adoption.

Key Findings

A collaborative research team, spearheaded by Nanjing University in China and involving perovskite specialist Renshine Solar, has successfully set a new world record for large-area perovskite solar modules. They achieved a certified power conversion efficiency of 24.0% for a module measuring an impressive 810 cm^2. This milestone is particularly noteworthy because it demonstrates that high efficiencies are not confined to small laboratory cells but can be scaled up to commercially relevant sizes.

The key to this record-breaking performance was the implementation of an innovative passivation strategy. The researchers utilized chemically stable lead carboxylate passivators, which effectively mitigate defects at the perovskite interfaces. This passivation technique played a dual role: it significantly improved the efficiency of charge-carrier transport within the module and substantially enhanced its overall durability, addressing critical stability concerns associated with perovskite technology.

Significance & Outlook

This achievement, cited by The Cool Down (referencing PV Magazine and Renshine Solar), marks a pivotal moment for the perovskite solar industry. The successful demonstration of 24.0% efficiency on a large-area module brings perovskite technology closer to competing with conventional silicon solar panels in terms of both performance and scale. Improved durability through advanced passivation strategies also bodes well for the long-term reliability required for commercial deployment. This breakthrough is expected to accelerate the industrialization of perovskite solar cells, opening new avenues for large-scale solar power generation and diverse applications, and reinforcing China's leadership in advanced photovoltaic research.

Source: https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQEo9LzpTlWWH2HnnfVsGGw9z2cx8vdMioSqk4fev2UXt4veHW7HGXGLMtxIZWuBnoNewKafC
Lb8oZP8A=

#09 RenShine Solar Sets World Record: 26.4% Efficiency for Large-Area All-Perovskite Tandem Module

Published September 10, 2026 TaiyangNews China

OVERVIEW

Perovskite PV developer RenShine Solar has achieved a certified power conversion efficiency of 26.4% for a large-area (809 cm²) all-perovskite tandem module, verified by TÜV SÜD. This marks a new world record for tandem modules of this size, realized using the company's 10 MW pilot line. RenShine Solar is now focused on validating industrial applications for space PV and high-efficiency terrestrial energy systems, signaling a significant leap towards commercial deployment.

IN DEPTH

Background

Tandem solar cells, particularly all-perovskite tandems, are key to pushing solar energy conversion efficiencies beyond the limits of single-junction devices. Achieving high efficiencies at large module areas is a critical step for commercial viability and widespread adoption in various demanding applications, including space photovoltaics.

Key Findings

RenShine Solar, a prominent developer in perovskite photovoltaic technology, has announced a groundbreaking achievement: a certified power conversion efficiency of 26.4% for a large-area all-perovskite tandem module. This module, measuring 809 cm², sets a new world record for tandem modules of this size, underscoring the rapid progress in this field. The efficiency was independently confirmed and certified by TÜV SÜD, a globally recognized testing and certification body, adding significant credibility to the claim. This remarkable feat was accomplished using the company's first 10 MW all-perovskite tandem pilot line, demonstrating not just laboratory potential but also the scalability of their manufacturing processes.

Significance & Outlook

This achievement, as reported by TaiyangNews, is a major milestone for perovskite technology. The record-breaking efficiency on a large-area module, coupled with its production on a pilot line, indicates RenShine Solar's readiness to transition from research to industrial-scale manufacturing. The company is now strategically focusing on industrial application validation, specifically targeting the high-performance demands of space photovoltaics (space PV) and the robust requirements of high-efficiency terrestrial energy systems. This move suggests that all-perovskite tandem technology is maturing rapidly, promising enhanced energy generation capabilities for diverse applications and solidifying its position as a frontrunner in the next generation of solar energy solutions.

Source: https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQEP8p2kf8pOtSUR6wZ7zjQ25wiBfYgb7lvS3grrbIER1tF6VC3oZK2ltCbGx6lOYMRJctM-

bqJORnMqp8Tko50si8BQFK6P1JcscKyOt35XRwij6kof774dtuCSZ3wcyTFtWpnlcgYOQbHO9F7VWVXu6exr9v

#10 China Exempts Perovskite and Tandem Solar Cells from Consumption Tax, Accelerating Commercialization

Published September 10, 2026 TaiyangNews China

OVERVIEW

China's Ministry of Industry and Information Technology (MIIT) has clarified new mandatory national standards for the PV sector, effective January 1, 2027. While primarily targeting traditional silicon PV overcapacity, the policy explicitly exempts perovskite and tandem solar cells from consumption tax until December 31, 2028. This strategic exemption provides a significant cost advantage for these emerging technologies, accelerating their commercialization phase and supporting China's leadership in advanced solar innovation.

IN DEPTH

Background

China, a global leader in solar PV manufacturing and deployment, frequently updates its industrial policies to manage market dynamics, ensure quality standards, and promote technological advancements. Recent concerns over overcapacity in the traditional silicon PV sector have prompted new regulatory measures.

Key Findings

The Ministry of Industry and Information Technology (MIIT) in China has issued crucial clarifying guidance regarding new mandatory national standards for energy consumption and efficiency within the photovoltaic sector. These comprehensive standards are slated to come into effect on January 1, 2027. While the primary objective of these regulations is to address and curb the existing overcapacity issues prevalent in the traditional silicon PV industry, a significant and forward-looking aspect of the policy is its treatment of advanced solar technologies.

The MIIT policy explicitly states that both perovskite solar cells and tandem solar cells will be exempt from consumption tax until December 31, 2028. This strategic exclusion provides a direct and substantial cost advantage to these emerging technologies during their critical commercialization phase. By reducing the financial burden, China aims to foster innovation and accelerate the market penetration of these next-generation solar solutions.

Significance & Outlook

This policy decision, as reported by TaiyangNews, is a clear signal of China's commitment to supporting and fast-tracking the development and deployment of advanced solar technologies. By offering a consumption tax exemption, the government creates a favorable economic environment for perovskite and tandem solar cells, enabling them to compete more effectively with established technologies and overcome initial market barriers. This move is expected to not only stimulate domestic research and investment in these areas but also solidify China's position at the forefront of global solar innovation, driving the next wave of photovoltaic advancements for a sustainable energy future.

Source: https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQHSdMCBW36h9gF4LVDDEPq0UlXBqDfeCRhECmUGNkUjaem1PQ2yAbHQHaVD6mYgl6gO
pIFw==

#11 LONGi Achieves 35.5% Perovskite-Silicon Tandem Cell Efficiency Record, Approves 100MW Pilot Production Line

Published September 03, 2026 pv magazine China

OVERVIEW

LONGi has set a new ESTI-certified world record of 35.5% power conversion efficiency for its perovskite-silicon tandem solar cell, marking its third record in 15 months. The company also reported certified module efficiencies of 31.4% (0.17 m²) and 29.4% (1.7 m²), demonstrating scalability. Following these breakthroughs, LONGi approved a 100 MW pilot line for tandem production, signaling a significant step towards commercializing next-generation high-efficiency photovoltaics.

