PerovskiteSolarCells

Weekly Intelligence Report

2026-08-23 | 32 articles | 8 countries

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This Week's Keyword

Perovskite Solar Scale-Up

Global race for efficiency, stability, and mass production

32	8	34.85	32.44
articles	countries	%	Billion USD
Total Articles Analyzed	Source Countries	NREL-Certified Efficiency	Market Forecast by 2033

All 32 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	LONGi 100MW Pilot Line	Corporate Strategy	●●●○	●●●○	●●●●	●●●●	●●●●	LONGi invests $28M in 100MW perovskite-silicon tandem pilot line in China, following 35.5% efficiency record.
#02	28.04% Perovskite-Organic	Research	●●●●	●○○○	●●●○	●●●●	●●●○	Chinese scientists achieve 28.04% efficiency with stable perovskite-organic tandem solar cell, published in Nature.
#03	Oxford PV Appoints CCO	Corporate Strategy	●●○○	●●●●	●●●○	●●○○	●●●●	Oxford PV appoints former First Solar exec Matthew Merfert as CCO to accelerate perovskite solar commercialization.
#04	34.85% Tandem Efficiency	Market Overview	●●○○	●●●●	●●●●	●●●○	●●●●	Perovskite-silicon tandem cells hit 34.85% efficiency; mass adoption expected by 2027-2028.
#05	US DOE Perovskite R&D;	Government Funding	●●○○	●●○○	●●●○	●●●●	●●●●	US DOE invests in R&D; to solve perovskite solar cell challenges: efficiency, stability, reproducibility, cost.
#06	US DOE SETO 27% Tandem	Government Funding	●●●○	●●○○	●●●○	●●●●	●●●●	US DOE SETO funds R&D; for 27% efficient perovskite-silicon tandem cells and stability via self-assembled monolayers.
#07	US DOE $3M Startup Prize	Government Funding	●●●○	●●●○	●●●●	●●●●	●●●●	US DOE launches $3M Perovskite Startup Prize to accelerate lightweight, >28% efficient tandem solar cells.
#08	US DOE Efficiency Drive	Government Funding	●●○○	●●○○	●●●○	●●●●	●●●●	US DOE drives perovskite solar cell efficiency from 3% to 34%, focusing on cost reduction and stability challenges.
#09	China PV: LONGi & Renshine	Industry News	●●●○	●●●○	●●●●	●●●○	●●●●	LONGi plans 100MW perovskite-silicon tandem pilot line; Renshine Solar achieves 22.0% efficiency on meter-scale modules.
#10	Spectral Mismatch Study	Research	●●●○	●●○○	●●●○	●●●●	●●●○	Perovskite/Silicon tandem cells may lose 3.25% annual energy yield due to spectral mismatch, but still outperform silicon.
#11	Oxford PV 30% by 2030	Corporate Strategy	●●●○	●●●●	●●●●	●●●○	●●●●	Oxford PV unveils roadmap to achieve 30% efficient, 30-year lifespan perovskite-silicon tandem solar modules by 2030.
#12	SoFab Inks $6M Funding	Corporate Strategy	●●●●	●●●○	●●●○	●●●○	●●●●	SoFab Inks secures $6M seed funding for perovskite solar reliability, targeting mass production of 1x2m modules.

#	Article Title	Type	Tech Novelty	Market Proximity	Market Impact	Data Reliability	US/EU Relevance	Summary
#13	UNIST 22.75% 100cm²	Research	●●●●	●●○○	●●●○	●●●●	●●●○	UNIST & KRICT achieve 22.75% efficiency in 100cm² perovskite module via non-destructive X-ray diffraction mapping.
#14	India P3C NISE-Certified	Corporate Strategy	●●○○	●●●●	●●○○	●●●○	●●○○	India's P3C Technology manufactures NISE-certified perovskite solar modules, plans 1MW expansion, launches test platform.
#15	Nanjing/Renshine 24%	Research	●●●●	●●●○	●●●●	●●●●	●●●●	Nanjing Uni & Renshine achieve record 24.0% efficiency for 810cm² perovskite module, meets IEC 61215 reliability.
#16	Monochrome High-Altitude	Field Testing	●●●○	●●●○	●●○○	●●●○	●●○○	Monochrome initiates high-altitude field testing of perovskite PV prototype at 5,150m in Pakistan's Karakoram range.
#17	Nanjing/Renshine 24%	Research	●●●●	●●●○	●●●●	●●●●	●●●●	Nanjing Uni & Renshine achieve record 24.0% efficiency for 810cm² perovskite module, 2200hr stability, meets IEC 61215.
#18	Korean 22.75% 100cm²	Research	●●●●	●●○○	●●●○	●●●●	●●●○	Korean researchers achieve 22.75% efficiency in 100 cm² perovskite solar cell, validating dynamic spin casting.
#19	Nanjing/Renshine 22%	Research	●●●●	●●●○	●●●●	●●●●	●●●●	Nanjing Uni & Renshine certify 22.0% efficiency in 0.72 m² perovskite module, advancing mass production scale.
#20	Cypris AI Patent Report	Market Analysis	○○○○	○○○○	●●○○	●●●○	●●●○	Cypris AI report analyzes perovskite solar patent landscape, highlighting efficiency records and commercialization barriers.
#21	Kaunas Uni Durability	Research	●●●●	●●○○	●●●○	●●○○	●●●●	Kaunas University of Technology boosts perovskite solar cell durability by modifying interfacial layer chemistry.
#22	Perovskite Market $32.44B	Market Report	○○○○	●●●●	●●●●	●●●○	●●●●	Perovskite solar cell market enters commercial scale-up in 2026, projected to reach $32.44 billion by 2033.
#23	Novel Additive "AMTZ"	Research	●●●●	○○○○	●●●○	●●●●	●●●○	Novel additive "AMTZ" boosts perovskite solar cell efficiency to 25.47% while retaining 91.1% after 1000 hours.
#24	India P3C Production	Corporate Strategy	●●○○	●●●●	●●○○	●●●○	●●○○	Indian startup P3C commences perovskite solar module production, achieves 19.3% cell efficiency with 1MW expansion plans.
#25	Guangji Lvneng Prod Line	Corporate Strategy	●●●○	●●●●	●●●●	●●●○	●●●●	China's Guangji Lvneng initiates production line for crystalline silicon-perovskite tandem thin-film cells.
#26	Tandem PV $1B LOI	Corporate Strategy	●●●○	●●●●	●●●●	●●●●	●●●●	Tandem PV secures $1B LOI for next-gen perovskite-silicon tandem modules, commencing commercial sales this year.
#27	GIST Molecular Interface	Research	●●●●	○○○○	●●●○	●●●●	●●●○	South Korean researchers at GIST develop molecular interface design to scale perovskite solar cells, mitigating charge loss.
#28	Perovskite Market $32.44B	Market Report	○○○○	●●●●	●●●●	●●●○	●●●●	Perovskite solar cells market estimated at $810.6M in 2026, projected to reach $32.44B by 2033 amidst commercial scale-up.
#29	Monochrome K2 Base Camp	Field Testing	●●●○	●●●○	●●○○	●●●○	●●○○	Monochrome to conduct perovskite solar cell field trials at over 5,000m altitude near Pakistan's K2 Base Camp.
#30	LONGi 34.85% NREL-Cert	Research	●●●●	●●○○	●●●●	●●●●	●●●●	LONGi achieves 34.85% NREL-certified efficiency for perovskite-silicon tandem solar cell, setting new industry record.
#31	Lithuanian Durability	Research	●●●●	●●○○	●●●○	●●○○	●●●●	Lithuanian researchers develop innovative method to significantly improve perovskite solar cell durability, enabling new applications.

#	Article Title	Type	Tech Novelty	Market Proximity	Market Impact	Data Reliability	US/EU Relevance	Summary
#32	Chinese Geo-Dependence	Research	●●●○ ○	●●○○ ○	●●●○ ○	●●●● ○	●●●○ ○	Chinese study finds optimal performance of two-terminal perovskite-silicon tandems highly dependent on geographical conditions.

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

Three Questions That Demand Your Decision This Week

❶ Is your PV roadmap obsolete?

Chinese and US firms are rapidly commercializing perovskite-silicon tandems with >34% efficiency (LONGi, Tandem PV). Does your current product pipeline match this pace, or are you at risk of being outcompeted on performance?

❷ Are your supply chains secure for next-gen PV?

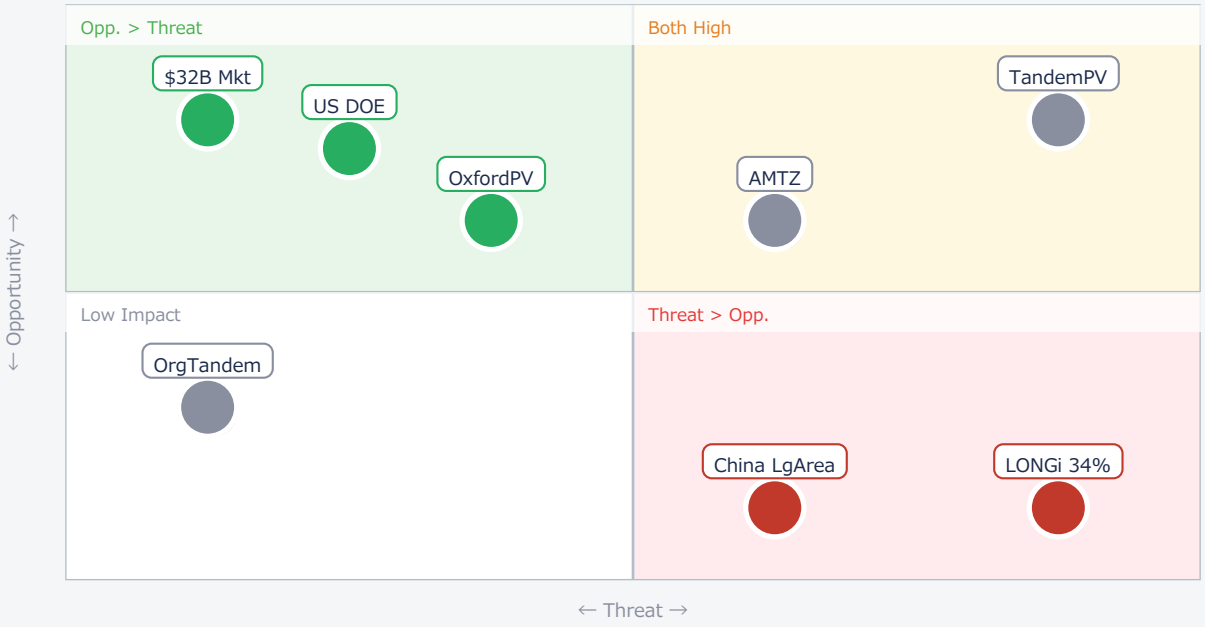
With major investments in China (LONGi, Guangji Lvneng) and US (Tandem PV, Swift Solar) for perovskite production, are you assessing material and component sourcing risks and opportunities in this evolving landscape?

❸ How will stability breakthroughs impact your market entry?

Novel additives (AMTZ) and interface engineering (Kaunas, GIST) are solving perovskite durability issues. Are you integrating these advancements, or risking market lag with less reliable products?

Opportunities vs. Threats for US/European Companies

Opportunity vs. Threat Matrix for US/European Companies



Item	Quadrant	↑ Opportunity	↓ Threat
TandemPV	Critical	US market entry	Domestic rivalry
LONGi 34%	Threat	Tech benchmark	Efficiency gap
China LgArea	Threat	Mfg benchmark	Scale advantage
$32B Mkt	Opp.	Market growth	Intense competition
OxfordPV	Opp.	EU leadership	Execution risk
OrgTandem	Ref.	New markets	Long R&D; cycle
AMTZ	Critical	Stability fix	Material lag

● US DOE	Opp.	US innovation	Limited scope

Deep Dive ① — Tandem PV Secures $1B LOI, Commercial Sales

#26 | 2026/08/14 | pv magazine Global | Tech Novelty●●●○○ Proximity●●●●● Market Impact●●●●● Data Reliability●●●●○ US/EU Relevance●●●●●

US-based Tandem PV has secured approximately $1 billion in Letters of Intent (LOI) for its perovskite-silicon 4T tandem solar modules, with commercial sales expected to begin this year. The company has already shipped its first production-quality panels.

This move signifies a critical transition from R&D; to market deployment, backed by an ambitious goal of gigawatt-scale mass production by 2028 and an industry-leading 30-year warranty with <1% annual degradation.

▶ Strategic Analyst's Perspective

Strategic Analyst's Perspective: The $1B LOI and imminent commercial sales from Tandem PV are highly realistic indicators of market readiness, especially with a 30-year warranty. The main technical barrier is scaling production to gigawatt levels while maintaining quality and cost-effectiveness. [Opportunity] for US/EU OEMs to partner or acquire, securing early access to high-efficiency modules and IP. [Threat] for existing silicon PV manufacturers facing direct competition from a high-performance, US-based alternative. Next actions: [Business Dev] immediately engage with Tandem PV for partnership/supply agreements; [Strategy] re-evaluate competitive landscape and market entry timelines for next-gen PV by Q4 2026.

Deep Dive ② — LONGi Achieves 34.85% NREL-Certified Efficiency

#30 | 2026/08/16 | Facebook | Tech Novelty●●●●● Proximity●●○○○ Market Impact●●●●● Data Reliability●●●●● US/EU Relevance●●●●○

LONGi Green Energy has achieved a new industry record with 34.85% power conversion efficiency for its perovskite-silicon tandem solar cell, independently verified by the U.S. National Renewable Energy Laboratory (NREL).

This breakthrough utilizes a tandem structure to capture a broader solar spectrum, significantly boosting power output per unit area. However, the article notes ongoing challenges in long-term durability for mass commercial deployment.

▶ Strategic Analyst's Perspective

Strategic Analyst's Perspective: LONGi's NREL-certified 34.85% efficiency is a credible, world-leading technical achievement, setting a new benchmark. The stated challenge of long-term durability for mass deployment is realistic and common for perovskites. [Opportunity] for US/EU R&D; to benchmark against this performance and focus on closing the efficiency gap, especially in tandem cell design. [Threat] for US/EU PV manufacturers if they cannot match or exceed this efficiency, potentially losing market share in high-performance segments. Next actions: [R&D;] conduct immediate competitive analysis of tandem cell architectures; [Executive] assess strategic investments in advanced materials and process R&D; by Q4 2026.

Deep Dive ③ — Nanjing Uni & Renshine 24.0% 810cm² Module

#17 | 2026/08/17 | PV Magazine | Tech Novelty●●●●○ Proximity●●●○○ Market Impact●●●●○ Data Reliability●●●●● US/EU Relevance●●●●○

A joint Chinese research team achieved a world-record 24.0% power conversion efficiency for an 810 cm² large-area perovskite solar module, certified by TÜV SÜD. This module also demonstrated excellent stability, retaining 96% efficiency after 2,200 hours of MPPT.

The achievement was made possible through high-saturated vapor pressure (SVP) treatment and lead carboxylate passivation, enabling the module to meet IEC 61215 reliability standards, a crucial step for commercial viability.

▶ Strategic Analyst's Perspective

Strategic Analyst's Perspective: The 24.0% efficiency for an 810 cm² module, coupled with TÜV SÜD certification and 2,200 hours of stability, is a highly significant and realistic milestone. This directly addresses the critical large-area scalability and durability barriers. [Opportunity] for US/EU materials & process suppliers to develop compatible SVP and passivation technologies. [Threat] for US/EU OEMs if Chinese manufacturers can mass-produce such modules at scale and lower cost, eroding market share. Next actions: [R&D;] investigate SVP and LCP technologies for large-area perovskite deposition; [Procurement] monitor Chinese large-area module production capacity and pricing by Q1 2027.

Other Notable Articles

Perovskite-Silicon Tandem Cells Achieve 34.85% Efficiency, Mass Adoption Expected by 2027-2028 (GreenLancer)
Tech Novelty●●○○○ Proximity●●●●○ Market Impact●●●●○

Highlights current efficiency records and near-term mass adoption projections (2027-2028) for tandem cells.

US DOE Launches $3M Perovskite Startup Prize to Accelerate Development and Commercialization of Lightweight, >28% Efficient Tandem Solar Cells (Department of Energy)
Tech Novelty●●●○○ Proximity●●●○○ Market Impact●●●●○

US government actively fostering domestic perovskite innovation and commercialization through prize challenges.

SoFab Inks Secures $6M Seed Funding for Perovskite Solar Reliability, Targeting Mass Production of 1x2m Commercial Modules (Dealroom.co)
Tech Novelty●●●●○ Proximity●●●○○ Market Impact●●●○○

US startup tackling perovskite stability with novel metal oxide nanoparticles, targeting 1x2m modules.

Kaunas University of Technology Boosts Perovskite Solar Cell Durability by Modifying Interfacial Layer Chemistry (The Cool Down)
Tech Novelty●●●●○ Proximity●●○○○ Market Impact●●●○○

Lithuanian research significantly improves perovskite durability via interfacial layer chemistry, enabling BIPV.

China's Guangji Lvneng Initiates Production Line for Crystalline Silicon-Perovskite Tandem Thin-Film Cells, Accelerating Commercialization (Shanghai Metals Market (SMM))
Tech Novelty●●●○○ Proximity●●●●○ Market Impact●●●●○

Another Chinese firm initiating production of crystalline silicon-perovskite tandem cells, accelerating industrialization.

Recommended Actions This Week

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

Immediate (this week)

- [Executive] Review competitive landscape: Assess recent Chinese efficiency records (LONGi 34.85%, Renshine 24% large-area) against internal R&D; targets.
- [R&D;] Evaluate novel stability solutions: Investigate AMTZ additive (#23) and Kaunas University's interfacial layer chemistry (#21) for potential integration.

Short-term (1 month)

- [Procurement] Supply chain risk assessment: Identify potential dependencies on Chinese perovskite material/component suppliers given their rapid scale-up.
- [Strategy] Market entry analysis: Analyze Tandem PV's $1B LOI and commercial sales launch (#26) to refine US/EU market entry strategies for tandem PV.
- [Business Dev] Explore US DOE programs: Investigate "American-Made Challenges: Perovskite Startup Prize" (#07) for partnership or funding opportunities.

Medium-long term (quarter+)

- [R&D;] Develop next-gen tandem platforms: Accelerate R&D; into 4-terminal tandem designs to mitigate spectral mismatch issues (#32) and achieve >30% efficiency.
- [Legal/IP] Patent landscape monitoring: Continuously monitor patent filings (Cypris AI #20) to identify white spaces and protect IP in perovskite stability and manufacturing.
- [Executive] Strategic partnerships: Explore M&A; or joint ventures with promising US/EU perovskite startups (e.g., SoFab Inks #12) to secure advanced materials and IP.

PerovskiteSolarCells — Selected Articles

Date: 2026-08-23

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#20 Nanjing University and Renshine Solar Certify 22.0% Efficiency in 0.72 m² Perovskite Module, Advancing Mass Production Scale

#21 Cypris AI Report: Analysis of Perovskite Solar Patent Landscape and White Space

#22 Kaunas University of Technology Boosts Perovskite Solar Cell Durability by Modifying Interfacial Layer Chemistry

#23 openPR Report: Perovskite Solar Cell Market Enters Commercial Scale-Up Phase in 2026, Projected to Reach $32.44 Billion by 2033

#25 Novel Additive "AMTZ" Boosts Perovskite Solar Cell Efficiency to 25.47% While Retaining 91.1% After 1000 Hours

#26 Indian Startup P3C Commences Perovskite Solar Module Production, Achieves 19.3% Cell Efficiency with Plans for 1MW Expansion

#27 China's Guangji Lvneng Initiates Production Line for Crystalline Silicon-Perovskite Tandem Thin-Film Cells, Accelerating Commercialization

#28 Tandem PV Secures $1 Billion LOI for Next-Gen Perovskite-Silicon Tandem Modules, Commencing Commercial Sales This Year

#29 South Korean Researchers at GIST Develop Molecular Interface Design to Scale Perovskite Solar Cells, Mitigating Charge Loss

#30 Perovskite Solar Cells Market Estimated at $810.6M in 2026, Projected to Reach $32.44B by 2033 Amidst Commercial Scale-Up

#31 Monochrome to Conduct Perovskite Solar Cell Field Trials at Over 5,000m Altitude Near K2 Base Camp, Pakistan

#32 LONGi Achieves 34.85% NREL-Certified Efficiency for Perovskite-Silicon Tandem Solar Cell, Setting New Industry Record

#33 Lithuanian Researchers Develop Innovative Method to Significantly Improve Perovskite Solar Cell Durability, Enabling New Applications

#34 Chinese Study Finds Optimal Performance of Two-Terminal Perovskite-Silicon Tandems Highly Dependent on Geographical Conditions

#01 LONGi to Invest $28M in 100MW Perovskite-Silicon Tandem Pilot Line in China, Following 35.5% World Record Efficiency

Published August 14, 2026 PV Magazine China

OVERVIEW

LONGi Green Energy announced a 204 million RMB (approximately $28 million) investment to construct a 100MW pilot production line for high-efficiency silicon-perovskite tandem solar cells in Xixian New Area, Shaanxi, China. This initiative will support R&D and pilot-scale testing, incorporating advanced perovskite thin-film deposition systems, leveraging LONGi's recent world-record 35.5% conversion efficiency for silicon-perovskite tandem cells achieved in July 2026. This significant investment underscores China's commitment to commercializing next-generation solar technology and advancing global clean energy solutions.

IN DEPTH

Key Findings

LONGi Green Energy has announced a substantial investment of approximately 204 million RMB (about $28 million USD) to establish a 100MW pilot production line for high-efficiency silicon-perovskite tandem solar cells in the Xixian New Area, Shaanxi Province, China. This strategic move aims to accelerate the commercialization of tandem cell technology, building upon the company's achievement of a new world-record conversion efficiency of 35.5% for silicon-perovskite tandem cells in July 2026. This project signifies a critical step in translating laboratory breakthroughs into scalable manufacturing, positioning LONGi at the forefront of the next-generation photovoltaic market.

Technical Details

The new pilot line will be integrated into LONGi's existing research facilities, focusing on advancing both the R&D and pilot-scale testing of these advanced tandem cells. Key equipment, including state-of-the-art perovskite thin-film deposition systems, will be installed to enable precise and high-quality fabrication of the perovskite layers. Perovskite-silicon tandem cells leverage the broad spectral absorption capabilities of perovskites—which efficiently convert high-energy photons—with the robust performance of silicon at lower energies. This synergistic approach allows for power conversion efficiencies that surpass the theoretical limits of single-junction silicon cells. LONGi's 35.5% efficiency record highlights the immense potential of this architecture to deliver significantly more power output per unit area, directly impacting the levelized cost of electricity (LCOE).

Background and Industry Context

As conventional silicon solar cells approach their theoretical efficiency limits, perovskite technology has emerged as a leading candidate for future photovoltaic innovation. Tandem configurations, in particular, combine the strengths of both materials, continuously breaking efficiency records. LONGi, a global leader in solar PV manufacturing, making such a significant investment in perovskite technology signals a strong industry shift towards adopting and scaling these advanced materials. This commitment reflects a broader trend within China, supported by government initiatives to foster domestic leadership in renewable energy technologies and enhance the nation's energy independence. The move from research to pilot production is a pivotal moment for the perovskite industry as a whole.

Future Outlook

The establishment of a 100MW pilot production line is a crucial step towards the mass commercialization of perovskite-silicon tandem solar cells. This facility will enable comprehensive optimization of manufacturing processes, cost reduction strategies, and rigorous reliability testing under real-world conditions. Successful scaling here is expected to pave the way for a broader market introduction within the next few years. LONGi's investment is set to drive the availability of more efficient and potentially lower-cost solar solutions for a diverse range of applications, from residential rooftops to utility-scale power plants. This advancement will play a significant role in accelerating the global transition to clean energy, demonstrating the tangible progress in perovskite technology from an academic curiosity to an industrial reality.

Source: https://www.pv-magazine.com/2026/08/14/chinese-pv-industry-brief-longi-plans-100-mw-perovskite-silicon-tandem-solar-cell-pilot-line/

Collected: August 21, 2026 | Automated Research System (Gemini API)

#02 Chinese Scientists Achieve World Record 28.04% Efficiency with Stable Perovskite-Organic Tandem Solar Cell, Published in Nature

Published August 20, 2026 Facebook China

OVERVIEW

Chinese scientists have set a new world record for perovskite-organic tandem solar cells, achieving a steady-state power conversion efficiency of 28.04%. This high-performance device demonstrated exceptional stability, retaining 90% of its initial efficiency after 625 hours of continuous light exposure. Published in Nature, this breakthrough paves the way for a wide range of applications, from integrated building components and wearables to satellites and aerospace systems, addressing key challenges in both efficiency and long-term stability.

IN DEPTH

Key Findings

A team of Chinese scientists has made a significant breakthrough in the field of perovskite-organic tandem solar cells, achieving a remarkable steady-state power conversion efficiency of 28.04%. This new world record for this specific tandem configuration is particularly noteworthy not only for its high efficiency but also for the device's impressive stability, maintaining 90% of its initial performance after 625 hours of continuous illumination. This achievement, published in the prestigious journal Nature, represents a critical step towards overcoming the long-standing challenges of simultaneously achieving high efficiency and durability in solar cell technology.

Technical Details

The record-breaking performance was achieved through meticulous optimization of the tandem structure, which combines a perovskite layer with an organic layer. This design leverages the complementary spectral absorption capabilities of each material, allowing for more efficient light harvesting across a broader range of the solar spectrum, thereby surpassing the limitations of conventional single-junction solar cells. Crucially, the team incorporated novel material engineering and interface passivation strategies to enhance the device's long-term stability. The high retention of efficiency under prolonged light exposure is a major advancement, addressing one of the primary concerns for the practical commercialization of perovskite solar cells.

Background and Industry Context

Solar photovoltaic technology is a cornerstone of global energy solutions, yet traditional silicon-based cells face challenges related to manufacturing costs, flexibility, and efficiency limits. Perovskite solar cells have garnered significant attention as a next-generation technology due to their high efficiency potential and versatile processing methods. However, ensuring long-term stability has remained the primary hurdle for their widespread commercial adoption. The integration of organic materials offers additional advantages such as flexibility and lightweight properties, opening doors to a wide array of new applications, including Building-Integrated Photovoltaics (BIPV) and wearable electronics. China has been aggressively pursuing leadership in this R&D domain as a national strategy, and this Nature publication solidifies its position as a global research leader.

Future Outlook

The high efficiency and excellent stability of this record-breaking perovskite-organic tandem solar cell technology hold significant promise for diverse applications. Its lightweight and flexible characteristics facilitate integration into unconventional surfaces, such as building facades and wearable devices, creating new market opportunities. Furthermore, the technology's potential for high efficiency and radiation resistance makes it suitable for demanding environments like satellites and aerospace systems. This research expands the potential for perovskite solar cells to offer broader energy solutions for a sustainable future, and further technological development and commercialization efforts will be closely watched by the industry and scientific community.

Source: https://pandaily.com/cas-perovskite-organic-tandem-solar-cell-record-28-04-percent-aug2026

Collected: August 21, 2026 | Automated Research System (Gemini API)

#03 Oxford PV Appoints Former First Solar Executive Matthew Merfert as CCO to Accelerate Perovskite Solar Commercialization

Published August 18, 2026 Solar Power Portal UK

OVERVIEW

Oxford PV, a UK-based perovskite technology company, has appointed Matthew Merfert, a former First Solar executive, as its new Chief Commercial Officer (CCO). Merfert will lead the company's commercial strategy for the commercialization and industrialization of its perovskite-on-silicon solar cell technology. This strategic appointment aims to accelerate the product launch and market entry from Oxford PV's pilot production line in Germany, leveraging Merfert's extensive experience to drive the adoption of next-generation solar solutions.

IN DEPTH

Key Findings

Oxford PV, a UK-based pioneer in perovskite technology, has strategically bolstered its leadership team by appointing Matthew Merfert, a veteran of the solar industry, as its new Chief Commercial Officer (CCO). Merfert, who held key commercial development roles at First Solar, brings extensive experience crucial for driving Oxford PV's commercial strategy towards the full commercialization and industrialization of its groundbreaking perovskite-on-silicon solar cell technology. This executive appointment underscores Oxford PV's strong commitment to accelerating its technology's market entry and facilitating the widespread adoption of next-generation solar solutions.

Technical Details

Oxford PV is at the forefront of developing perovskite-on-silicon tandem solar cells, a technology poised to significantly exceed the efficiency limits of conventional silicon solar cells. This innovative approach involves layering a perovskite top cell onto a silicon-based bottom cell, enabling the capture of a broader spectrum of sunlight and substantially boosting power conversion efficiency. The company currently operates a pilot production line in Brandenburg an der Havel, Germany, where it is demonstrating the commercial-scale manufacturing processes and product reliability. Merfert's commercial acumen will be instrumental in efficiently bringing this advanced technology to market and building a robust customer base.

Background and Industry Context

The global solar photovoltaic market is expanding rapidly, driven by the urgent need for climate change mitigation and enhanced energy independence. However, traditional silicon technology is approaching its physical efficiency limits, necessitating new performance advancements. Perovskite solar cells, with their potential for high efficiency and low-cost manufacturing, are widely regarded as a key solution to this challenge. Oxford PV is one of the leading companies in this field, and its technology offers the advantage of being compatible with existing silicon manufacturing infrastructure, thereby reducing adoption barriers. Merfert's appointment signals that the technology is moving beyond laboratory research to establish itself as a viable commercial product.

Future Outlook

Under Matthew Merfert's leadership, Oxford PV is expected to significantly accelerate the global deployment of its perovskite-on-silicon solar cells. His role in formulating and executing commercial strategies will be vital for securing early market adoption and establishing large-scale manufacturing partnerships. The objective is to introduce more efficient and cost-effective solar modules to the market, contributing to the broader proliferation of solar energy. This will, in turn, increase the proportion of renewable energy in the global energy mix and advance the transition towards a sustainable future. Merfert's contribution will be crucial as Oxford PV aims for 30% efficient solar panels by 2030, reinforcing its position as a leader in next-generation PV technology.