IN DEPTH

Key Findings: LONGi Shatters Efficiency Records with 35.5% Perovskite-Silicon Tandem Cell, Greenlights 100MW Pilot Production

LONGi, a global leader in solar technology, has achieved a groundbreaking ESTI-certified world record efficiency of 35.5% for its perovskite-silicon tandem solar cell. This achievement, announced on July 14, 2026, represents the company's third such record in just fifteen months, underscoring rapid advancements in this critical next-generation photovoltaic technology. This breakthrough confirms the immense potential of integrating perovskite with traditional silicon to push beyond conventional efficiency limits.

Technical and Commercialization Details

Beyond the single-cell record, LONGi has also demonstrated impressive performance at the module level. The company reported certified efficiencies of 31.4% for a 0.17 square meter tandem module and 29.4% for a larger, more commercially relevant 1.7 square meter module. These module-level efficiencies are crucial indicators of the technology's readiness for scale, as high-efficiency modules can generate more power from a smaller footprint, improving land utilization and the overall cost-effectiveness of solar installations. The 29.4% efficiency for a 1.7 m² module is particularly significant, suggesting that the gap between lab-scale records and deployable products is narrowing rapidly.

In a strong move towards commercialization, LONGi's board approved the construction of a 100 MW pilot production line for perovskite-silicon tandem cells on August 14, 2026. This pilot facility will be instrumental in validating and optimizing large-scale manufacturing processes, serving as a critical bridge between R&D and mass production. A 100 MW capacity signifies a serious commitment to bringing this high-potential technology to market, indicating a shift from purely scientific exploration to industrial deployment.

Background and Industry Context

The solar industry is increasingly looking beyond the theoretical limits of conventional silicon solar cells, with perovskite technology emerging as a frontrunner for the next generation. Perovskite-silicon tandem cells, which combine the complementary light absorption spectra of both materials, offer a significantly higher theoretical efficiency limit than silicon alone. LONGi's consistent record-breaking achievements validate the viability of this tandem approach, moving it from a research curiosity to a technology with tangible commercial prospects. This progress is vital for accelerating global energy transition goals and enhancing the competitiveness of solar power as a primary energy source.

Strategic Significance and Outlook

The operationalization of LONGi's pilot line is expected to solidify manufacturing techniques for perovskite-silicon tandem solar cells, paving the way for broader commercial rollout. If this technology successfully penetrates the market, it promises to further reduce the Levelized Cost of Energy (LCOE) for solar power, thereby accelerating renewable energy adoption worldwide. Moreover, this development is likely to intensify the race among other solar manufacturers to develop and commercialize high-efficiency tandem technologies, fostering innovation across the entire industry. For researchers, engineers, and investors, this represents a definitive signal of a new growth phase in the solar photovoltaic market.

Source: https://www.solar-stack.com/en/blog/most-efficient-solar-panels-2026

Collected: September 11, 2026 | Automated Research System (Gemini API)

#12 LONGi and Soochow University Achieve 34.0% Efficiency, 2,000-Hour Stability in Perovskite-Silicon Tandem Solar Cell via ZrO_2 Interfacial Strategy

Published September 10, 2026 pv magazine Global China

OVERVIEW

A collaborative research effort by China's Soochow University and LONGi has yielded a perovskite-silicon tandem solar cell with a remarkable 34.0% power conversion efficiency. This advance, detailed in "Science Bulletin," stems from a novel ZrO_2 interfacial strategy that effectively suppresses non-radiative recombination and enhances charge extraction. The device also exhibited high operational stability, retaining 84% of its initial efficiency after 2,000 hours, setting a new benchmark for simultaneous high efficiency, high voltage (2.014V), and long-term stability.

IN DEPTH

Key Findings: LONGi and Soochow University Breakthrough with 34.0% Efficient Perovskite-Silicon Tandem Cell, Demonstrating Superior Stability

Researchers from China's Soochow University and solar giant LONGi have published a study in "Science Bulletin" detailing the development of a perovskite-silicon tandem solar cell achieving an impressive 34.0% power conversion efficiency. This significant breakthrough is attributed to a unique ZrO_2 (zirconium dioxide) interfacial strategy, which effectively suppresses non-radiative recombination and dramatically improves charge extraction within the device. This advance represents a major step towards the commercial viability of next-generation solar cells, pushing the boundaries of existing photovoltaic technology.

Technical Details and Performance Metrics

The newly developed tandem solar cell recorded a high open-circuit voltage (Voc) of 2.014 V, a critical parameter for high-efficiency devices. This high voltage indicates that the ZrO_2-based interfacial layer minimizes charge carrier losses and maximizes the potential difference across the device. Even more notably, the device demonstrated exceptional stability, retaining 84% of its initial efficiency after 2,000 hours of continuous operation. This addresses one of the most persistent challenges facing perovskite solar cells: long-term durability, particularly against environmental factors like moisture and heat. The ZrO_2 interfacial strategy provides a novel pathway to enhance both efficiency and environmental robustness, crucial for real-world deployment.

Research Context and Innovation

Perovskite solar cells are garnering significant attention as a next-generation photovoltaic technology due to their high efficiency potential and low manufacturing costs. As single-junction perovskite devices approach their theoretical efficiency limits, tandem structures combining perovskite with silicon offer a promising route to even higher efficiencies by leveraging broader solar spectrum absorption. This research specifically targets the suppression of non-radiative recombination caused by interfacial defects. ZrO_2, known for its high dielectric constant and chemical stability, acts as an effective interface layer, preventing recombination without impeding charge carrier transport. This approach offers a new paradigm for designing tandem cells that concurrently pursue both high efficiency and enhanced stability.