Source: https://taiyangnews.info/people/matthew-merfert-new-oxford-pv-chief-commercial-officer

Collected: August 21, 2026 | Automated Research System (Gemini API)

#04 Perovskite-Silicon Tandem Cells Achieve 34.85% Efficiency, Mass Adoption Expected by 2027-2028, Driving Global Solar Trends in 2026

Published August 18, 2026 GreenLancer USA

OVERVIEW

Perovskite-silicon tandem cells achieved 34.85% efficiency in 2026, surpassing conventional silicon panels' theoretical limits, marking a significant advancement in solar technology. Oxford PV shipped the world's first commercial perovskite tandem panels with 24.5% module efficiency to a US utility-scale project in September 2024. Japan also announced substantial national investments for ultra-thin perovskite solar cell commercialization in 2025. While residential market penetration is limited in 2026, widespread adoption is projected to accelerate with manufacturing scale-up from 2027-2028.

IN DEPTH

Key Findings

In a pivotal development for solar technology, perovskite-silicon tandem cells have achieved a remarkable 34.85% conversion efficiency in 2026, significantly surpassing the theoretical limit of approximately 29% for single-junction silicon solar cells. This breakthrough holds immense potential to revolutionize the global energy landscape by providing substantially higher power output per unit area. Further cementing the technology's practical viability, Oxford PV, a leading British company, already shipped the world's first commercial perovskite tandem panels, boasting 24.5% module efficiency, to a US utility-scale project in September 2024, signaling that the technology is now transitioning from the laboratory to large-scale deployment.

Technical Details

Perovskite-silicon tandem solar cells operate on a principle that maximizes energy harvesting across the solar spectrum. A perovskite top cell efficiently absorbs high-energy photons, while a silicon bottom cell captures the lower-energy photons that pass through the perovskite layer. This tandem arrangement allows for a more comprehensive utilization of sunlight, leading to power conversion efficiencies unattainable by single-junction designs. Oxford PV's commercial module, with its 24.5% efficiency, underscores the successful translation of high laboratory efficiencies into manufacturable large-area modules, showcasing advances in deposition and integration processes. Moreover, these technologies are often inherently lightweight and flexible, enabling deployment in a wider array of applications and challenging environments than traditional rigid silicon panels.

Background and Industry Context

As the global imperative for climate action and energy independence intensifies, solar power stands as a cornerstone of renewable energy. However, conventional silicon solar cell technology is approaching its fundamental efficiency limits, necessitating new avenues for performance improvement. Perovskite solar cells are widely recognized as the 'next big thing' in photovoltaics, primarily due to their high efficiency potential and cost-effective manufacturing methods. The tandem configuration is particularly attractive because it offers a path to significantly higher efficiencies without requiring a complete overhaul of existing silicon manufacturing infrastructure. Japan's substantial national investment in 2025 for the commercialization of ultra-thin perovskite solar cells further highlights the global confidence and strategic interest in this nascent technology.

Future Outlook

While perovskite solar cells currently have limited penetration in the residential market in 2026, widespread adoption is anticipated to accelerate rapidly as the technology matures and manufacturing scales up. The projected expansion of manufacturing capacity from 2027 to 2028 will increase market supply and enhance price competitiveness, encouraging broader adoption by consumers and industries. The evolution of tandem technology promises to enable greater power generation from limited installation areas, facilitating solar energy deployment in urban environments and space-constrained locations. This will further expand the role of solar power in the global energy mix and significantly contribute to the transition towards a sustainable, clean energy future, making perovskite a transformative force in the energy sector.

Source: https://www.greenlancer.com/post/solar-panel-technology-trends

Collected: August 21, 2026 | Automated Research System (Gemini API)

#05 U.S. Department of Energy Invests in R&D to Solve Perovskite Solar Cell Challenges: Efficiency, Stability, Reproducibility, and Cost-Effectiveness

Published August 14, 2026 Department of Energy USA

OVERVIEW

The U.S. Department of Energy (DOE) is actively funding R&D focused on the four main hurdles for perovskite solar cell commercialization: efficiency, stability, reproducibility, and cost-effectiveness. A key objective is to maintain high efficiencies achieved in small cells while improving practical stability for large-area modules. The DOE is accelerating market entry by establishing standardized testing protocols for mini-modules, including IEC 61215 and ISOS standards (UV, thermal cycling, damp heat, PID), and setting clear initial commercialization targets.

IN DEPTH

Key Findings

The U.S. Department of Energy (DOE) is strategically investing in research and development to address four critical challenges hindering the commercialization of perovskite solar cells: efficiency, stability, reproducibility, and cost-effectiveness. This targeted approach aims to bridge the gap between laboratory achievements and industrial-scale production, with a particular emphasis on maintaining high efficiencies in large-area modules while ensuring long-term operational stability. To build confidence and facilitate market adoption, the DOE is also establishing standardized testing protocols for mini-modules, including those based on IEC 61215 and ISOS standards (covering UV exposure, thermal cycling, damp heat, and potential-induced degradation (PID)), and setting clear initial commercialization targets for the industry.

Technical Details

While perovskite solar cells have demonstrated exceptionally high power conversion efficiencies in laboratory settings, challenges persist in scaling up to large areas and ensuring long-term durability against environmental factors such as moisture, temperature fluctuations, and UV radiation. DOE-supported research is focused on overcoming these hurdles through advanced materials optimization, interface engineering, and improved encapsulation techniques. The specified testing protocols—including damp heat tests (+85°C, 85% relative humidity for 1000 hours), thermal cycling tests (-40°C to +85°C for 50 cycles), UV irradiation, and PID tests—are crucial for validating that perovskite modules can achieve a practical lifespan of at least 10 to 20 years in real-world deployment. These rigorous standards are designed to ensure bankability and reliability, key factors for investor confidence.

Background and Industry Context

Perovskite solar cells are widely regarded as a promising next-generation photovoltaic technology, offering the potential for high efficiency and low-cost manufacturing that could either replace or complement traditional silicon-based solar cells. However, issues of stability and scalability have been significant barriers to their widespread commercialization. The U.S. government is accelerating investment in this sector to bolster domestic clean energy production capabilities and enhance energy security. The DOE's initiative is more than just providing R&D funding; it's a comprehensive strategy that defines shared technical challenges and performance targets for the entire industry, thereby fostering an efficient R&D cycle and accelerating market entry. This aligns with broader national goals to lead in sustainable energy innovation.

Future Outlook

The DOE's concentrated investment and the introduction of standardized testing protocols are expected to serve as a critical catalyst for the emergence of reliable commercial perovskite solar cell products. Successful execution of these initiatives would enable perovskite solar cells to become competitive across a wide range of market segments, from residential and industrial applications to specialized uses like Building-Integrated Photovoltaics (BIPV) and wearable electronics. As progress continues in balancing efficiency and stability, the cost of solar power is projected to decrease further, accelerating the global transition to clean energy. This support from the DOE is designed to build a robust foundation for U.S. startups to innovate and establish leadership in the burgeoning global perovskite market.

Source: https://www.energy.gov/cmei/systems/perovskite-research-directions

Collected: August 21, 2026 | Automated Research System (Gemini API)

#06 US DOE SETO Funds R&D for 27% Efficient Perovskite-Silicon Tandem Cells and Stability Enhancement via Self-Assembled Monolayers

Published August 14, 2026 Department of Energy USA

OVERVIEW

The U.S. Department of Energy (DOE)'s Solar Energy Technologies Office (SETO) is actively driving perovskite solar cell R&D through its FY2020 Perovskite Funding Program. This program targets three key areas: device R&D (efficiency and stability), manufacturing R&D, and validation & bankability. Specifically, projects include developing manufacturing processes for 27% efficient perovskite-silicon tandem cells and research to enhance stability and mechanical adhesion strength by incorporating self-assembled monolayers, paving the way for commercialization.

IN DEPTH

Key Findings

The U.S. Department of Energy's (DOE) Solar Energy Technologies Office (SETO) is providing crucial financial support for perovskite solar cell research and development through its FY2020 Perovskite Funding Program. This program is designed to accelerate the market readiness of perovskite technology, with a particular focus on improving device efficiency and stability, innovating manufacturing processes, and establishing infrastructure for validation and bankability. Funded projects include the development of manufacturing processes for perovskite-silicon tandem cells achieving 27% efficiency, as well as research to enhance mechanical adhesion strength and stability through the incorporation of self-assembled monolayers (SAMs). These advancements are significantly propelling the technology towards commercial viability.

Technical Details

Projects supported by this funding program are rigorously addressing the primary technical challenges of perovskite solar cells. In the device R&D domain, efforts are concentrated on optimizing material composition and device architecture to push perovskite-silicon tandem cell efficiency to 27%. Tandem structures are considered a key pathway for next-generation photovoltaics as they can exceed the theoretical efficiency limits of single-junction cells. For stability enhancement, the integration of self-assembled monolayers (SAMs) is a promising approach. SAMs improve interfacial adhesion between different layers and enhance resistance to external environmental factors like moisture and heat, thereby mitigating long-term device degradation. Manufacturing R&D focuses on developing scalable and cost-effective production techniques that can transition from laboratory to industrial scale.

Background and Industry Context

For over a decade, perovskite solar cells have been one of the most exciting advancements in the photovoltaic industry, owing to their astonishing rate of efficiency improvement and potential for low-cost manufacturing. However, the challenge of translating high laboratory efficiencies to large-area module production, particularly ensuring long-term stability, has been the main barrier to their widespread commercialization. The U.S. government is committed to strengthening energy security and combating climate change through strategic investments in clean energy technologies. SETO's funding program is tightly aligned with these national strategies, leveraging U.S. innovation capabilities to transform perovskite technology into a practical and impactful energy solution.

Future Outlook

The research outcomes generated by SETO's FY2020 Perovskite Funding Program are poised to significantly shorten the path to commercialization for perovskite solar cells. The development of manufacturing processes for 27% efficient tandem cells and advances in material technologies that substantially improve stability will enable the market introduction of more efficient and reliable solar modules. As these technologies mature, perovskite solar cells are expected to penetrate new market segments, including Building-Integrated Photovoltaics (BIPV) and flexible devices, in addition to residential, commercial, and industrial applications. This expansion will further increase the role of solar power in the global energy mix. The DOE's continued support is an indispensable element in building a sustainable energy future with perovskite technology.

Source: https://www.energy.gov/cmei/systems/solar-energy-technologies-office-fiscal-year-2020-perovskite-funding-program-0

#07 US DOE Launches $3M Perovskite Startup Prize to Accelerate Development and Commercialization of Lightweight, >28% Efficient Tandem Solar Cells

Published August 14, 2026 Department of Energy USA

OVERVIEW

The U.S. Department of Energy (DOE)'s Solar Energy Technologies Office is accelerating perovskite solar cell development and manufacturing through a $3 million "American-Made Challenges: Perovskite Startup Prize" competition. This initiative aims to transition world-class research to U.S. startups, with winning teams receiving $700,000 in cash and $100,000 in technical support. Projects include developing lightweight, flexible perovskite modules and commercializing perovskite/silicon 2-terminal tandem solar cells with over 28% efficiency, strongly bolstering domestic innovation and industry growth.

IN DEPTH

Key Findings

The U.S. Department of Energy (DOE)'s Solar Energy Technologies Office has launched the "American-Made Challenges: Perovskite Startup Prize," a $3 million prize competition designed to significantly accelerate the development and manufacturing of perovskite solar cells. This pioneering initiative aims to effectively bridge the gap between world-class research and commercialization by supporting U.S.-based startups. Winning teams will receive $700,000 in cash and $100,000 in technical support vouchers, which are expected to fast-track the development of lightweight, flexible perovskite solar modules and the market introduction of perovskite/silicon 2-terminal tandem solar cells achieving efficiencies over 28%. This program represents a powerful push for domestic industry growth and technological innovation.

Technical Details

Projects supported by the "Perovskite Startup Prize" are specifically targeted at unlocking the full potential of perovskite solar cell technology. This includes the development of lightweight and flexible perovskite solar modules, which are crucial for opening up new application areas previously inaccessible to heavy, rigid silicon panels, such as Building-Integrated Photovoltaics (BIPV) and portable devices. A key focus is also on perovskite/silicon 2-terminal tandem solar cells, aiming for efficiencies exceeding 28%. This tandem design enables more efficient utilization of the solar spectrum, thereby achieving performance levels beyond the theoretical limits of single-junction solar cells. Participants are challenged to demonstrate advancements across material science, device architecture, and manufacturing processes to meet these ambitious performance targets.

Background and Industry Context

Perovskite solar cells are considered the front-runner for next-generation photovoltaic technology due to their high efficiency potential, low-cost manufacturing possibilities, and versatile physical properties, including thinness and flexibility. However, significant technical and funding hurdles exist in translating laboratory-scale achievements into large-scale commercial products. The DOE's "American-Made Challenges" program is specifically designed to overcome these barriers and foster a robust clean energy technology innovation and manufacturing ecosystem within the U.S. This prize competition serves as a vital mechanism to support high-risk, early-stage research, enabling startups to gain market competitiveness and strengthen the domestic supply chain for critical renewable energy components.

Future Outlook

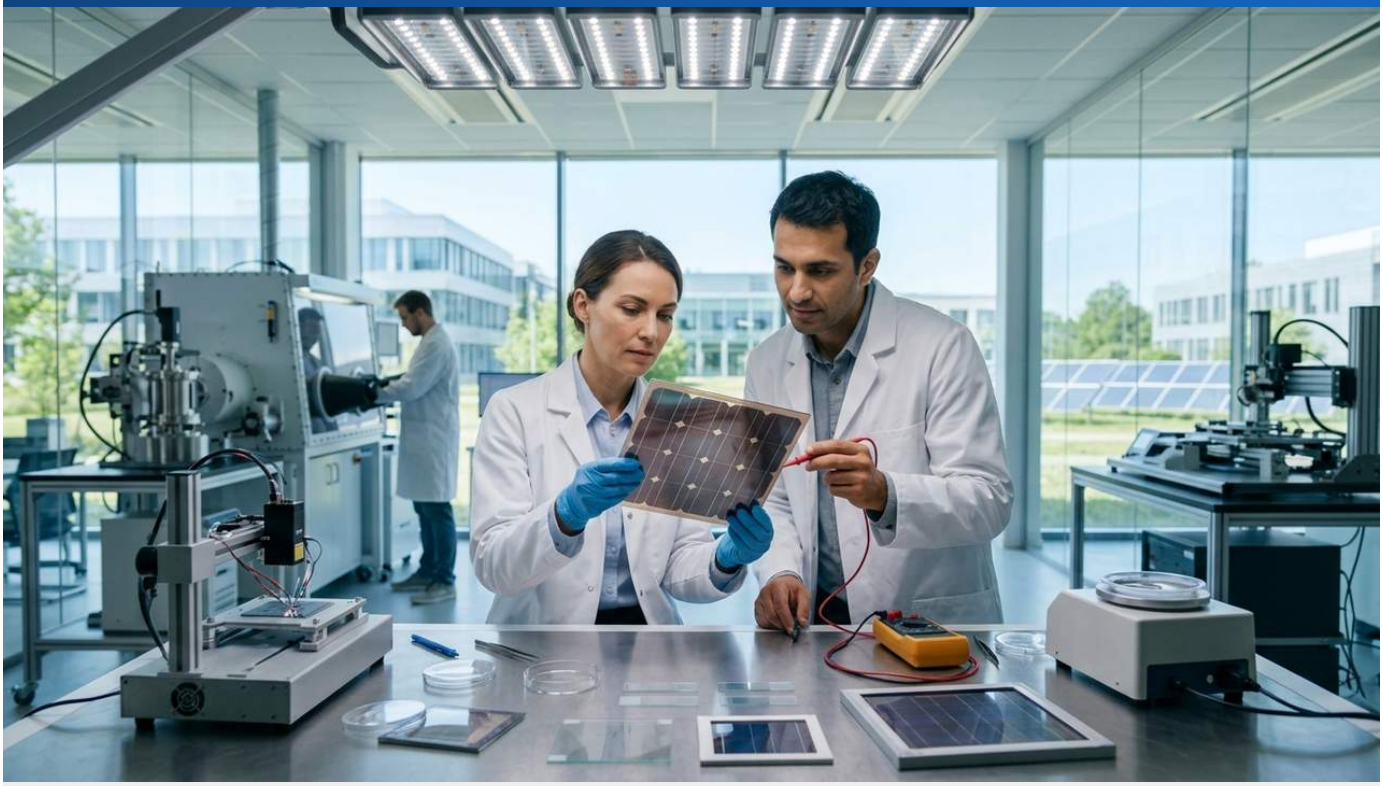
The success of the "Perovskite Startup Prize" is anticipated to have a profound impact on the growth of the U.S. perovskite solar cell industry. Winning teams and participating companies will leverage DOE funding and technical support to accelerate product development and scale up manufacturing capabilities. Lightweight and flexible modules will open new markets for solar power in sectors where it has been traditionally difficult to deploy, such as smart city infrastructure, off-grid power solutions, and even space applications. High-efficiency tandem cells exceeding 28% will contribute to reduced electricity costs and improved land-use efficiency, strongly supporting U.S. energy security and decarbonization goals. This program lays the groundwork for perovskite technology to become a central pillar of the clean energy revolution, driving sustained innovation and economic growth.