Future Outlook and Market Impact

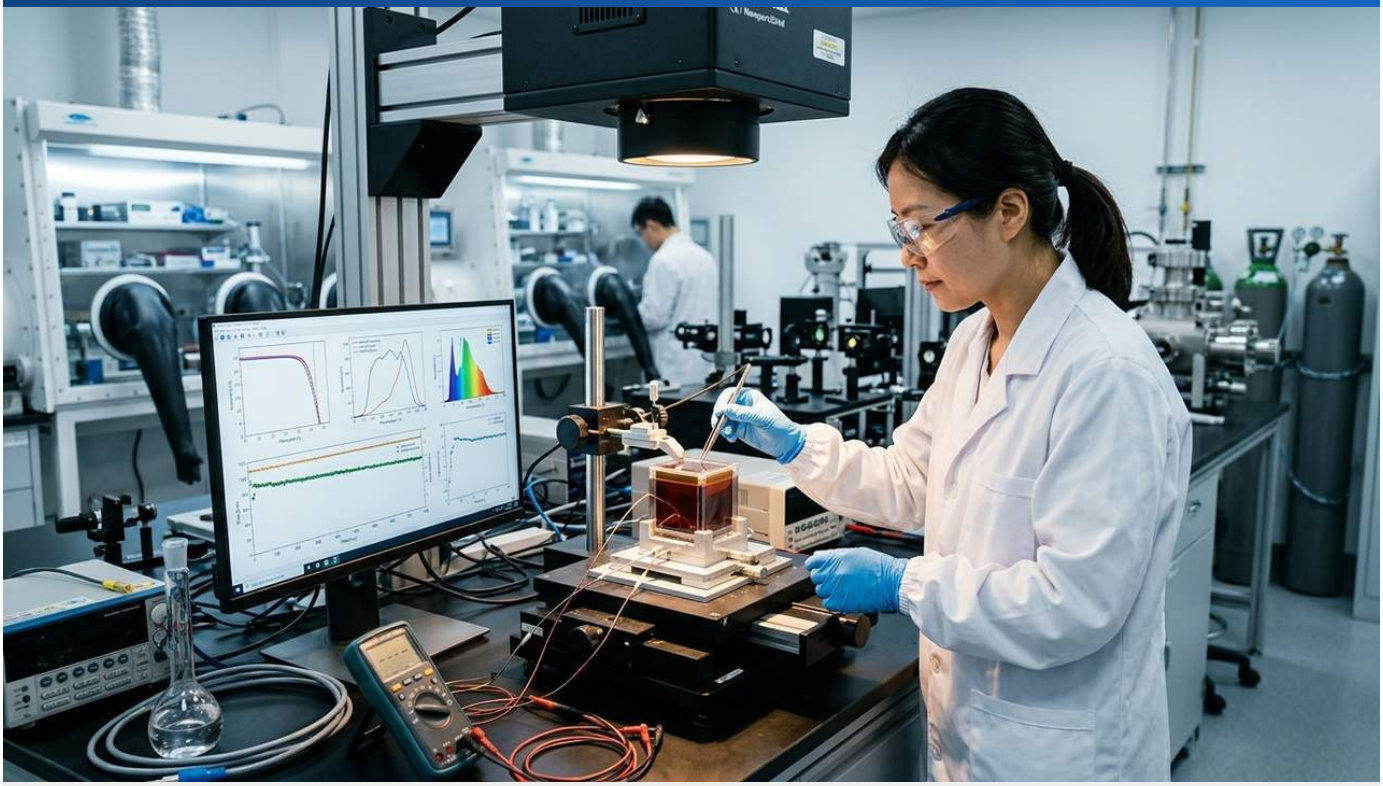
This achievement is expected to accelerate the commercialization of high-efficiency and long-lasting perovskite-silicon tandem solar cells. The demonstrated stability, with 84% efficiency retained after 2,000 hours, is particularly attractive to investors and industry players looking for robust, practical solutions. Should this technology be successfully scaled for mass production, it could further drive down the cost of solar electricity, facilitating broader adoption of renewable energy globally. In the long term, such tandem technologies have the potential to complement or even partially replace conventional silicon solar cells, becoming an indispensable part of the world's energy mix, offering superior performance in diverse applications.

Source: https://www.pv-magazine.com/2026/09/10/longi-soochow-university-unveil-34-0-perovskite-silicon-tandem-solar-cell-based-on-dual-anchored-interfacial-design/

Collected: September 11, 2026 | Automated Research System (Gemini API)

#13 Nanjing University Achieves Record 27.35% Efficiency, 744-Hour Stability for Perovskite-Organic Tandem Solar Cell

Published September 11, 2026 pv magazine Global China



OVERVIEW

Researchers at Nanjing University in China have fabricated a perovskite-organic tandem solar cell with a certified efficiency of 26.88%, reaching a record-breaking 27.35%. This device employs a novel low-bandgap acceptor to enhance near-infrared light harvesting and improve photocurrent matching between the sub-cells. Crucially, it demonstrated promising stability, maintaining 80% of its initial performance after 744 hours of continuous illumination, addressing a critical hurdle for organic-based perovskite applications.

IN DEPTH

Key Findings: Nanjing University Sets New Efficiency Record of 27.35% for Perovskite-Organic Tandem Solar Cells with Enhanced Stability

Researchers at Nanjing University in China have announced a significant achievement in the field of perovskite-organic tandem solar cells, fabricating a device that reached a record-breaking power conversion efficiency of 27.35%, with a certified efficiency of 26.88%. This new world record for perovskite-organic tandems is primarily attributed to the incorporation of a novel low-bandgap acceptor. This material effectively boosts near-infrared light harvesting and dramatically improves photocurrent matching between the perovskite and organic sub-cells. This advancement marks a critical step towards the realization of lightweight and flexible solar cells, accelerating their potential application in building-integrated photovoltaics (BIPV) and portable devices.

Technical Details and Performance Metrics

The record efficiency was achieved through a tandem architecture, combining the broad spectral absorption of perovskites with the unique properties of organic solar cells, such as flexibility and transparency. While organic solar cells typically offer flexibility but lower standalone efficiencies, their combination with a wide-spectrum-absorbing perovskite layer allows for maximal utilization of each material's strengths. The research team specifically designed a new low-bandgap acceptor, integrated into the organic bottom cell, which significantly enhances the absorption of photons from the near-infrared portion of the solar spectrum. This improved light harvesting consequently boosts the overall photocurrent generation of the tandem cell, leading to more efficient current matching between the top and bottom cells.

Beyond efficiency, the stability of the device is a crucial aspect of this research. The developed tandem cell demonstrated promising operational stability, retaining 80% of its initial performance after 744 hours of continuous illumination. This level of stability is vital for outdoor deployment and partially mitigates concerns regarding the environmental robustness of perovskite materials, especially when combined with organic components. The enhanced stability, resulting from advancements in both device design and material science, represents a significant hurdle overcome on the path to practical commercialization for this class of next-generation solar cells.

Background and Industry Context

Perovskite solar cells are widely considered a promising successor to silicon PV, but expanding their application scope requires achieving lightweight, flexibility, and transparency. Perovskite-organic tandem structures are a compelling approach to meet these requirements while pursuing high efficiencies. While perovskite-silicon tandems often lead in pure efficiency metrics, perovskite-organic tandems are particularly well-suited for niche markets that demand specific characteristics like flexibility, transparency (for solar windows), and integration into wearable electronics. Nanjing University's research significantly broadens the potential applications of perovskite technology within these emerging markets, offering alternatives to conventional rigid solar panels.

Strategic Significance and Outlook

This breakthrough from Nanjing University is expected to be a strong catalyst for accelerating the commercialization of perovskite-organic tandem solar cells. Their lightweight nature, design freedom, and high efficiency will provide a significant competitive advantage in BIPV applications and the flexible device market. Researchers and engineers are now poised to build upon these results, focusing on further stability enhancements and the development of large-scale manufacturing techniques. For investors, this new technological frontier signals substantial growth potential, contributing to the diversification of the clean energy technology portfolio. In the future, these tandem solar cells could be seamlessly integrated into our living and working environments, contributing to a more sustainable society.

Source: https://www.pv-magazine.com/2026/09/11/chinese-scientists-achieve-record-breaking-27-35-efficiency-for-perovskite-organic-tandem-solar-cell/

Collected: September 11, 2026 | Automated Research System (Gemini API)

#14 HZB Achieves 27.3% Efficiency, Record 770-Hour 90% Stability in All-Perovskite Triple-Junction Solar Cell Using Graphene Oxide/SAM Interface

Published September 09, 2026 physicsworld.com Germany

OVERVIEW

Researchers at Helmholtz-Zentrum Berlin (HZB) have developed an all-perovskite triple-junction solar cell with a power conversion efficiency of 27.3%. Published in "Joule," this device integrates a chemically robust graphene oxide/self-assembled monolayer (SAM) interface, enabling it to retain 90% of its initial performance after 770 hours of continuous 1-sun illumination. This establishes a new stability record for all-perovskite configurations, marking a significant milestone towards commercial viability.