Source: https://www.energy.gov/cmei/systems/american-made-challenges-perovskite-startup-prize

Collected: August 21, 2026 | Automated Research System (Gemini API)

#08 US DOE Drives Perovskite Solar Cell Efficiency from 3% to 34%, Focuses on Manufacturing Cost Reduction and Stability Challenges

Published August 14, 2026 Department of Energy USA



OVERVIEW

The U.S. Department of Energy (DOE) supports R&D to boost the efficiency and lifetime of metal-halide perovskite solar cells, accelerating their commercialization and manufacturing cost reduction. Perovskite solar cells have advanced remarkably, from approximately 3% in 2009 to over 26% for small-area devices and nearly 34% for perovskite-silicon tandem cells. However, overcoming large-scale manufacturing challenges and improving stability against moisture, oxygen, light, and heat are deemed essential for commercial viability. The DOE's initiatives vigorously advance the practical application of perovskite solar cells through addressing these critical issues.

IN DEPTH

Key Findings

The U.S. Department of Energy (DOE) is driving significant advancements in metal-halide perovskite solar cells, having supported research and development that propelled their efficiency from an initial ~3% in 2009 to over 26% for small-area devices and nearly 34% for perovskite-silicon tandem cells today. A primary objective for the DOE is to accelerate the commercialization of this high-efficiency technology while simultaneously achieving substantial reductions in manufacturing costs. However, the DOE emphasizes that translating these breakthroughs into widespread market deployment necessitates overcoming large-scale manufacturing challenges and ensuring long-term device stability against environmental factors such as moisture, oxygen, light, and heat.

Technical Details

The high power conversion efficiency of perovskite solar cells stems from their excellent light absorption and charge transport properties. Specifically, tandem structures with silicon efficiently utilize different light spectra, breaking the theoretical limits of single-junction cells and achieving efficiencies up to 34%. Yet, these materials are susceptible to degradation from moisture, oxygen, and heat, posing a significant challenge for maintaining performance over long periods in outdoor environments. DOE-supported research primarily focuses on:

- **Material Composition Improvement:** Developing more intrinsically stable perovskite materials.
- **Interface Engineering:** Optimizing interfaces between charge transport layers and perovskite layers to reduce charge recombination losses and enhance stability.
- **Encapsulation Technology:** Innovating new encapsulation materials and processes to protect devices from environmental factors.
- **Large-Scale Manufacturing Techniques:** Establishing low-cost, scalable manufacturing methods such as roll-to-roll printing.

These technical approaches aim to extend device lifetime and ensure practical durability for real-world applications.

Background and Industry Context

Photovoltaics are critical for meeting global energy demands, but conventional silicon solar cells face limitations regarding manufacturing costs, weight, and inherent efficiency ceilings. Perovskite solar cells, with their potential for low cost, manufacturing flexibility, and unprecedented efficiency gains, are widely regarded as a 'game-changer.' The DOE's investment aligns with national goals to enhance U.S. innovation and competitiveness in the clean energy sector. Successful commercialization of this technology would further reduce the cost of solar power, enable broader adoption in diverse applications (e.g., BIPV, portable devices), and significantly increase the share of renewables in the global energy mix.

Future Outlook

The DOE's continued R&D support and collaboration with industry partners are critical for perovskite solar cells to enter large-scale commercial markets. If current challenges related to stability and manufacturing scalability are overcome, perovskite solar cells have the potential to both complement existing photovoltaic markets and create entirely new ones. In the future, more efficient and durable perovskite solar cells are expected to accelerate the proliferation of clean energy and become a key technology in mitigating climate change. The DOE's initiatives are strengthening the foundation for this technology to build a sustainable energy future, ensuring a reliable and affordable power supply for decades to come.

Source: https://www.energy.gov/cmei/systems/perovskite-solar-cells

Collected: August 21, 2026 | Automated Research System (Gemini API)

#09 China PV Brief: LONGi Plans 100MW Perovskite-Silicon Tandem Pilot Line; Renshine Solar Achieves 22.0% Efficiency on Meter-Scale Modules

Published August 13, 2026 TaiyangNews China

OVERVIEW

JinkoSolar, in collaboration with Suzhou University, won the 2026 WITec Paper Award Gold for research on defects in silicon solar cells. Additionally, LONGi revealed plans to construct a 100MW pilot line for high-efficiency crystalline silicon-perovskite tandem cells, alongside a 1GW BC cell production line. Renshine Solar announced achieving 22.0% efficiency for meter-scale perovskite modules, signaling progress in large-area perovskite solar cell development. These updates underscore the continuous technological innovation and manufacturing capacity expansion within China's PV industry.

IN DEPTH

Key Findings

The Chinese photovoltaic industry continues to demonstrate remarkable progress in both technological innovation and manufacturing capacity expansion. JinkoSolar, in collaboration with Suzhou University, was awarded the prestigious 2026 WITec Paper Award Gold for their significant contributions to understanding defects in silicon solar cells. Concurrently, industry giant LONGi has announced ambitious plans to build a 100MW pilot line specifically for high-efficiency crystalline silicon-perovskite tandem cells, in addition to a 1GW production line for BC (Back Contact) cells. Notably, Renshine Solar, a company specializing in perovskite PV, reported achieving an impressive 22.0% efficiency on meter-scale perovskite modules, marking a crucial milestone towards the practical implementation of large-area perovskite solar cells.

Technical Details

JinkoSolar's award-winning research contributes to a deeper understanding of internal defect mechanisms in silicon solar cells, which is vital for further efficiency improvements. LONGi's planned 100MW perovskite-silicon tandem pilot line follows their recent world record of 35.5% efficiency and aims to accelerate the commercialization of this innovative technology. Tandem cells combine perovskite and silicon layers, each optimized for different parts of the solar spectrum, enabling more efficient light utilization and surpassing the efficiency limits of single-junction cells. Renshine Solar's achievement of 22.0% efficiency on meter-scale modules is particularly significant as it demonstrates the successful scale-up of high efficiencies from small laboratory cells to larger, product-relevant areas, thereby enhancing the feasibility of mass production.

Background and Industry Context

China is the world's largest producer of solar photovoltaics and a leading force in technological innovation within the sector. Driven by strong government support and aggressive corporate investments, continuous improvements in solar cell efficiency and reductions in manufacturing costs have been achieved. Perovskite solar cells, with their high theoretical efficiency and manufacturing flexibility, are globally recognized as a leading next-generation technology. China's proactive stance in this field, with companies like LONGi and Renshine Solar leading advancements, holds significant implications for the global energy transition. The progress in perovskite-silicon tandems and large-area perovskite modules is expected to contribute to the expansion of existing solar markets and the development of new application areas.

Future Outlook

These announcements collectively indicate that perovskite solar cells are rapidly transitioning from the research laboratory to commercial production. LONGi's pilot line construction is a forward-looking move towards large-scale production within a few years, while Renshine Solar's high-efficiency large-area modules broaden the potential for perovskite technology across diverse applications. JinkoSolar's fundamental research underpins long-term innovation across the PV landscape. These developments are crucial for solar power to further enhance its competitiveness and play a dominant role in the global energy mix, thereby accelerating the transition to a sustainable society. The sustained technological leadership of Chinese companies is expected to continue profoundly influencing the global solar market dynamics.

Source: https://taiyangnews.info/markets/china-solar-pv-news-snippets-august-13-2026

Collected: August 21, 2026 | Automated Research System (Gemini API)

#10 Perovskite/Silicon Tandem Cells May Lose Up to 3.25% Annual Energy Yield Due to Spectral Mismatch, but Outperform Single-Junction Silicon Overall

Published August 15, 2026 PV Magazine China

OVERVIEW

Researchers from Southwest Petroleum University, in collaboration with Tongwei Solar, developed a framework to quantify the impact of real-world solar spectra on 2-terminal (2T) perovskite/silicon tandem solar cell performance. The study revealed that outdoor spectral variations can exacerbate current mismatch between the tandem's two sub-cells, potentially reducing annual energy yield by up to 3.25% compared to single-junction silicon. Nevertheless, the inherent higher efficiency of tandems still delivered 8.74% to 11.16% more energy per land area across all studied climate zones, confirming their overall performance advantage.

IN DEPTH

Key Findings

A collaborative study by researchers from Southwest Petroleum University and Tongwei Solar has meticulously analyzed the impact of real-world solar spectrum variations on the performance of 2-terminal (2T) perovskite/silicon tandem solar cells. The research quantitatively demonstrated that fluctuations in outdoor spectral conditions can exacerbate current mismatch between the upper perovskite layer and the lower silicon layer of the tandem cell, potentially leading to an annual energy yield reduction of up to 3.25% compared to single-junction silicon. Despite this, the inherent higher conversion efficiency of these tandem cells maintained a significant advantage, delivering 8.74% to 11.16% more energy per unit land area across all climate zones investigated, thus confirming their superior overall performance.

Technical Details

In 2-terminal tandem solar cells, where the top and bottom cells are connected in series, the overall efficiency is compromised if a 'current mismatch' occurs—meaning the currents generated by both cells do not align. Solar spectra vary significantly with time of day, season, and weather conditions (e.g., cloud cover), which in turn alters the amount of light absorbed by each sub-cell, making current matching challenging. This study utilized simulations and empirical data to evaluate how specific spectral variations under different climatic conditions intensify this current mismatch. The findings underscore that achieving current matching that is less sensitive to spectral fluctuations is critical for maintaining high, stable annual energy yields in optimized tandem designs. This work provides crucial insights for future device engineering.

Background and Industry Context

Perovskite/silicon tandem solar cells represent a next-generation technology poised to surpass the theoretical efficiency limits of conventional single-junction silicon solar cells, attracting substantial attention from the photovoltaic industry. While laboratory efficiencies exceeding 35% have been reported, evaluating and optimizing performance under real-world outdoor conditions is an indispensable step towards commercialization. Understanding the effects of spectral variation and developing corresponding design strategies are vital for enhancing the reliability and economic viability of tandem solar cells. This research contributes a deep understanding of practical performance characteristics, offering invaluable insights for future device design and deployment strategies.

Future Outlook

The results of this study highlight the critical importance of optimizing current matching in perovskite/silicon tandem solar cell designs under diverse solar spectral conditions. Future tandem solar cells are expected to integrate dynamic spectral tracking technologies or robust materials and device architectures that are less sensitive to spectral fluctuations, thereby minimizing annual energy yield losses. Furthermore, the adoption of 4-terminal (4T) designs, which allow for independent optimization of each cell, is also considered a promising solution to this challenge. Overall, tandem technology is highly likely to provide superior real-world performance compared to single-junction silicon, contributing significantly to advancements in solar energy efficiency and broader adoption, driving the clean energy transition forward. This will ensure that solar power continues to be a leading force in sustainable development.

Source: https://www.pv-magazine.com/2026/08/18/study-finds-two-terminal-perovskite-silicon-tandems-may-not-deliver-optimal-performance-in-all-climates/

Collected: August 21, 2026 | Automated Research System (Gemini API)

#11 Oxford PV Unveils Roadmap to Achieve 30% Efficient, 30-Year Lifespan Perovskite-Silicon Tandem Solar Modules by 2030

Published August 18, 2026 Facebook UK

OVERVIEW

Oxford PV is actively developing perovskite-silicon tandem solar cell technology, currently achieving 25% efficiency for commercial modules. The company aims for 26% efficiency and a 15-year lifespan this year, with an ambitious roadmap targeting 27% efficiency and 20-year module lifespan by 2027, and ultimately 30% efficiency with a 30-year lifespan by 2030. This innovative technology is expected to accelerate commercialization by complementing existing silicon manufacturing infrastructure, requiring only the addition of a perovskite layer to existing production lines, thus promising significant advancements in solar energy production.

IN DEPTH

Key Findings

Oxford PV has unveiled its ambitious roadmap for the development and future performance targets of its perovskite-silicon tandem solar cell technology, setting high expectations across the industry. Currently, the company's commercial modules are achieving a respectable 25% conversion efficiency, demonstrating robust performance at a practical level. Oxford PV aims to reach 26% efficiency and a 15-year lifespan within the current year. Their detailed roadmap further targets 27% efficiency and a 20-year module lifespan by 2027, with the ultimate goal of achieving 30% efficiency and a 30-year operational lifespan for their solar panels by 2030. These aggressive technical milestones underscore the company's confidence in its technology's potential.

Technical Details

Oxford PV's perovskite-silicon tandem solar cells utilize a stacked architecture, where a perovskite top cell is deposited onto a conventional silicon bottom cell. This design strategy maximizes the utilization of the entire solar spectrum: the perovskite layer efficiently absorbs high-energy photons, while the silicon layer converts lower-energy photons. This dual-layer approach allows for greater overall photon harvesting and power conversion efficiency than single-junction cells. The current 25% module efficiency validates the effectiveness of this tandem structure, and the path to 30% efficiency involves further optimization in material science, interface engineering, and manufacturing processes. Achieving a 30-year lifespan specifically requires significant advancements in encapsulation technologies and material stability to withstand humidity, heat, and UV radiation over extended periods.

Background and Industry Context

Solar photovoltaics are central to the global energy transition, but traditional silicon solar cells are nearing their theoretical efficiency limits. In this context, perovskite solar cells are widely considered the most promising next-generation technology, owing to their high efficiency potential and possibilities for low-cost manufacturing. A key advantage of Oxford PV's technology is its compatibility with existing silicon manufacturing infrastructure. This means that perovskite layers can be added to current production lines without requiring extensive overhauls, thereby reducing manufacturing costs and capital expenditure. This compatibility is a critical factor for rapid market penetration and will contribute significantly to meeting global clean energy targets.

Future Outlook

The roadmap presented by Oxford PV suggests that perovskite-silicon tandem solar cells are poised for rapid evolution in the coming years, potentially leading the market with performance capabilities that surpass conventional solar cells. If the targets of 30% efficiency and a 30-year lifespan are achieved by 2030, it will dramatically increase solar power output, improve land-use efficiency, and further reduce the cost of electricity. This will make solar power an even more economically viable energy source in a wider range of locations, accelerating the clean energy transition towards a sustainable society. Oxford PV's efforts are expected to play a crucial role in shaping the future of photovoltaic technology, driving innovation and expanding the reach of solar energy globally.

Source: https://www.facebook.com/groups/3227689050868500/posts/4036329333337797/

Collected: August 21, 2026 | Automated Research System (Gemini API)

#12 SoFab Inks Secures $6M Seed Funding for Perovskite Solar Reliability, Targeting Mass Production of 1x2m Commercial Modules

Published August 17, 2026 Dealroom.co USA

OVERVIEW

U.S. specialty materials manufacturer SoFab Inks, focused on perovskite solar cells, secured $6 million in seed funding. The company developed a technology replacing the C60 fullerene layer—a primary cause of voltage loss and cracks—with metal oxide nanoparticles, achieving 22.3% efficiency in 30cm single-junction modules. The funds will be used to expand the engineering team and scale up for mass production of 1x2-meter commercial-spec modules. This investment is set to significantly accelerate the reliability and commercialization of perovskite solar cells.

IN DEPTH

Key Findings

SoFab Inks, a U.S.-based specialty materials manufacturer for perovskite solar cells, has successfully raised $6 million in seed funding. This capital injection is poised to accelerate the commercialization of the company's innovative materials technology. SoFab Inks has developed a breakthrough solution by replacing the C60 fullerene layer—a known cause of voltage loss and cracks in conventional perovskite solar cells—with more stable metal oxide nanoparticles. This technological advancement has enabled them to achieve an impressive 22.3% conversion efficiency in 30cm single-junction modules. The secured funds will be allocated towards expanding the engineering team and scaling up for mass production of 1x2-meter commercial-specification modules.

Technical Details

SoFab Inks' core technological innovation lies in its use of metal oxide nanoparticles instead of C60 fullerene in the electron transport layer (ETL) of perovskite solar cells. While C60 fullerene is often incorporated between the perovskite layer and electrodes to facilitate charge transport, it has been identified as being susceptible to degradation under heat and humidity, contributing to long-term device instability. Metal oxide nanoparticles, in contrast, offer superior chemical and thermal stability, combined with excellent electron mobility and high transparency. This substitution significantly enhances the long-term stability of the device, suppresses voltage losses, and ultimately resulted in the achievement of 22.3% efficiency in 30cm^2 single-junction modules. This technology is critical for substantially improving the reliability and durability of perovskite solar cells, paving the way for extended outdoor operation.

Background and Industry Context

Perovskite solar cells are widely anticipated as a next-generation photovoltaic technology due to their high efficiency and low manufacturing costs, but long-term stability has remained the primary hurdle for commercialization. While much research focuses on efficiency gains, SoFab Inks addresses this challenge at a fundamental material level by tackling intrinsic stability issues. The successful seed funding indicates that venture capitalists recognize the significant potential in enhancing the reliability of perovskite solar cells, reflecting a broader industry shift towards prioritizing durability alongside efficiency. Such technological innovation within the U.S. also contributes to strengthening the domestic supply chain for critical clean energy technologies.

Future Outlook

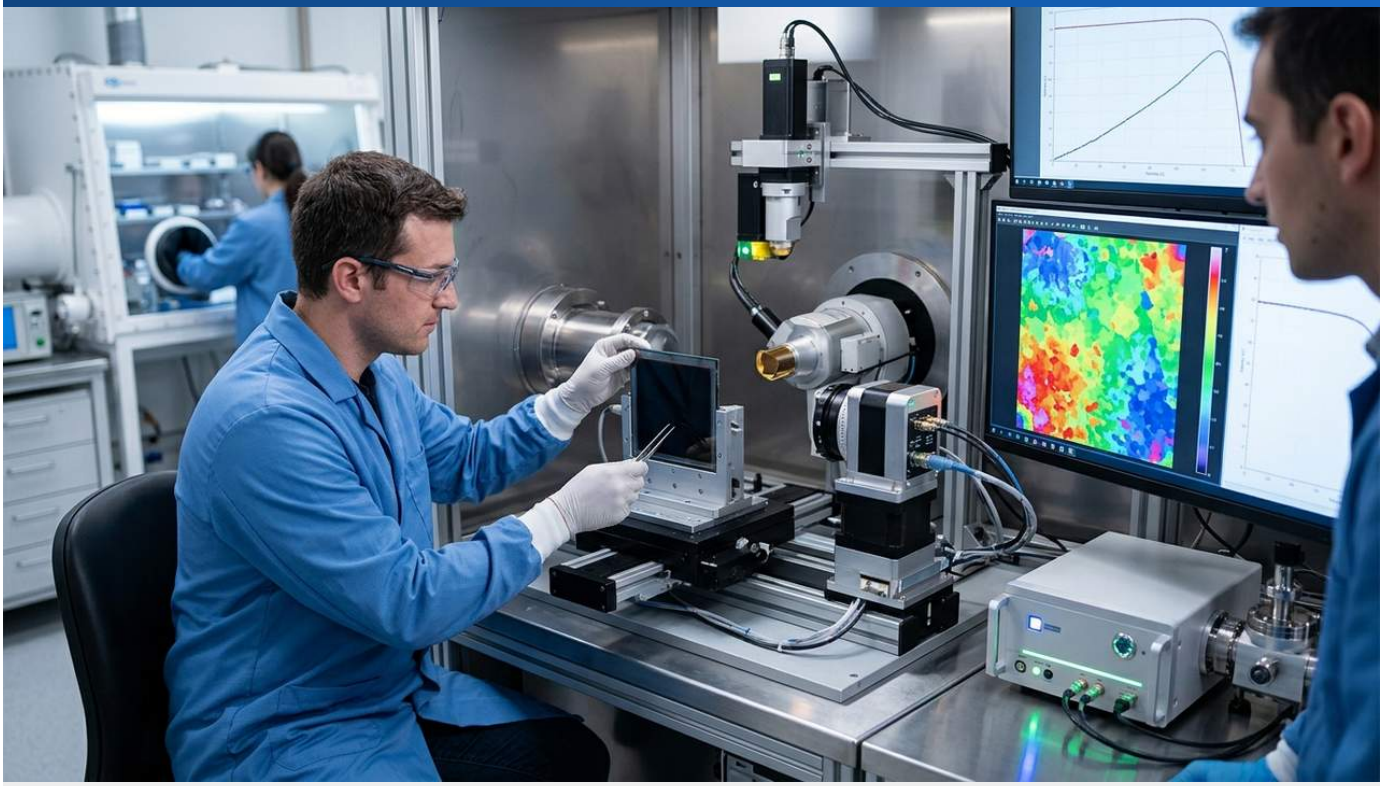
The $6 million secured by SoFab Inks is crucial for the company to transition its technology from the research and development phase to full-scale commercial production. The expansion of the engineering team will facilitate the optimization and automation of manufacturing processes, leading to the establishment of mass production capabilities for large, 1x2-meter modules. If this scale-up is successful, SoFab Inks' material technology will significantly improve the lifespan and performance of perovskite solar modules, thereby boosting the competitiveness of perovskite technology in the solar market. In the future, more reliable perovskite solar cells are expected to be widely adopted in residential, commercial, and utility-scale applications, contributing substantially to the proliferation of clean energy globally.

Source: https://dealroom.co/news/145363-sofab-inks-raises-6m-seed-for-perovskite-solar-reliability/

Collected: August 21, 2026 | Automated Research System (Gemini API)

#13 UNIST and KRICT Achieve 22.75% Efficiency in 100cm² Perovskite Solar Module via Non-Destructive X-ray Diffraction Mapping

Published August 21, 2026 UNIST News Center South Korea



OVERVIEW

Researchers from Ulsan National Institute of Science and Technology (UNIST), in collaboration with the Korea Research Institute of Chemical Technology (KRICT), developed a non-destructive X-ray diffraction mapping (2DXDM) technique to map crystal uniformity across large-area perovskite solar cell films. Utilizing this innovative method, the team identified a manufacturing process that enabled a certified efficiency of 22.75% in a 100cm² perovskite solar module. This research demonstrates the critical importance of uniform crystal growth in large-scale perovskite manufacturing to prevent efficiency loss, marking a significant step toward the mass production of next-generation solar cells.

IN DEPTH

Key Findings

A research team from Ulsan National Institute of Science and Technology (UNIST), in collaboration with the Korea Research Institute of Chemical Technology (KRICT), has developed a groundbreaking technique crucial for enhancing the performance of large-area perovskite solar cells. They introduced a 2-dimensional X-ray diffraction mapping (2DXDM) technique that allows for non-destructive mapping of crystal uniformity across the entire perovskite solar cell film. Leveraging this advanced tool, the researchers successfully identified a manufacturing process that achieved a certified efficiency of 22.75% in a 100cm^2 perovskite solar module, a practical size for commercial applications. This achievement is paramount in resolving technical bottlenecks associated with the mass production of perovskite solar cells.

Technical Details

The efficiency of perovskite solar cells is highly dependent on the uniformity and quality of the perovskite crystalline layer. In large-area devices, crystal defects and non-uniform growth are primary contributors to efficiency loss. Traditional analytical methods have struggled to provide detailed, non-destructive evaluations of the crystal structure across an entire module. The 2DXDM technique employs X-rays to acquire high-precision information on crystal orientation, grain size, and defect density over a large area without damaging the sample. By using this technique, the research team identified optimal film deposition conditions and annealing treatments that promote uniform crystal growth, resulting in the 22.75% certified efficiency for the 100cm^2 module, a world-class figure for large-scale devices.

Background and Industry Context

Perovskite solar cells are garnering significant global attention as a next-generation photovoltaic technology due to their potential to achieve high power conversion efficiencies, comparable to or exceeding traditional silicon-based cells, at a lower cost. However, maintaining the high efficiencies achieved in small-area laboratory devices when scaled up to commercially viable large-area modules has been a long-standing challenge, primarily due to difficulties in ensuring manufacturing uniformity and stability. This research provides a powerful diagnostic tool for quality control and process optimization in large-scale manufacturing, effectively removing one of the major barriers to the commercialization of perovskite technology. The South Korean government is also heavily invested in developing renewable energy technologies, and such breakthroughs enhance the nation's scientific and technological competitiveness.

Future Outlook

The 2DXDM technique developed by UNIST and KRICT has the potential to revolutionize the development and quality control of perovskite solar cell manufacturing processes. By employing this technique, companies can monitor crystal quality in real-time during production and rapidly identify optimized processes. This will accelerate the production of efficient and reliable large-area perovskite modules and contribute to reducing manufacturing costs. The achievement of 22.75% certified efficiency in a 100cm^2 module indicates that perovskite solar cells are becoming competitive in a wide range of markets, from residential to utility-scale power plants, as well as Building-Integrated Photovoltaics (BIPV) and flexible devices. This accomplishment is expected to play a crucial role in accelerating the global transition to clean energy.

Source: https://www.perovskite-info.com/non-destructive-x-ray-diffraction-mapping-technique-enables-2275-efficiency

Collected: August 21, 2026 | Automated Research System (Gemini API)

#14 India's P3C Technology Manufactures NISE-Certified Perovskite Solar Modules, Plans 1MW Expansion, Launches 'P3SKY' Test Platform

Published August 20, 2026 YourStory.com India

OVERVIEW

Gurugram-based P3C Technology and Solutions in India manufactures perovskite modules on glass and flexible substrates, with cell efficiency certified by the National Institute of Solar Energy (NISE). The company currently operates its own assembly line with a 100-kilowatt production capacity for small modules, planning to expand to 1 megawatt. In March 2026, it launched "P3SKY," a platform for manufacturers to test and validate perovskite modules under real-world conditions. This marks a critical step towards accelerating the commercialization and adoption of perovskite technology in India.

IN DEPTH

Key Findings

P3C Technology and Solutions, based in Gurugram, India, is making significant strides in the production of perovskite solar modules, offering products with cell efficiencies certified by the National Institute of Solar Energy (NISE) on both glass and flexible substrates. The company currently operates its own assembly line with a 100-kilowatt production capacity for small modules and has ambitious plans to scale this capacity significantly to 1 megawatt in the future. Furthermore, in March 2026, P3C launched "P3SKY," a dedicated platform designed to enable manufacturers to test and validate perovskite modules under real-world conditions, thereby enhancing the technology's reliability and practical utility. These developments represent a crucial advancement for the commercialization and market penetration of perovskite technology within India.

Technical Details

The perovskite modules manufactured by P3C Technology and Solutions possess characteristics of being lightweight, thin, and flexible, making them highly adaptable to a diverse range of applications. The NISE efficiency certification objectively verifies that the company's products meet credible performance standards. By establishing its own assembly line, even at a modest initial scale, P3C demonstrates early success in addressing the challenges of scalability and cost-efficiency inherent in perovskite manufacturing. The "P3SKY" platform is a vital tool for evaluating module performance, durability, and reliability under varying environmental conditions, which is particularly essential for long-term solar power operation in a region like India with its diverse climatic zones, providing indispensable data for product improvement.

Background and Industry Context

India faces immense energy demands driven by rapid economic growth and population expansion. Concurrently, the nation is pursuing ambitious renewable energy targets as a national strategy, with solar power playing a central role. Alongside conventional silicon-based solar cells, perovskite technology, with its high-efficiency potential and prospects for low-cost manufacturing, is expected to contribute significantly to India's energy goals. The emergence of domestic companies like P3C Technology reflects India's concerted efforts to strengthen self-reliance and foster technological innovation within the solar energy supply chain. The NISE certification is instrumental in establishing the credibility of perovskite technology within the Indian solar ecosystem.

Future Outlook

P3C Technology and Solutions' plan to expand its production capacity to 1 megawatt signifies a major step towards accelerating the market introduction of perovskite solar cells in India. The high-efficiency and flexible perovskite modules have the potential to open up niche markets that have traditionally been challenging for conventional solar cells, such as building facades, portable electronic devices, and off-grid power solutions. Moreover, the "P3SKY" platform will contribute to the standardization and reliability improvement of perovskite technology for the entire Indian solar industry, promoting widespread adoption. P3C's initiatives are expected to be a critical factor in establishing India as a clean energy powerhouse and achieving sustainable development goals, demonstrating the practical impact of advanced PV technology.