IN DEPTH

Key Findings: HZB Pioneers All-Perovskite Triple-Junction Solar Cell with Record 27.3% Efficiency and Unprecedented 770-Hour Stability

Researchers at Germany's Helmholtz-Zentrum Berlin (HZB) have unveiled a groundbreaking all-perovskite triple-junction solar cell that achieves a remarkable power conversion efficiency of 27.3%. Detailed in the journal "Joule," this device sets a new benchmark not just for efficiency, but also for stability in all-perovskite architectures: it maintained 90% of its initial performance after 770 hours of continuous operational tracking under 1-sun illumination. This breakthrough is a pivotal moment for perovskite photovoltaics, demonstrating their potential for long-term reliability and clearing a major hurdle towards widespread commercial adoption.

Technical Details and Stability Enhancement

The triple-junction design incorporates three distinct perovskite layers, each tuned to absorb different segments of the solar spectrum, thereby maximizing photon utilization beyond what single-junction cells can achieve. The critical innovation enabling both high efficiency and record stability is the integration of a chemically benign and robust graphene oxide/self-assembled monolayer (SAM) interface. This interface plays a dual role: it optimizes charge carrier transport, minimizing recombination losses, and simultaneously acts as a protective barrier against environmental degradation factors, particularly moisture and oxygen, which are notorious for destabilizing perovskite materials. The inclusion of graphene oxide imparts superior electrical properties and chemical resilience, facilitating efficient charge extraction and suppressing non-radiative recombination pathways. This engineering significantly extends the operational lifetime of the device, addressing a primary weakness of earlier perovskite solar cells.

Achieving 90% retention of initial performance after 770 hours of continuous operation under realistic conditions represents a substantial leap forward compared to previous all-perovskite devices. This performance brings the technology closer to the operational durations required for practical outdoor applications.

Background and Industry Context

Perovskite solar cells are seen as a transformative technology for the future of photovoltaics due to their high efficiency potential and low manufacturing costs. However, particularly for multi-junction structures aimed at super-high efficiencies, ensuring both interfacial compatibility and long-term stability has been a significant challenge. All-perovskite multi-junction devices offer advantages over silicon-based tandems, such as simplified manufacturing processes and easier integration onto flexible substrates. HZB's achievement demonstrates that the all-perovskite approach can indeed be competitive in both efficiency and stability, promoting diversification and advancement in solar energy technology.

Strategic Significance and Outlook

The development of this all-perovskite triple-junction solar cell accelerates the path towards commercializing high-performance and durable next-generation solar devices. Innovative material engineering approaches, such as the graphene oxide/SAM interface, will likely inform future research and development in perovskite photovoltaics. With stability challenges being steadily overcome, investor confidence in perovskite technology is expected to grow, potentially attracting larger-scale investments. In the long term, these highly efficient and stable perovskite devices are poised to drive adoption across a wide range of applications, including building-integrated photovoltaics (BIPV), portable electronics, and even niche markets requiring specific flexibility or transparency, thereby significantly contributing to global energy supply and sustainability goals.

Source: https://physicsworld.com/a/bilayer-approach-ramps-performance-of-all-perovskite-triple-junction-solar-cells/

Collected: September 11, 2026 | Automated Research System (Gemini API)

#15 Nanjing University, Renshine Solar Set 24.0% World Record for Large-Area Perovskite Solar Module with LCPs Passivation

Published September 03, 2026 The Cool Down China

OVERVIEW

A joint research team from Nanjing University and Renshine Solar has achieved a new world record for large-area perovskite solar modules, certifying 24.0% efficiency (24.2% peak) for an 810 cm² aperture module. This breakthrough employs a passivation strategy utilizing chemically stable lead carboxylate passivators (LCPs), which significantly improves charge-carrier transport and device stability. This advancement paves the way for lower solar electricity costs and robust, large-scale commercial deployment of perovskite technology.

IN DEPTH

Key Findings: Nanjing University and Renshine Solar Achieve 24.0% World Record Efficiency for Large-Area Perovskite Solar Modules

A collaborative research team spearheaded by Nanjing University and perovskite specialist Renshine Solar has established a new world record for large-area perovskite solar modules, achieving a certified efficiency of 24.0% (with a top conversion efficiency of 24.2%) for an 810 square centimeter (125.6 square inch) aperture module. This groundbreaking accomplishment is expected to significantly contribute to reducing the cost of solar electricity and represents a crucial milestone in the commercialization of next-generation solar cells. Achieving high efficiency at such a large area is particularly vital for translating laboratory-scale successes into industrial production.

Technical Details: Enhanced Efficiency and Stability via LCPs Passivation Strategy

The key to this world record lies in a unique passivation strategy employing chemically stable lead carboxylate passivators (LCPs). Perovskite materials often suffer from defects in their crystal structure that lead to charge carrier recombination, thereby reducing efficiency and stability. LCPs effectively passivate these defects, suppressing charge carrier losses and significantly improving photoelectric conversion efficiency. Specifically, LCPs bind to defect sites present on the perovskite layer's surface and grain boundaries, reducing non-radiative recombination and allowing more electrons and holes to reach the external circuit. This not only enhances carrier lifetime but also boosts the overall device performance.

Beyond efficiency, this passivation strategy has also been shown to dramatically improve the long-term stability of the devices. For commercial solar cells, high efficiency must be coupled with long-term reliability, typically over 20 years, and the LCPs approach substantially increases the likelihood of meeting these requirements. The achievement on large-area modules also suggests compatibility with scalable manufacturing processes such as slot-die or blade coating, further bolstering expectations for future mass production.

Background and Industry Context

Conventional silicon solar cells are nearing their theoretical efficiency limits, making next-generation technologies essential for further cost reductions and performance improvements. Perovskite solar cells are widely recognized as a leading candidate due to their high theoretical efficiency and potential for low-cost manufacturing. While high efficiencies have been demonstrated in small-area perovskite devices, the primary challenge has been to achieve both high efficiency and long-term stability in practical large-area modules. The research by Nanjing University and Renshine Solar offers a concrete solution to this challenge, demonstrating that perovskite solar cells are approaching a stage where they can compete with existing solar technologies across a broad range of applications, from residential to industrial.

Strategic Significance and Outlook

This world record in large-area perovskite modules is a significant step towards further reducing the Levelized Cost of Energy (LCOE) for solar power, thereby accelerating the adoption of renewable energy. If this technology can be scaled up to gigawatt-level production, perovskite solar cells could become a major player in the global energy market. For researchers, it will stimulate exploration into new chemical approaches for defect passivation; for engineers, it will lead to the development of more robust and efficient module designs. Investors are keenly watching the significant commercialization potential of this technology and its transformative impact on the solar photovoltaic industry.