Source: https://yourstory.com/2026/08/p3c-perovskite-solar-modules

Collected: August 21, 2026 | Automated Research System (Gemini API)

#16 Nanjing University & Renshine Solar Achieve World Record 24.0% Efficiency for 810cm² Large-Area Perovskite Module, Meets IEC 61215 Reliability

Published August 17, 2026 PV Magazine China

OVERVIEW

A research group from China's Nanjing University and perovskite PV specialist Renshine Solar achieved a record 24.0% power conversion efficiency for a perovskite solar cell module with an aperture area of 810cm². Verified by TÜV SÜD, this is a world record for this module format. The module integrates high saturated vapor pressure (SVP) treatment with chemically stable lead carboxylate passivators (LCPs) for high performance and durability, meeting IEC 61215 reliability requirements. This breakthrough marks a significant advancement towards large-scale commercialization of perovskite solar cells.

IN DEPTH

Key Findings

A collaborative research group from Nanjing University in China and perovskite PV specialist Renshine Solar has established a groundbreaking world record in the efficiency of large-area perovskite solar cell modules. They achieved an astonishing 24.0% power conversion efficiency for a module with a practical aperture area of 810cm^2. This performance was independently verified by the internationally reputable certification body TÜV SÜD, certifying it as the highest efficiency ever recorded for a perovskite module of this size. Furthermore, the developed module also met the stringent IEC 61215 reliability requirements, demonstrating significant progress in terms of durability and stability towards commercialization.

Technical Details

This record-breaking efficiency and stability were achieved through a combination of innovative technologies. One key element is the adoption of a high saturated vapor pressure (SVP) treatment, a process crucial for improving the crystal quality and reducing defects within the perovskite thin film. Another critical innovation is the introduction of chemically stable lead carboxylate passivators (LCPs). LCPs effectively passivate defects on the perovskite crystal surface, suppressing non-radiative recombination, thereby extending the lifetime of charge carriers and enhancing efficiency. LCPs also increase resistance to moisture and heat, contributing to the long-term stability of the device. These technical advancements have made it possible to minimize efficiency loss associated with large-area scaling while meeting rigorous reliability testing standards.

Background and Industry Context

Perovskite solar cells are widely considered the leading candidate for next-generation photovoltaics globally, due to their high power conversion efficiency and potential for low-cost manufacturing. However, maintaining the high efficiencies achieved in small laboratory cells when scaled up to commercially viable large-area modules, and ensuring long-term environmental stability, have been the primary barriers to their commercialization. China is a global leader in PV technology R&D and manufacturing, and under strong government and industry support, has made rapid progress in this sector. The collaborative research by Nanjing University and Renshine Solar provides concrete solutions to these challenges, clearly outlining a path towards large-scale commercialization of perovskite solar cells.

Future Outlook

The achievement of 24.0% conversion efficiency for an 810cm^2 module and its compliance with IEC 61215 reliability requirements indicate that perovskite solar cells are rapidly becoming ready for practical market introduction. This breakthrough is expected to contribute to reduced manufacturing costs, increased power generation, and broader adoption of solar photovoltaics. In the future, these high-efficiency, durable, large-area perovskite modules are anticipated to be widely utilized in residential, commercial, and utility-scale solar power plants, as well as various other applications. This technological innovation by Chinese research institutions and companies is poised to accelerate the global clean energy transition and play an indispensable role in achieving a sustainable society.

Source: https://www.pv-magazine.com/2026/08/17/chinese-scientists-achieve-record-breaking-24-0-efficieny-for-meter-scale-perovskite-solar-modules/

Collected: August 21, 2026 | Automated Research System (Gemini API)

#17 Monochrome Initiates High-Altitude Field Testing of Perovskite Solar Modules in Pakistan's Karakoram Range at 5150m

Published August 15, 2026 pv magazine Global Japan

OVERVIEW

Monochrome commenced field testing of a perovskite PV prototype at approximately 5,150 meters altitude during a high-altitude expedition in Pakistan's Karakoram range. This test will evaluate power generation performance and durability under harsh off-grid conditions, exploring perovskite technology's potential for future BIPV applications. Perovskite cells, being thin, flexible, and lightweight, enable installation on surfaces challenging for traditional silicon panels, such as roofs, windows, and building facades. This extreme environment validation heightens expectations for market expansion.

IN DEPTH

Key Findings

Monochrome, a Japanese Building-Integrated Photovoltaic (BIPV) manufacturer, has commenced field testing of its perovskite solar cell prototypes in the exceptionally harsh environment of Pakistan's Karakoram mountain range. The tests, conducted at an altitude of approximately 5,150 meters, are designed for a rigorous evaluation of the perovskite PV technology's power generation performance and durability under extreme off-grid conditions, including significant temperature variations, high UV radiation, and low atmospheric pressure. This real-world validation represents a critical step towards realizing the potential of perovskite technology for future BIPV applications, opening up diverse installation possibilities where conventional solar power has historically been challenging.

Technical Details

The perovskite solar cells being tested by Monochrome are notable for their thin, lightweight, and flexible characteristics. These properties allow the modules to be roll-printed, cut to any size, and applied to curved surfaces, windows, building facades, or irregular shapes 'like wallpaper.' High-altitude environments such as the Karakoram present significant challenges for standard PV modules; they demand resilience against drastic diurnal temperature swings, physical stress from snow and ice, and intense UV radiation. This field test will provide invaluable data on how perovskite materials perform and degrade under these extreme conditions, contributing directly to the design and reliability enhancements of future commercial products.

Background and Industry Context

Solar photovoltaic technology plays an indispensable role in the global energy transition, but traditional silicon solar cells face limitations due to their weight and rigidity, which restrict installation locations. Perovskite solar cells are poised to overcome these constraints, offering greater design freedom and opening new market segments such as BIPV, off-grid power solutions, and portable applications. Field testing in high-altitude environments is crucial not only for validating efficiency but, more importantly, for ensuring the robustness and reliability of the products. This will enable their deployment in remote areas and specialized infrastructures where stable power supply is critical, even under severe climatic conditions.

Future Outlook

Monochrome's field testing in the Karakoram range holds profound implications for the commercialization and widespread adoption of perovskite solar cell technology. The data gathered from this test will be vital for verifying long-term reliability under harsh conditions and will inform future product improvements. If successful, lightweight and flexible perovskite solar cells are expected to be integrated into architectural designs in ways previously impossible for conventional solar, and utilized in a wide array of innovative applications, including emergency power during disasters and powering IoT sensors. This will enable a future where unique clean energy can be generated everywhere, accelerating contributions to a sustainable society and expanding the reach of solar power globally.

Source: https://www.pv-magazine.com/2026/08/12/perovskite-solar-tested-at-over-5000-m-altitude/

Collected: August 21, 2026 | Automated Research System (Gemini API)

#18 Nanjing University & Renshine Solar Set World Record with 24.0% Efficiency in 810 cm^2 Perovskite Solar Module

Published August 17, 2026 PV Magazine China

OVERVIEW

A joint research team from Nanjing University and Renshine Solar in China has achieved a world-record power conversion efficiency of 24.0% for an 810 cm^2 large-area perovskite solar module, as certified by TÜV SÜD. This advancement was made possible through a unique combination of high-saturated vapor pressure (SVP) treatment and lead carboxylate passivation. The module also demonstrated excellent stability, maintaining 96% of its initial efficiency after 2,200 hours of maximum power point tracking (MPPT) and meeting IEC 61215 reliability standards, significantly advancing the commercial viability of large-scale perovskite technology.

IN DEPTH

Key Findings

A collaborative research team from Nanjing University and Renshine Solar in China has established a new world record for large-area perovskite solar modules, achieving a certified power conversion efficiency of 24.0% for an 810 cm^2 device, as verified by TÜV SÜD. This achievement critically addresses the dual challenge of high efficiency and large-area scalability, which has been a primary bottleneck for the commercialization of perovskite solar cells, marking a significant step towards practical deployment.

Technical Details and Stability

The groundbreaking efficiency was attained through a unique combination of high-saturated vapor pressure (SVP) treatment and lead carboxylate passivation techniques. The SVP treatment enhances the crystalline quality of the perovskite layer, effectively suppressing defects. Meanwhile, lead carboxylate passivation reduces charge recombination at interfaces and boosts carrier transport efficiency, optimizing the overall device performance.

- **Certified Efficiency:** 24.0% for an 810 cm^2 module (TÜV SÜD certified), representing the highest reported efficiency for a perovskite solar module of this size globally.
- **Stability:** The module demonstrated exceptional long-term stability, retaining 96% of its initial efficiency after 2,200 hours of maximum power point tracking (MPPT) testing.
- **Reliability Standards:** Crucially, it met the demanding IEC 61215 international reliability testing requirements for solar modules, confirming its robust performance under practical operating conditions.

Background and Industry Context

Perovskite solar cells are garnering significant attention as a next-generation photovoltaic technology due to their high theoretical efficiency and potential for low-cost manufacturing. However, despite impressive efficiencies reported for small-area cells, the challenge of maintaining high efficiency when scaling up to larger modules, coupled with ensuring long-term stability, has hindered commercial adoption. This research offers concrete technical solutions to these issues, paving the way for large-scale manufacturing and reliable performance in real-world environments.

Strategic Significance & Outlook

This achievement suggests that perovskite solar cells can now rival, and potentially surpass, the performance of conventional crystalline silicon solar cells even in large-area modules. The establishment of high-efficiency, highly stable large-area module technology significantly broadens the potential for perovskite solar cells to become a key player in the future energy market. Such technology is expected to see widespread adoption across various applications, from rooftop installations to utility-scale solar farms, thereby accelerating the global transition to renewable energy.

Source: https://www.pv-magazine.com/2026/08/17/chinese-scientists-achieve-record-breaking-24-0-efficieny-for-large-area-perovskite-solar-modules/

Collected: August 21, 2026 | Automated Research System (Gemini API)

#19 Korean Researchers Achieve 22.75% Efficiency in 100 cm² Perovskite Solar Cell, Validating Dynamic Spin Casting

Published August 19, 2026 Seoul Economic Daily South Korea

OVERVIEW

A South Korean research team has achieved a certified efficiency of 22.75% for a 100 cm² large-area perovskite solar cell. This was accomplished by demonstrating that the dynamic spin casting (DSC) method, which continuously supplies raw materials, forms superior thin films compared to conventional static spin coating. The cells also exhibited robust stability, maintaining over 80% of their initial efficiency after 1,000 hours of light soaking, marking a significant step towards scalable and stable high-performance perovskite devices.

IN DEPTH

Key Findings

A South Korean research team has achieved a remarkable certified power conversion efficiency of 22.75% for a large-area perovskite solar cell measuring 100 cm^2. This breakthrough demonstrates the superior capability of the dynamic spin casting (DSC) method, which continuously supplies raw materials, to form higher quality thin films compared to conventional static processes, thereby advancing both high efficiency and scalability in larger cells.

Technical / Clinical Details

The research team confirmed that the DSC method, characterized by its continuous supply of raw materials, forms more uniform and higher-quality perovskite thin films than traditional static spin coating. This improved film quality directly translates to enhanced efficiency in large-area cells.

- **Certified Efficiency:** 22.75% power conversion efficiency for a 100 cm^2 large-area perovskite solar cell, independently verified by a third-party organization.
- **Fabrication Method:** The dynamic spin casting (DSC) method, which ensures a continuous supply of precursor materials, was employed. This technique significantly improved film uniformity and quality compared to conventional static spin coating methods.
- **Stability:** The cells exhibited excellent long-term stability, maintaining over 80% of their initial efficiency after 1,000 hours of continuous light soaking. This robust performance is crucial for addressing durability, one of the primary challenges for the commercialization of perovskite solar cells.

Background & Context

Perovskite solar cells are widely regarded as a promising next-generation photovoltaic technology due to their high potential for photoelectric conversion efficiency. However, while high efficiencies have been reported for small-area cells, efficiency degradation upon scaling up and ensuring long-term stability have been significant barriers to commercialization. This study presents an effective approach to overcome these challenges by optimizing a scalable manufacturing technique like DSC, holding substantial implications for the development of cost-effective, large-scale production methods.

Strategic Significance & Outlook

This research offers a practical pathway to simultaneously improve the efficiency and stability of large-area perovskite solar cells. Scalable processes like DSC have the potential to accelerate the adoption of perovskite solar cells in diverse applications, including flexible solar panels and Building Integrated Photovoltaics (BIPV). Further optimization and advancements in cost reduction and mass production based on this technology are expected to introduce new competitiveness into the renewable energy market.

Source: https://en.sedaily.com/technology/2026/08/19/korean-team-hits-2275-percent-efficiency-in-large

Collected: August 21, 2026 | Automated Research System (Gemini API)

#20 Nanjing University and Renshine Solar Certify 22.0% Efficiency in 0.72 m² Perovskite Module, Advancing Mass Production Scale

Published August 18, 2026 XenoSpectrum China

OVERVIEW

Researchers from Nanjing University and Renshine Solar have reported a third-party certified power conversion efficiency of 22.0% for a large-area, 0.72 square meter (1.2m × 0.6m) single-junction perovskite solar module. This work, published as "Lead carboxylates passivation for meter-scale perovskite solar modules," demonstrates a significant reduction in efficiency loss during large-area scaling. The module also underwent 1,300 hours of damp heat testing and a three-month outdoor comparative test, providing critical reliability data for the commercialization of large-scale perovskite solar cells.

IN DEPTH

Key Findings

A research collaboration between Nanjing University and Renshine Solar in China has reported a third-party certified power conversion efficiency of 22.0% for an exceptionally large single-junction perovskite solar module, measuring 0.72 square meters (1.2m × 0.6m). This achievement represents a groundbreaking advance in significantly mitigating efficiency loss during module scale-up, marking a crucial step towards the commercial mass production of perovskite solar cells.

Technical / Clinical Details

This high efficiency is based on technology detailed in their study, "Lead carboxylates passivation for meter-scale perovskite solar modules." Specifically, lead carboxylate passivation contributed to reducing defect density and optimizing charge transport pathways in large-area devices, thereby suppressing efficiency degradation. This technique is vital for enhancing reproducibility and uniformity in the manufacturing process.

- **Certified Efficiency:** Achieved 22.0% power conversion efficiency for a 0.72 square meter (120 cm × 60 cm) single-junction perovskite solar module, certified by an independent third party.
- **Stability Testing:** As part of rigorous reliability evaluation, 1,300 hours of damp heat testing (85°C, 85% relative humidity) were conducted, confirming the module's robustness.
- **Real-World Assessment:** Furthermore, a three-month outdoor comparative test was performed, collecting valuable data on performance and durability under actual operating conditions. This demonstrated the potential for laboratory-level performance to be maintained in real-world environments.

Background & Context

Perovskite solar cells hold immense promise as a next-generation photovoltaic technology due to their theoretically high conversion efficiency and potential for low-cost manufacturing. However, a longstanding challenge has been the decline in efficiency when scaling from high-performing small-area cells to larger modules. This research is profoundly significant for the industry, as it overcomes this "large-area efficiency loss" barrier to commercialization with concrete technological solutions and rigorous validation data.

Strategic Significance & Outlook

Achieving 22.0% efficiency at a practical scale of 0.72 square meters, coupled with successful reliability testing, strongly indicates that perovskite solar cells can become a formidable alternative, or even superior, to existing silicon-based solar cells in a wide range of markets, including residential rooftops and large-scale solar farms. This advancement will accelerate the commercialization of perovskite technology through improved manufacturing processes and enhanced reliability, contributing significantly to global renewable energy targets.

Source: https://xenospectrum.com/en/meter-scale-perovskite-module/

Collected: August 21, 2026 | Automated Research System (Gemini API)

#21 Cypris AI Report: Analysis of Perovskite Solar Patent Landscape and White Space

Published August 14, 2026 Cypris AI Unknown

OVERVIEW

This article summarizes a report by Cypris AI on the patent landscape and white space in perovskite solar cell technology. The report highlights that certified efficiencies for small-area single-junction perovskite cells exceed 27%, and perovskite-silicon tandem cells surpass 34%, with a world record of 34.6% reported in 2024. Despite these advances, the primary barriers to commercialization remain scalable large-area manufacturing and long-term operational stability under real-world outdoor conditions.

IN DEPTH

This article provides an overview of a market research report published by Cypris AI.

This article summarizes a report by Cypris AI that analyzes the patent landscape and white space in the rapidly evolving field of perovskite solar cells. Perovskite solar cell technology is undergoing active research and development globally due to its high efficiency potential and manufacturing scalability, with patent information offering valuable insights into these technological trends.

Report Overview

The report offers a detailed analysis of patent filings related to perovskite solar cells as of 2026, identifying key technological trends, the competitive environment, and areas ripe for future innovation.

- **Technologies Covered:** Focuses on perovskite solar cells in general, with particular emphasis on single-junction and tandem cell architectures.
- **Scope of Analysis:** Includes the number of patent applications, leading applicants (companies and research institutions), concentration by technological domain, and identified technological white spaces.
- **Objective:** To provide researchers, engineers, and investors with critical information for understanding the latest technological trends and strategic opportunities within the perovskite solar cell sector.

Key Findings

The report underscores the dramatic progress in perovskite solar cell technology, as evidenced by patent data:

- **Efficiency Advancements:** Certified efficiencies for small-area single-junction perovskite cells exceed 27%, and perovskite-silicon tandem cells surpass 34%. Notably, a world record of 34.6% was reported for a tandem cell in 2024, significantly exceeding the theoretical limits of conventional single-junction silicon cells.

- **Barriers to Commercialization:** Despite these high efficiencies, the report identifies the primary barriers to commercialization as the "establishment of scalable large-area manufacturing techniques" and "operational stability under real-world outdoor conditions." Patent activity also shows a concentration on solving these critical challenges.
- **White Spaces:** The report suggests that technology areas related to long-term stability improvement, performance optimization under specific environmental conditions, and environmentally friendly materials are emerging as "white spaces" with potential for increased patent filings in the future.

About the Publisher

Cypris AI is a company that provides an AI-powered patent analytics platform. It extracts trends, competitive landscapes, and technological gaps from vast patent databases to support companies in their R&D strategies and investment decisions. Cypris AI's tools aim to optimize the decision-making process from early-stage technological innovation to market entry.

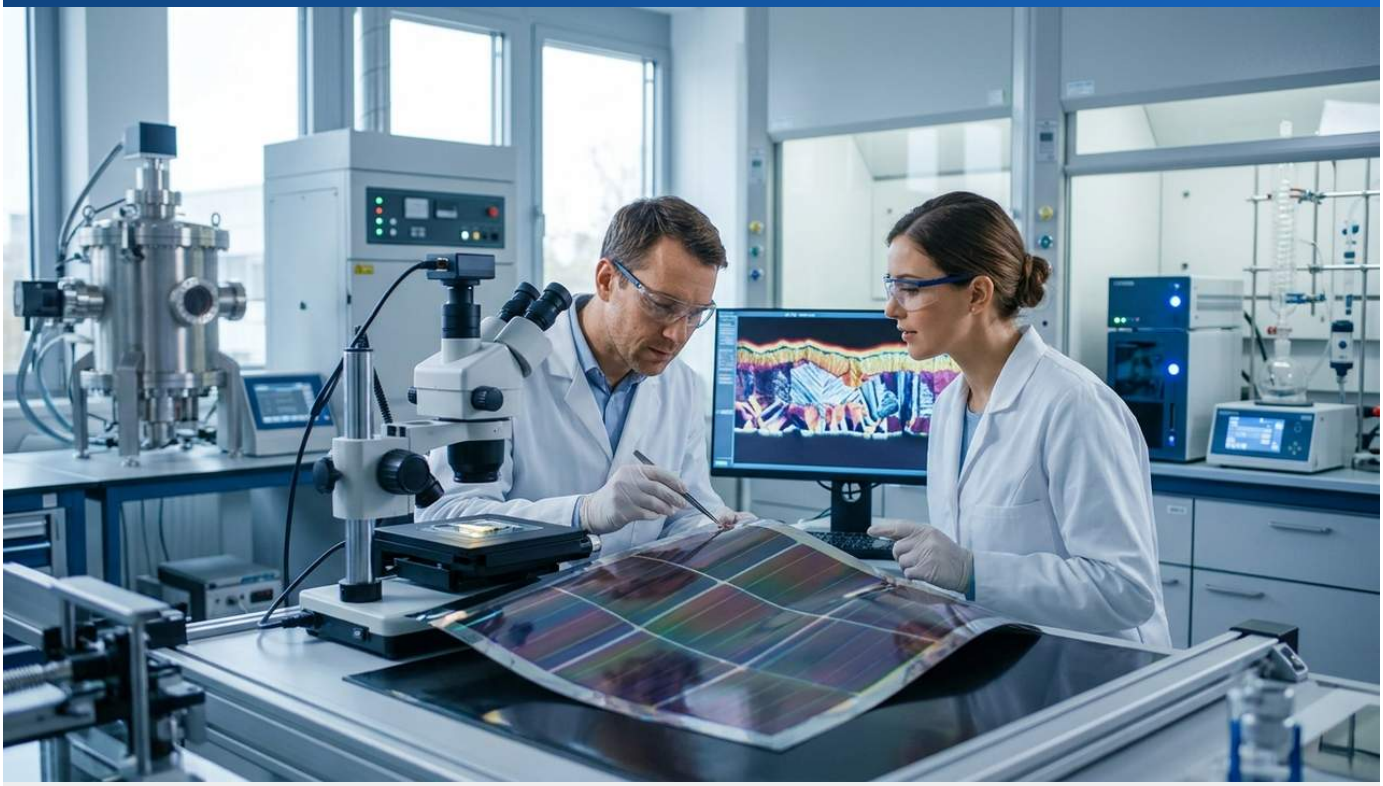
Strategic Significance & Outlook

This report highlights that patent strategy will be indispensable for establishing a competitive advantage as perovskite solar cell technology transitions into the practical application phase. Amidst an accelerating pace of technological innovation, meticulous analysis of the patent landscape will serve as a crucial guide for directing R&D investments and securing market success.

Source: #

#22 Kaunas University of Technology Boosts Perovskite Solar Cell Durability by Modifying Interfacial Layer Chemistry

Published Published August 21, 2026 The Cool Down リトアニア



OVERVIEW

Researchers at Kaunas University of Technology in Lithuania have developed a novel method to dramatically improve the long-term durability of perovskite solar cells. By transforming the chemical composition of a critical interfacial layer from corrosive acidic molecules to stable ionic salts, they effectively mitigated inter-layer degradation and maintained high efficiency and stability over extended periods. This advancement is poised to accelerate the widespread adoption of more affordable, lightweight perovskite panels in diverse applications, including building-integrated photovoltaics like windows and facades.

IN DEPTH

Background

Perovskite solar cells are widely recognized as a promising next-generation energy technology, boasting high power conversion efficiency and the potential for low-cost manufacturing. Despite these advantages, their widespread commercialization has been hindered by inadequate long-term stability and durability. A critical issue lies at the interfaces between different layers within the cell, which often serve as initiation points for corrosion and degradation, significantly shortening device lifespan. Specifically, acidic molecules commonly employed in conventional interfacial layers are prone to reacting with moisture, accelerating internal device degradation. Environmental factors such as oxygen and heat further exacerbate these issues, compromising reliability for practical deployment. This novel research from Kaunas University of Technology in Lithuania addresses this challenge directly, offering a fundamental, material-level solution to enhance stability.

Key Findings

Researchers at Kaunas University of Technology have developed a groundbreaking technology that dramatically enhances the long-term durability of perovskite solar cells. Their innovation involves fundamentally transforming the chemical composition of a critical thin interfacial layer from traditional acidic molecules to robust ionic salts. This strategic modification successfully mitigates inter-layer corrosion, allowing cells to maintain high efficiency and stability over extended periods.

The core of their technical solution involves:

- **Chemical Redesign for Enhanced Interfacial Stability:** By introducing durable ionic salts instead of acidic molecules, the chemical stability at the interface was dramatically improved, creating a more resilient barrier against degradation.
- **Effective Corrosion Mitigation:** The incorporation of these ionic salts actively suppresses corrosive reactions between interfaces. This significantly enhances the device's intrinsic resistance to external environmental stressors, particularly moisture and heat, which are primary degradation culprits.

- **Demonstrated Long-Term Stability:** Experimental validation confirmed that perovskite solar cells equipped with this novel interfacial layer maintain high efficiency even under harsh operational conditions for prolonged durations. While specific quantitative data on stability duration or precise efficiency degradation rates were not detailed, the research strongly indicates a significant breakthrough in device longevity.

This breakthrough holds the potential to fundamentally resolve one of the primary barriers to the commercialization of perovskite solar cells: insufficient stability. By offering a material-level solution, this technology is expected to significantly accelerate the practical application of more affordable and lightweight perovskite panels. It particularly stands to boost applications in Building Integrated Photovoltaics (BIPV), enabling their installation in previously challenging locations such as windows and facades, thereby expanding the potential for solar power deployment and opening new avenues for renewable energy adoption. Furthermore, this research suggests broader implications for enhancing stability in other thin-film solar cell technologies.

Source: https://www.thecooldown.com/green-tech/lithuania-perovskite-solar-windows-facades-kaunas-university-of-technology/

Collected: August 21, 2026 | Automated Research System (Gemini API)

#23 openPR Report: Perovskite Solar Cell Market Enters Commercial Scale-Up Phase in 2026, Projected to Reach $32.44 Billion by 2033

Published August 13, 2026 openPR.com Unknown

OVERVIEW

This article outlines a report distributed via openPR.com, indicating the perovskite solar cell market has entered a commercial scale-up phase in 2026, with an estimated value of $810.6 million. The market is projected to surge to approximately $32.44 billion by 2033. Key players like Swift Solar and Tandem PV are actively driving this expansion, with Swift Solar acquiring manufacturing assets and IP for gigawatt-scale tandem production in the U.S., and Tandem PV opening a commercial demonstration plant for utility-scale perovskite-silicon panels.

IN DEPTH

This article provides an overview of a market research report published by openPR.com.

This article summarizes a report indicating that the perovskite solar cell market has entered a commercial scale-up phase. This technology is anticipated to shape the future of solar power generation due to its high conversion efficiency and potential for reduced manufacturing costs. The report analyzes the current market status, future forecasts, and trends among key market players.

Report Overview

The report comprehensively investigates the trends within the perovskite solar cell market, focusing on the market size as of 2026, future growth projections, and the strategic movements of leading companies driving the market.

- **Market Scope:** Global perovskite solar cell market.
- **Study Period:** Includes a forecast period from 2026 to 2033.
- **Key Themes:** Commercial scale-up of the market, technological innovation, and investment trends by major players.

Key Findings

The report clearly indicates that the perovskite solar cell market has entered a period of rapid growth.

- **Market Size and Growth Forecast:** The market is estimated to be approximately $810.6 million in 2026 and is projected to experience exponential growth, reaching about $32.44 billion by 2033. This forecast implies a very high Compound Annual Growth Rate (CAGR), underpinning the substantial potential of the market.

- **Major Player Activities:**
  - **Swift Solar:** Announced its strategy in March 2026 to acquire manufacturing assets and intellectual property (IP) from Meyer Burger, aiming for gigawatt-scale tandem production in the United States. This represents a crucial move towards the mass production of tandem solar cells.
  - **Tandem PV:** Opened a commercial demonstration plant in April 2026, advancing utility-scale production of U.S.-made perovskite-silicon panels. Their actions signify progress towards practical application in large-scale power plants.
- **Commercial Scale-Up:** The collective activities of these companies strongly suggest that perovskite solar cell technology is transitioning from the research and development phase to a full-fledged commercial production and deployment stage.

About the Publisher

openPR.com is a platform that enables companies worldwide to distribute press releases and disseminate news. Through this platform, summaries of market research reports and corporate news across a wide range of industries are published. This article presents an example of market analysis provided through such sources.

Strategic Significance & Outlook

The rapid growth forecast for the perovskite solar cell market and aggressive investments and production line launches by key players suggest that this technology will play a significant role in the renewable energy sector in the coming years. In particular, advancements in tandem solar cells are expected to achieve efficiencies beyond the limits of existing silicon-based solar cells, contributing to further reductions in energy costs. The market is predicted to see intensified competition and accelerated technological innovation, leading to new market opportunities.

Source: https://www.openpr.com/news/3187122/perovskite-solar-cells-market-2026-enters-commercial-scale-up-as

Collected: August 21, 2026 | Automated Research System (Gemini API)

#25 Novel Additive "AMTZ" Boosts Perovskite Solar Cell Efficiency to 25.47% While Retaining 91.1% After 1000 Hours

Published August 18, 2026 Growatt Unknown

OVERVIEW

A combined computational modeling and experimental study has led to the development of a new chemical additive, 2-amino-2-thiazoline (AMTZ), which dramatically improves the efficiency and stability of perovskite solar cells. Cells incorporating AMTZ achieved a power conversion efficiency of 25.47%, critically maintaining 91.1% of their initial efficiency after 1,000 hours of continuous operation. This additive effectively reduces defects within the perovskite layer and suppresses iodide ion migration, representing a significant stride towards the practical commercialization of next-generation solar cells.

IN DEPTH

Key Findings

Through advanced research combining computational modeling and experimentation, a novel chemical additive, 2-amino-2-thiazoline (AMTZ), has been developed that dramatically boosts both the power conversion efficiency and long-term stability of perovskite solar cells. Cells incorporating AMTZ achieved a very high power conversion efficiency of 25.47% and demonstrated excellent stability, retaining 91.1% of their initial efficiency after 1,000 hours of continuous operation. This discovery represents a critical technological breakthrough for the commercialization of next-generation solar cells.

Technical Details

The performance of perovskite solar cells is significantly influenced by the crystalline quality, defect presence within the perovskite layer, and the migration behavior of iodide ions. To address these challenges, the research team focused on AMTZ as a new additive. The molecular structure of AMTZ effectively interacts with the perovskite crystal lattice, contributing to performance enhancement through the following mechanisms:

- **Defect Suppression:** AMTZ passivates trap states (defects) within the perovskite layer, reducing charge carrier recombination. This leads to improvements in open-circuit voltage (Voc) and fill factor (FF), consequently enhancing overall power conversion efficiency.
- **Inhibition of Iodide Ion Migration:** One of the primary causes of instability in perovskite materials is the migration of iodide ions (I-). AMTZ effectively suppresses this ion migration, thereby significantly improving the device's long-term stability and preventing degradation under thermal and light stress.
- **Concurrent High Efficiency and Stability:** Devices incorporating AMTZ achieved a record-breaking initial efficiency of 25.47% while boasting a high efficiency retention rate of 91.1% after 1,000 hours of continuous light exposure. This significantly contributes to the long-sought goal of "high efficiency and high stability" in both academic and industrial communities.