Source: https://now.solar/2026/09/04/chinese-researchers-set-24-efficiency-world-record-for-large-perovskite-solar-module-the-cool-down/

Collected: September 11, 2026 | Automated Research System (Gemini API)

#16 KIER Achieves World Record 26.7% Efficiency for Perovskite/CIGS Tandem Solar Cells, Paving Way for Space, Automotive, BIPV Applications

Published September 09, 2026 Compound Semiconductor South Korea

OVERVIEW

The Korea Institute of Energy Research (KIER) has set a new world record for perovskite/CIGS tandem solar cells, achieving 26.7% efficiency, as certified by Fraunhofer ISE and recognized by the US NLR. This breakthrough addresses efficiency losses through advanced interfacial layer materials and optimized transparent electrodes and charge transport layers. Focusing on a lightweight, flexible form factor, this technology is poised for applications in space, automotive, and building-integrated photovoltaics (BIPV).

IN DEPTH

Key Findings: KIER Breaks World Record with 26.7% Efficient Perovskite/CIGS Tandem Solar Cell, Advancing Flexible PV for Diverse Applications

The Korea Institute of Energy Research (KIER) has achieved a new world record power conversion efficiency of 26.7% for perovskite/CIGS (copper-indium-gallium-selenide) tandem solar cells, a figure independently certified by the Fraunhofer Institute for Solar Energy Systems (ISE) and acknowledged by the US National Laboratory of the Rockies (NLR). This landmark accomplishment represents a significant milestone in the development of next-generation photovoltaic technology. Crucially, the technology's inherent lightweight and flexible nature positions it for transformative applications in sectors previously challenging for traditional solar cells, including space, automotive, and building-integrated photovoltaics (BIPV).

Technical Details: Overcoming Efficiency Losses and Material Optimization

KIER's research team successfully tackled major efficiency losses that typically plague perovskite/CIGS tandem solar cells through an innovative approach. At the core of this breakthrough is the development of advanced interfacial layer materials coupled with a meticulous optimization of the top transparent electrode and charge transport layer. The interfacial layer plays a critical role in facilitating efficient charge carrier transport between the perovskite and CIGS sub-cells while minimizing recombination losses. Previous devices often suffered from efficiency degradation due to defects at these interfaces, a challenge KIER has effectively overcome with its novel material design.

Specifically, improvements in the transmittance of the top transparent electrode and enhanced conductivity and stability of the charge transport layer were key drivers for boosting overall conversion efficiency. These optimizations allow for a broader range of the solar spectrum to be utilized effectively, ensuring that both the perovskite and CIGS layers perform at their maximum potential within their respective absorption bands. This technology effectively transcends the "heavy" and "rigid" limitations of conventional silicon solar cells, maximizing the benefits of lightweight and flexible thin-film photovoltaics.

Background and Application Potential

Perovskite solar cells are widely recognized for their high efficiency and low-cost potential but have faced challenges related to durability and lead content. CIGS solar cells, conversely, offer high stability and excellent performance but have been limited in efficiency. The tandem structure, combining both, leverages their respective strengths and mitigates weaknesses, leading to superior device performance. KIER's achievement is particularly significant as it opens up possibilities for widespread adoption in innovative applications such as spacecraft, drones, electric vehicle roofs, and BIPV, where lightweight and aesthetic integration are paramount. The flexible form factor also simplifies retrofitting on existing structures, helping to accelerate renewable energy deployment in urban environments.

Strategic Significance and Outlook

This world record underscores South Korea's emerging leadership in next-generation solar cell technology. KIER's innovation is set to accelerate the commercialization of perovskite/CIGS tandem solar cells, potentially making a substantial impact on the global photovoltaic market. Researchers and engineers are expected to build upon these results, focusing on further improvements in stability, cost reduction, and scalable manufacturing techniques. For investors, the expanding market for lightweight and flexible solar cells presents new growth opportunities with KIER's technology, stimulating further investment in sustainable energy solutions and positioning South Korea as a key innovator in the global clean energy transition.

Source:
https://compoundsemiconductor.net/article/125336/Korean_team_sets_efficiency_record_for_perovskiteCIGS_

Collected: September 11, 2026 | Automated Research System (Gemini API)

#17 Japanese Researchers Boost Tin Perovskite Solar Cell Durability, Achieving 84.94% Initial Efficiency Retention After 100 Days with 9.07% PCE

Published September 03, 2026 IndexBox Japan

OVERVIEW

Japanese researchers have developed a novel molecule, 2-aminobenzothiazole (2-ABZ), dramatically improving the durability of tin-based perovskite solar cells. Devices incorporating 2-ABZ achieved an initial power conversion efficiency of 9.07% and maintained an impressive 84.94% of their initial efficiency after 100 days of operation. This breakthrough, achieved by multifunctionally suppressing tin oxidation, reducing defects, and inhibiting ion migration, marks a critical step towards the commercialization of stable, lead-free, and environmentally benign next-generation solar cells.

IN DEPTH

A Japanese research group has developed a novel molecule, 2-aminobenzothiazole (2-ABZ), which significantly enhances the durability of lead-free tin-based perovskite solar cells. This groundbreaking compound enabled devices to maintain an impressive 84.94% of their initial 9.07% power conversion efficiency (PCE) after 100 days of continuous operation. This achievement represents a major leap forward in addressing the primary stability challenge faced by conventional tin-based perovskite solar cells, positioning it as a crucial milestone for the practical implementation of low-environmental-impact, next-generation solar technology.

Technical & Material Details

The 2-ABZ molecule exerts multiple beneficial effects within the perovskite material. Firstly, it precisely tunes the crystallization growth process, effectively suppressing the formation of performance-hindering defects. Secondly, it robustly inhibits ion migration within the perovskite layer, thereby improving long-term stability. Furthermore, it plays a critical role in suppressing the undesirable oxidation of tin (Sn^{2+}), which has been one of the most severe degradation pathways for tin-based perovskites. This multi-functional synergy concurrently achieves both high efficiency and enhanced durability, demonstrating the potential for high-performance, stable perovskite solar cells without the use of toxic lead.

Background & Industry Context

Perovskite solar cells have garnered significant attention as a next-generation solar technology due to their high power conversion efficiency and low manufacturing costs. However, a major barrier to their commercialization has been material stability and durability. Particularly for tin-based perovskites, which are highly anticipated as an environmentally friendly, lead-free alternative, the rapid degradation due to tin ion oxidation presented a formidable challenge. This Japanese research offers a decisive solution to this issue, substantially accelerating the practical deployment of lead-free materials.

Future Outlook

The discovery of the 2-ABZ molecule holds the potential to dramatically improve the performance and lifespan of tin-based perovskite solar cells. Industry players like Caelux and Oxford PV, who are focused on commercializing perovskite solar cell technology, will closely watch how this technology is integrated into product development. This enhanced stability is expected to drive the adoption of perovskite solar cells in a wide range of applications, including Building-Integrated Photovoltaics (BIPV) and flexible solar cells, contributing to the advancement of clean energy technologies. Further challenges include scaling up for mass production and validating cost-effectiveness.

Source: https://www.indexbox.io/blog/new-molecule-boosts-tin-based-perovskite-solar-cell-durability/

Collected: September 11, 2026 | Automated Research System (Gemini API)

#18 Chinese Researchers Set New World Record with 27.39% Efficient Inverted Perovskite Solar Cell via Novel Molecular Design, Independently Verified

Published September 05, 2026 pv-magazine.com China

OVERVIEW

A Chinese research group has achieved a new world record for power conversion efficiency in inverted perovskite solar cells, reaching 27.39%, as independently verified by a third-party certification body. This remarkable achievement stems from a novel molecular design that effectively reduces defect density within the perovskite film, simultaneously enhancing both device efficiency and stability. Furthermore, the technology has been successfully scaled up to bifacial mini-modules, signaling a significant acceleration toward the commercialization of high-efficiency, next-generation solar cells.

IN DEPTH

A Chinese research group has set a new world record for power conversion efficiency in perovskite solar cells, achieving an remarkable 27.39%. This outstanding performance was realized with an inverted perovskite solar cell incorporating a newly developed molecular design, and its efficiency has been rigorously verified by an independent third-party certification body. This breakthrough successfully reduced defect density within the perovskite film, optimizing charge carrier transport and extraction, thereby simultaneously enhancing both device performance and long-term stability.

Technical & Material Details

The core of this research lies in a new molecular design functioning at the interface between the perovskite layer and the charge transport layer. The researchers utilized organic molecules to effectively passivate unsaturated sites (defects) on the perovskite crystal surface, thereby suppressing non-radiative recombination losses. This led to improvements in both open-circuit voltage (Voc) and fill factor (FF), ultimately achieving the high efficiency of 27.39%. Moreover, this passivation layer contributes to improved operational stability, enhancing resistance to moisture and heat. The technology has also been successfully scaled up to bifacial mini-modules with transparent electrodes on both sides, demonstrating a clear path towards efficient large-area fabrication.

Background & Industry Context

Perovskite solar cells are the subject of intense global research and development due to their potential to achieve high efficiencies comparable to, or even exceeding, traditional silicon solar cells, at a lower manufacturing cost. Specifically, controlling defects at interfaces has been identified as one of the most critical challenges for improving the performance and stability of perovskite solar cells. This Chinese research demonstrates significant progress on both efficiency and stability fronts by overcoming this challenge through precise molecular-level control. The inverted structure is also well-suited for applications on flexible substrates and in tandem solar cells, raising high expectations for practical implementation.

Strategic Significance & Outlook

The achievement of 27.39% efficiency with third-party certification clearly indicates that perovskite solar cells are approaching practical efficiency levels. The successful scale-up to bifacial mini-modules, in particular, will accelerate deployment in diverse applications such as Building-Integrated Photovoltaics (BIPV) and power supply for mobile devices. As further validation of the manufacturability and long-term reliability of this molecular design progresses, the competitiveness of perovskite technology in the next-generation solar cell market is expected to strengthen further, serving as a new driving force for renewable energy adoption.

Source: https://now.solar/2026/09/05/chinese-researchers-build-27-39-efficient-inverted-perovskite-solar-cell-based-on-new-molecular-design-pv-magazine-com/

Collected: September 11, 2026 | Automated Research System (Gemini API)

#19 Nanjing University & Renshine Solar Set World Record: 24.0% Efficiency for 810 cm² Large-Area Perovskite Solar Module

Published September 03, 2026 PV Magazine China

OVERVIEW

A collaborative research team from Nanjing University and Renshine Solar in China has established a new world record, achieving 24.0% power conversion efficiency on an 810 square centimeter large-area perovskite solar module. This breakthrough stems from a novel passivation strategy utilizing a chemically stable lead carboxylate passivator (LCP). The LCP significantly enhances charge carrier transport and circumvents stability issues common with previous passivators, marking a substantial step towards the large-scale commercialization of perovskite solar cells.

IN DEPTH

A joint research team from Nanjing University and Renshine Solar in China has achieved a world-record power conversion efficiency of 24.0% for large-area perovskite solar cell modules. This remarkable accomplishment was realized on a practical module size of 810 square centimeters, strongly indicating the feasibility of large-scale production for commercial perovskite solar cells. Unlike high-efficiency records on small-area cells, this represents a significant performance improvement in a form factor much closer to actual market-ready products.

Technical & Material Details

The key to this world record achievement lies in an innovative passivation strategy employing a newly developed, chemically stable lead carboxylate passivator (LCP). LCP effectively passivates defect sites within the perovskite material and at interfaces, which typically act as charge recombination centers. This action extends the lifetime of charge carriers and significantly improves their transport efficiency. Furthermore, LCP addresses the instability issues of conventional organic passivators against heat and humidity, contributing to the long-term stability of the device. This dual effect enabled the simultaneous achievement of high efficiency and stability in large-area devices.

Background & Industry Context

While many high efficiencies have been reported for small-area perovskite solar cells in R&D, scaling that performance to large-area modules has presented significant challenges, including ensuring uniformity, suppressing defects, and maintaining stability. Particularly, as the area increases, the impact of defects becomes more pronounced, often leading to a drop in efficiency. The research by Nanjing University and Renshine Solar has overcome this scaling barrier with a novel material approach using LCP, representing a crucial step for perovskite technology to become a primary or complementary technology to silicon solar cells.

Strategic Significance & Outlook

Achieving 24.0% efficiency on an 810 square centimeter module directly translates to reduced manufacturing costs and increased power generation per unit area, significantly boosting commercial competitiveness. This technology is anticipated for integration into factory mass production processes, broadening the potential market adoption of perovskite solar cells from residential and industrial applications to even utility-scale power plants. Future focus will shift to further long-term reliability testing of LCP-based modules and performance evaluation under real-world environmental conditions. This achievement is expected to have a substantial impact on the entire solar PV industry, acting as a powerful catalyst for the widespread adoption of renewable energy.

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

#20 Oxford PV Secures $239M in Funding, Begins Commercial Tandem Module Shipments to US, and Forms Key Licensing Partnerships with Trinasolar and First Solar

Published September 03, 2026 Tracxn UK

OVERVIEW

Oxford PV, a pioneer in perovskite-on-silicon tandem solar cells, has successfully raised a total of $239 million in funding, accelerating its commercialization efforts. The company initiated shipments of its first commercial tandem modules to a US customer in September 2024 and subsequently signed significant licensing agreements with Trinasolar in April 2025 and First Solar in February 2026. These strategic advancements underscore Oxford PV's growing market presence and its pivotal role in pushing the efficiency limits of solar technology beyond traditional silicon.

IN DEPTH

Oxford PV, a UK-based pioneer in perovskite-on-silicon tandem solar cell technology, has successfully raised a cumulative $239 million in funding, significantly accelerating its commercialization strategy. The company is actively building a track record in the market, having commenced shipments of its first commercial tandem modules to a US customer in September 2024. Furthermore, Oxford PV has cemented its global recognition by sequentially securing licensing agreements with solar industry giants Trinasolar (April 2025) and First Solar (February 2026), demonstrating the widespread acceptance and readiness of its technology.

Technology & Product Details

Oxford PV's perovskite-on-silicon tandem solar cell technology aims to surpass the theoretical efficiency limits of conventional single-junction silicon solar cells. This approach involves layering a low-cost, manufacturable perovskite cell on top of a high-performance silicon solar cell. This combination leverages the strengths of both materials, allowing for the conversion of a broader spectrum of sunlight into electricity. This holds the potential to achieve power conversion efficiencies exceeding 30%, a level unattainable by silicon cells alone. Such high efficiency is particularly advantageous for space-constrained applications like urban installations and rooftop deployments, where maximizing power output per unit area is critical.

Background & Industry Context

In the solar PV market, the relentless pursuit of higher efficiency and lower costs has been a constant. Traditional silicon solar cell technology is now mature, and efficiency gains are gradually plateauing. Consequently, tandem structures utilizing new technologies like perovskites and HJT (Heterojunction) are widely anticipated as the next major breakthrough. Oxford PV, as a leader in this field, is aggressively transitioning from R&D to commercial production. Its partnerships with major players like Trinasolar and First Solar serve as strong validation of the technology's manufacturability and reliability at scale. This indicates a turning point where perovskite technology is shifting from a niche area towards the mainstream market.

Strategic Significance & Outlook

The $239 million funding and strategic licensing agreements provide Oxford PV with a robust foundation to establish global leadership in perovskite tandem solar cells. The initiation of commercial shipments to the US signifies that the company's products are already demonstrating performance and reliability in real-world conditions. Moving forward, these partnerships are expected to drive the adoption of Oxford PV's technology by more solar cell manufacturers worldwide, increasing the likelihood that perovskite-on-silicon tandem solar cells will become the next industry standard. This technology is poised to play a crucial role as an efficient power generation solution, contributing significantly to achieving renewable energy deployment targets.

Source: https://tracxn.com/d/companies/oxford-photovoltaics/__6plv1SEM2SPO6n0F3ZSabQsHBw8Z6sXt3TXZxPIOmv0

#21 German Firm Credoxys Secures Series A Funding to Advance p-Dopant Technology for OLEDs and Perovskite Solar Cells, Eyes Asian Market Expansion

Published September 04, 2026 Fundz Germany

OVERVIEW

German materials technology company Credoxys has successfully closed a Series A funding round co-led by Ventech and eCAPITAL. The capital will be utilized to further develop its p-dopant OLED technology and expand operations, particularly in the Asian market. Credoxys' novel p-dopant materials are designed to enhance phosphorescent blue OLEDs and notably also boost the power conversion efficiency of perovskite solar panels, demonstrating multi-utility across next-generation electronics and energy sectors.

IN DEPTH

Credoxys, a German advanced materials technology company, has successfully completed a Series A funding round co-led by Ventech and eCAPITAL, securing significant capital. This strategic injection of funds will be allocated to further research and development of the company's p-dopant technology for OLEDs (Organic Light Emitting Diodes), as well as to accelerate business expansion and strengthen market presence, particularly in the rapidly growing Asian market. Credoxys aims to contribute to the development of high-efficiency and long-life displays through innovation in the OLED sector, while also holding the potential to create ripple effects in the solar power generation field.

Technical & Product Details

The new p-dopant material developed by Credoxys is primarily designed to improve the luminous efficiency and stability of phosphorescent blue OLEDs. In OLED displays, efficient light emission for red, green, and blue colors is crucial, and the lifespan of blue OLEDs, in particular, has long been a bottleneck determining the overall display lifespan. Credoxys' p-dopant dramatically improves the performance and longevity of blue OLEDs by enhancing charge injection efficiency and reducing resistive losses within the device. Furthermore, this dopant technology has been shown to be applicable to the charge transport layers of perovskite solar cells, suggesting its potential to improve the power conversion efficiency of solar cells. This is because the material is expected to boost overall solar cell performance by increasing carrier extraction efficiency.

Background & Industry Context

The OLED market continues to expand across diverse applications, including smartphones, televisions, and wearable devices. As demand for high-efficiency, thin, and flexible displays grows, innovation in material technology is indispensable for establishing a competitive advantage. Credoxys' p-dopant technology offers a promising solution to a long-standing industry challenge, specifically the performance improvement of blue OLEDs. Concurrently, perovskite solar cells are garnering attention as a next-generation renewable energy technology, requiring further advancements in efficiency and stability. The potential for Credoxys' technology to contribute to both OLEDs and perovskite solar cells highlights the company's deep expertise in material science and the synergistic effects across different technological domains.

Strategic Significance & Outlook

With the successful Series A funding, Credoxys is poised to further enhance its competitiveness in the OLED market and enable aggressive expansion, especially in Asia. Through partnerships with leading display manufacturers and potentially solar cell manufacturers, the company's p-dopant materials could see widespread adoption in next-generation high-performance devices. If its application to perovskite solar cells materializes, Credoxys could also establish itself as a key supplier in the clean energy sector. This multi-functional materials technology is expected to play a significant role in the future evolution of both the electronics and energy industries.

Source: https://app.fundz.net/fundings/credoxys-funding-round-series-a-1ddf41

#22 US DOE Project Leverages Perovskite Particles for Cost-Effective Thermochemical Solar Energy Storage System

Published September 03, 2026 Department of Energy USA

OVERVIEW

A project by the U.S. Department of Energy (DOE) is developing an innovative thermochemical solar energy storage system utilizing specialized sand-like perovskite particles. This system aims to efficiently store solar energy via thermochemical reactions within concentrating solar power (CSP) applications, reducing costs significantly. Collaborating with the Colorado School of Mines and Sandia National Laboratories, researchers are tuning the perovskite's chemical composition to enhance both the economic viability and practical utility of solar energy storage.

IN DEPTH

A pioneering project spearheaded by the U.S. Department of Energy (DOE) aims to develop a thermochemical energy storage system by utilizing perovskite materials in the form of sand-like particles. This technology is poised to revolutionize the Concentrating Solar Power (CSP) sector, opening new avenues for high-efficiency and long-duration solar energy storage. Specifically, the project focuses on meticulously tuning the chemical composition of perovskite particles to significantly reduce system costs while maximizing the efficacy of energy storage through thermochemical reactions.

Technical & System Details

In this thermochemical storage system, concentrated sunlight is directed onto perovskite particles, storing thermal energy in the form of chemical bonds. Compared to conventional sensible or latent heat storage, thermochemical storage offers the advantages of higher energy density and minimal heat loss during the storage period. The Colorado School of Mines and Sandia National Laboratories are central to this project, conducting detailed research into the thermochemical behavior exhibited by different perovskite compositions. Their objective is to identify optimal compositions that improve the efficiency of energy storage and release cycles, thereby balancing both the durability and economic viability of the entire system. This approach promises stable power supply even during nighttime or adverse weather conditions when solar radiation is unavailable.

Background & Industry Context

With the expanding integration of renewable energy sources, efficient and cost-competitive energy storage technologies are becoming indispensable to overcome the intermittency challenges of solar power. Concentrating Solar Power (CSP), in particular, holds a unique advantage over other solar technologies due to its ability to directly store solar thermal energy; however, the cost and efficiency of its storage systems are critical for widespread adoption. Perovskite materials are not only recognized for their excellent photoelectric conversion properties but also for their thermal stability and chemical flexibility. This DOE project seeks to unlock their potential in the novel application of energy storage, representing a crucial initiative to resolve the fundamental issue of 'supply instability' in solar power generation.

Strategic Significance & Outlook

This U.S. DOE project highlights the potential for perovskite-based thermochemical storage technology to play a central role in next-generation clean energy systems. If the optimization of perovskite particles succeeds in achieving the targeted cost reductions and efficiency improvements, it could significantly lower the construction and operational costs of CSP plants, establishing a robust foundation for solar power to function as a baseload energy source. Future research will likely focus on large-scale system demonstration, long-term reliability assessments, and the development of commercial-scale manufacturing processes. This technology has the potential to accelerate the adoption of renewable energy and transform the global energy mix.

Source: https://www.energy.gov/cmei/systems/concentrating-solar-power-efficiently-leveraging-equilibrium-mechanisms-engineering

#23 Dinto Solar Accelerates Commercialization of HJT & Perovskite-HJT Tandem Cells, Targeting Over 30% Efficiency with Major Chinese Power Procurement Wins

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OVERVIEW

Dinto Solar is intensifying its focus on Heterojunction (HJT) and perovskite-HJT tandem solar cell technologies, aiming to achieve cell efficiencies exceeding 30% through integrated R&D and manufacturing. The company is collaborating with value chain partners to pursue this ambitious goal and has achieved significant commercial momentum, including successful bids and shortlisting for large-scale procurement by major Chinese power companies in 2026. This trajectory positions Dinto Solar as a key player in the next-generation, high-efficiency solar market, contributing substantially to renewable energy adoption.

IN DEPTH

Dinto Solar is driving a specialized strategy focused on Heterojunction (HJT) solar cell technology, advancing both its R&D and integrated manufacturing capabilities. Notably, the company is concentrating on next-generation perovskite-HJT tandem solar cell technology, setting an ambitious target of achieving over 30% cell efficiency. This pursuit of high efficiency is supported by a robust collaboration framework with value chain partners. Dinto Solar has significantly accelerated its commercial momentum, exemplified by its selection as a strong contender in large-scale procurement programs conducted by major Chinese power companies in 2026.

Technical & Product Details

Dinto Solar's core HJT technology achieves high passivation effects and excellent carrier transport characteristics by depositing amorphous silicon thin films on a crystalline silicon substrate. Furthermore, the perovskite-HJT tandem cell, formed by layering a perovskite material on top of an HJT cell, combines two cells with different spectral absorption properties. This allows for broader utilization of solar energy that cannot be captured by a single cell. Consequently, it is expected to achieve power conversion efficiencies exceeding 30%, surpassing the theoretical limits of conventional silicon solar cells. This high efficiency is extremely advantageous for maximizing power generation in limited areas and relatively reducing installation costs.

Background & Industry Context

The global solar power market continues to grow, driving increased demand for higher efficiency and lower-cost technologies. HJT technology is garnering attention as one of the next-generation mainstream technologies, offering higher efficiency, a superior temperature coefficient, and bifacial power generation capabilities compared to the already established PERC (Passivated Emitter and Rear Cell) technology. Dinto Solar is leveraging the strengths of HJT while further advancing its tandem integration with perovskites to achieve technological differentiation. The large-scale procurement from Chinese power companies aligns with the government's renewable energy promotion policies, serving as proof that Dinto Solar's technology is receiving high evaluation and trust in the market. This is a classic example of technological innovation combining with national strategy to drive rapid commercialization.

Strategic Significance & Outlook

Dinto Solar's pursuit of over 30% efficiency with HJT and perovskite-HJT tandem technology, coupled with its success in securing major contracts with leading Chinese power companies, strongly underpins its future potential. This commercial success will enable further investment in R&D and manufacturing capacity expansion, accelerating the mass production of high-efficiency tandem solar cells. In the global market, Dinto Solar's technology will enhance its competitiveness as a sustainable energy solution and is expected to play an indispensable role in achieving renewable energy deployment targets. As cell efficiencies exceeding 30% are realized at the product level and long-term reliability is demonstrated, the company will further solidify its position as a key player in the solar PV industry.

Source: https://en.antaranews.com/news/429767/nine-years-one-focus-dinto-solar-builds-hjt-momentum-from-lab-to-global-markets

Collected: September 11, 2026 | Automated Research System (Gemini API)

#24 German Funding Boosts LMU's Quantum Research on Perovskite Modules, Exploring Novel Applications Beyond Solar Cells

Published September 03, 2026 Quantum News Germany

OVERVIEW

Researchers at Ludwig Maximilian University of Munich (LMU) have secured German government funding to advance quantum technology applications utilizing perovskite solar cell technology. This initiative aims to push beyond current innovations in perovskite modules, exploring new frontiers in quantum computing and communications. Leveraging the unique physical properties of perovskite materials, the project strategically investigates their future potential beyond conventional solar energy.

IN DEPTH

The German government has allocated funding to researchers at Ludwig Maximilian University of Munich (LMU) to explore the application of perovskite solar cell technology in quantum technologies. This support aims to unlock new possibilities for perovskite materials beyond their well-known high-efficiency solar cell capabilities, venturing into cutting-edge fields such as quantum computing, quantum communication, and advanced sensors. This initiative is positioned as a crucial step where fundamental scientific research can lead to future technological breakthroughs.

Technical & Research Details

LMU researchers are focusing on the unique electronic structure and photophysical properties of perovskite materials. In particular, perovskites exhibit high charge carrier mobility, long carrier diffusion lengths, and tunable bandgaps, making them highly attractive as components for quantum technologies. This research aims to maximize quantum effects through nanoscale designs, such as perovskite quantum dots and superlattice structures. This enables exploring the potential of perovskite materials to realize fundamental quantum phenomena like single-photon generation and detection, control of quantum entanglement, or ultra-fast qubit operations—foundational elements of quantum technology. This research is distinct from solar cell efficiency improvements, focusing instead on the intrinsic quantum characteristics of the material.

Background & Industry Context

Perovskite materials, amid a series of breakthroughs in the solar cell sector, have shown potential for applications beyond energy conversion due to their excellent properties. Quantum technology is a strategic frontier attracting national investments worldwide, promising to be the next generation of computing, communication, and sensing technologies. The German government's investment in LMU's perovskite quantum technology research clearly demonstrates the nation's intent to strengthen its international competitiveness in this domain. Beyond improving solar cell performance, unraveling the diverse physical properties of perovskite materials and linking them to new industrial applications represents a significant advancement at the intersection of materials science and quantum physics.

Strategic Significance & Outlook

With the German funding, LMU's research into perovskite quantum technologies is set to accelerate, promising new scientific discoveries and technological breakthroughs. If successful, this research could establish perovskite materials not just as key components for renewable energy, but also as fundamental materials contributing to the advancement of quantum information science. In the future, perovskite-based quantum devices might enable ultra-fast and high-sensitivity sensors, secure quantum communication systems, or even general-purpose quantum computers that are challenging with existing semiconductor technologies. This research is expected to dramatically broaden the application scope of perovskite technology and have a profound impact on long-term scientific and technological development.

Source: https://quantumzeitgeist.com/quantum-news/