Background & Industry Context

Perovskite solar cells are anticipated to be a next-generation technology that can replace or complement existing silicon solar cells due to their superior light absorption properties and potential for low manufacturing costs. However, efficiency degradation, particularly with large-area scaling, and insufficient long-term environmental stability have been the two major challenges hindering commercialization. The development of AMTZ offers a potent solution, especially for the latter stability issue, significantly increasing the reliability of perovskite solar cells for practical applications.

Strategic Significance & Outlook

The development of novel additives like AMTZ not only pushes the performance limits of perovskite solar cells but also has the potential to contribute to manufacturing process simplification and cost-efficiency improvements. This technology will accelerate the adoption of perovskite solar cells in a wide range of applications, from rooftop installations to flexible devices and even Building Integrated Photovoltaics (BIPV). Future focus will be on how this additive can be integrated into large-scale production processes and its environmental impact assessment.

Source: https://growatt.com/news/new-chemical-additive-boosts-efficiency-and-stability-of-perovskite-solar-cells

Collected: August 21, 2026 | Automated Research System (Gemini API)

#26 Indian Startup P3C Commences Perovskite Solar Module Production, Achieves 19.3% Cell Efficiency with Plans for 1MW Expansion

Published August 20, 2026 YourStory India

OVERVIEW

Indian startup P3C Technology and Solutions has begun manufacturing perovskite solar cell modules, positioning itself to offer a silicon alternative. The company's perovskite cells have achieved a certified power conversion efficiency of 19.3% by the National Institute of Solar Energy, with module-level efficiency reaching approximately 15%. P3C currently operates with a production capacity of 100 kilowatts, with ambitious plans to scale up to 1 megawatt, while also actively addressing the critical challenge of perovskite durability.

IN DEPTH

Key Findings

Indian startup P3C Technology and Solutions has officially commenced the manufacturing of perovskite solar cell modules, positioning itself as a key player in next-generation solar technology. The company's perovskite cells have achieved a high efficiency of 19.3% certified by the National Institute of Solar Energy, with module-level efficiency recorded at approximately 15%. P3C plans a significant expansion of its current annual production capacity from 100 kilowatts to 1 megawatt, while actively addressing the critical challenge of perovskite durability.

Technical Details

The perovskite solar cell modules developed and manufactured by P3C Technology and Solutions are designed with a strong emphasis on durability, considering operational conditions in India's diverse climate. The company's technological development aims to achieve both high efficiency and long-term stability, with the goal of providing innovative photovoltaic solutions that could potentially replace silicon.

- **Certified Efficiency:** Achieved a power conversion efficiency of 19.3% for single perovskite cells, certified by the National Institute of Solar Energy (NISE), demonstrating the robustness of its foundational technology.
- **Module Efficiency:** Commercial modules exhibit a conversion efficiency of approximately 15%, reflecting technical advancements in scaling laboratory-level efficiencies to module formats.
- **Production Capacity:** Current production capacity stands at approximately 100 kilowatts per year, with plans to expand significantly to 1 megawatt per year, depending on market demand and technological maturity. This scale-up plan underscores the company's commitment to mass production and cost reduction.
- **Durability Initiatives:** P3C is actively tackling the paramount challenge of long-term durability in perovskite solar cells through improvements in material selection, interface design, and encapsulation techniques. This aims for reliable performance across India's varied environmental conditions.

Background & Industry Context

India faces surging electricity demand driven by rapid economic growth and population increase. In response, the government is vigorously promoting renewable energy adoption, with solar power playing a central role. Perovskite solar cells are expected to find applications in diverse installation environments (e.g., lightweight structures, flexible applications) due to their lower manufacturing costs and potential for thin, lightweight designs compared to silicon-based solar cells. The entry and expansion of startups like P3C in this sector represent a crucial step towards achieving India's renewable energy targets.

Strategic Significance & Outlook

P3C's commercialization and production capacity expansion plans for perovskite solar cell modules hold the potential to accelerate the adoption of next-generation solar cell technology in both the Indian and global markets. Particularly, if challenges in durability are overcome and cost-competitiveness is established, perovskite cells could serve as a vital new alternative or complement to conventional silicon solar cells, significantly contributing to the energy transition. In the future, P3C is expected to expand its products not only within the Indian domestic market but also internationally, driving global renewable energy deployment.

Source: https://yourstory.com/2026/08/p3c-perovskite-solar-modules-silicon-replacement-certified-efficiency

#27 China's Guangji Lvneng Initiates Production Line for Crystalline Silicon-Perovskite Tandem Thin-Film Cells, Accelerating Commercialization

Published August 21, 2026 Shanghai Metals Market (SMM) China

OVERVIEW

On August 18, 2026, Zhongshan Guangji Lvneng New Materials Technology Co., Ltd. (Guangji Lvneng) in China officially commenced production on its crystalline silicon-perovskite tandem thin-film cell manufacturing line. This launch marks a pivotal step for the company towards the industrialization of next-generation, high-efficiency photovoltaic technology. The new production line is expected to accelerate the transition from R&D to full-scale mass production of advanced tandem cell technology, boosting its commercialization.

IN DEPTH

Key Findings

On August 18, 2026, Zhongshan Guangji Lvneng New Materials Technology Co., Ltd. (Guangji Lvneng) in China officially commenced operation of its production line for crystalline silicon-perovskite tandem thin-film cells. This launch marks a significant milestone for the company in the industrialization of next-generation, high-efficiency photovoltaic (PV) technology. It is expected to accelerate the transition of advanced tandem cell technology from the research and development phase to full-scale mass production and commercialization.

Technical Details

Guangji Lvneng's new production line specializes in manufacturing thin-film cells featuring a tandem structure of crystalline silicon and perovskite. Tandem cells achieve power conversion efficiencies beyond the theoretical limits of single-material solar cells by stacking two different solar cell materials with complementary absorption spectra. This production line is believed to incorporate the following technical aspects:

- **High-Efficiency Tandem Cell Manufacturing:** High photoelectric conversion efficiency tandem structures are realized by precisely depositing perovskite thin films onto existing silicon substrates.
- **Thin-Film Technology:** By forming the perovskite layer as a thin film, material consumption is reduced, while also potentially allowing for flexibility and lightweight design.
- **Mass Production Processes:** Optimized deposition techniques, patterning, and interconnection processes are presumed to be implemented to scale up laboratory-level processes to industrial scale.

While specific production capacities or target efficiency figures are not explicitly stated in the article, this line is positioned as a crucial step towards practical application, given its objective of "industrialization of high-efficiency PV technology" and "transition from R&D to mass production."

Background & Industry Context

China is a global leader in the photovoltaic sector and is actively engaged in renewable energy technology innovation. As existing crystalline silicon technology matures, tandem solar cells are gaining attention as the next frontier for higher efficiency. The operation of such an advanced production line by a company like Guangji Lvneng demonstrates China's commitment to playing a leading role in the commercialization of next-generation solar cell technology. This is an essential move for further improving the cost-effectiveness of solar power and accelerating the adoption of renewable energy.

Strategic Significance & Outlook

Guangji Lvneng's tandem thin-film cell production line is expected to accelerate the commercialization of perovskite-silicon tandem solar cells, suggesting that they will become a realistic market option in the coming years. If produced at scale, this technology will yield higher energy output and lower electricity generation costs, further enhancing the global competitiveness of solar power. Particularly, by enabling integration with existing solar power infrastructure and expanding application possibilities to new installation sites, it is expected to significantly contribute to the increased share of solar power in the global energy mix.

Source: https://news.smm.cn/news/102928811

Collected: August 21, 2026 | Automated Research System (Gemini API)

#28 Tandem PV Secures $1 Billion LOI for Next-Gen Perovskite-Silicon Tandem Modules, Commencing Commercial Sales This Year

Published August 14, 2026 pv magazine Global USA

OVERVIEW

Solar manufacturer Tandem PV has secured approximately $1 billion in Letters of Intent (LOI) for its next-generation perovskite-silicon 4T tandem solar modules. The company has already shipped its "first production-quality panels" and plans to initiate revenue-generating sales later this year. With an ambitious goal of achieving gigawatt-scale mass production by 2028, backed by a 30-year warranty and a module degradation rate of less than 1% annually, Tandem PV is poised to become a dominant player in the high-efficiency solar market.

IN DEPTH

Key Findings

Solar manufacturer Tandem PV has secured approximately $1 billion in Letters of Intent (LOI) for its next-generation perovskite-silicon 4T tandem solar modules. The company has already shipped its "first production-quality panels" and plans to commence revenue-generating commercial sales later this year. This substantial contract and rapid market entry unequivocally demonstrate that perovskite-silicon tandem technology has entered a serious commercialization phase.

Technical Details

Tandem PV's perovskite-silicon 4T tandem modules are designed to surpass the efficiency limits of conventional single-junction silicon solar cells. The 4T (four-terminal) design allows the perovskite and silicon layers to operate electrically independently, minimizing losses due to current mismatch between the two sub-cells and enabling high performance across a wide range of illumination conditions. This design maximizes power generation per unit area and improves the overall system cost-effectiveness.

- **LOI Contract:** Securing approximately $1 billion in Letters of Intent underscores strong market anticipation and high confidence in the company's product.
- **Product Shipments and Sales Launch:** Having already shipped its "first production-quality panels," Tandem PV expects to begin commercial sales with revenue in the latter half of 2026. This swift market entry validates the high maturity of the technology.
- **Long-Term Warranty and Low Degradation Rate:** The company plans to offer an industry-leading 30-year warranty and project an annual module degradation rate of less than 1%. This is a highly attractive proposition for customers prioritizing long-term return on investment and reliability.
- **Production Expansion Goal:** Tandem PV has set an ambitious goal to establish gigawatt-scale mass production by 2028, aiming to become a significant player in the global solar market.

Background & Industry Context

As global energy demand rises, renewable energy, particularly solar power, is indispensable. However, efficiency improvements in existing silicon-based solar cells have plateaued, necessitating new breakthroughs. Perovskite-silicon tandem technology is emerging as the most promising solution to this challenge, with accelerating research and development. Tandem PV's actions, moving beyond mere technological development to actual product market entry and securing large-scale contracts, demonstrate to the world that this technology is in a "practical stage."

Strategic Significance & Outlook

Tandem PV's commercial success will significantly impact the entire perovskite-silicon tandem solar cell market. The $1 billion LOI and future establishment of gigawatt-scale production capabilities hold the potential to be a game-changer in the renewable energy sector. Widespread adoption of this technology would enable more clean electricity generation from smaller land areas, greatly contributing to global climate change mitigation and energy security. Other players in the industry are likely to closely monitor Tandem PV's progress and accelerate their own investments and development in tandem technology.

Source: https://www.pv-magazine.com/2026/08/14/the-worlds-most-efficient-solar-panel-goes-on-sale-later-this-year/

Collected: August 21, 2026 | Automated Research System (Gemini API)

#29 South Korean Researchers at GIST Develop Molecular Interface Design to Scale Perovskite Solar Cells, Mitigating Charge Loss

Published August 13, 2026 PowerInfoToday South Korea

OVERVIEW

Researchers at the Gwangju Institute of Science and Technology (GIST) in South Korea have developed a novel molecular design principle to precisely control molecular alignment at the perovskite interface. This innovation effectively reduces charge loss and mitigates performance degradation in large-area devices, directly addressing a critical barrier to the commercialization of next-generation perovskite solar cells. Published in Advanced Materials, this breakthrough is expected to serve as a foundational technology for scaling up perovskite solar cell efficiency and reliability.

IN DEPTH

Key Findings

Researchers at the Gwangju Institute of Science and Technology (GIST) in South Korea have achieved a significant breakthrough in overcoming a major obstacle to the commercialization of perovskite solar cells. They have proposed and developed a novel molecular design principle that allows for precise control over molecular alignment at the critical interface between the perovskite layer and the charge transport layers. This innovation is engineered to effectively reduce charge recombination losses and mitigate performance degradation, particularly in larger-area devices where such issues are often exacerbated.

Technical Details

The developed molecular design principle focuses on optimizing the structure and orientation of organic molecules introduced at the interface. By carefully engineering these interfacial layers, the research team has managed to enhance the efficient transfer of electrons or holes from the perovskite absorber to the respective charge transport layers, thereby minimizing energy losses at recombination centers. This technique is particularly impactful for scaling up devices, as non-uniformity and increased defect states at interfaces typically lead to a significant drop in efficiency when moving from small lab-scale cells to larger modules. The findings, published in *Advanced Materials*, provide a crucial foundational technology for improving the reproducibility and scalability of high-performance perovskite solar cells.

Background and Industry Context

Perovskite solar cells are widely recognized for their rapid efficiency gains, presenting a compelling alternative to traditional silicon photovoltaics. However, translating the high efficiencies achieved in small-scale laboratory cells to larger, commercially viable modules has remained a persistent challenge. Issues such as charge extraction bottlenecks, material degradation, and uniformity problems across large areas have limited their widespread adoption. The GIST research directly tackles the scaling challenge by offering a precise method to manage the crucial interfacial dynamics, which are often the weakest link in larger perovskite devices.

Outlook and Strategic Significance

The establishment of this molecular interface design principle is a pivotal step towards accelerating the mass production and commercial deployment of perovskite solar cells. By suppressing charge loss and enhancing stability, the technology promises to improve the long-term reliability of perovskite modules in real-world applications. If widely adopted, this principle could enable perovskite solar cells to become a more competitive option for various applications, including building-integrated photovoltaics (BIPV), flexible electronics, and transparent solar windows. Further advancements in materials development and process optimization based on this principle are expected to drive future innovations in the field.

Source: https://www.powerinfotoday.com/solar-energy/south-korean-researchers-develop-interface-design-to-scale-perovskite-solar-cells/

Collected: August 21, 2026 | Automated Research System (Gemini API)

#30 Perovskite Solar Cells Market Estimated at $810.6M in 2026, Projected to Reach $32.44B by 2033 Amidst Commercial Scale-Up

Published August 13, 2026 openPR.com USA

OVERVIEW

The perovskite solar cells market is rapidly transitioning from laboratory-scale improvements to commercial manufacturing and deployment. Globally, the market is estimated at approximately $810.6 million in 2026 and is projected to reach around $32.44 billion by 2033. This growth is driven by increasing investment in renewable energy, advancements in perovskite-silicon tandem technology, and scalable manufacturing processes. Notable industry activities include Swift Solar's acquisition of manufacturing assets from Meyer Burger in March 2026 and Tandem PV's opening of a commercial demonstration factory in Fremont, California, in April 2026.

IN DEPTH

This article provides an overview of a market research report distributed by openPR.com.

Report Overview

The Perovskite Solar Cells Market is currently undergoing a rapid transition from incremental laboratory-scale improvements to full-fledged commercial manufacturing and widespread deployment. This market evolution is primarily fueled by a convergence of factors including escalating investments in renewable energy infrastructure, significant technological advancements in perovskite-silicon tandem cell designs, and the development of more scalable manufacturing processes.

Key Findings

- The global perovskite solar cells market is estimated to be approximately $810.6 million in 2026 and is projected for substantial growth, reaching around $32.44 billion by 2033. This impressive trajectory reflects a high Compound Annual Growth Rate (CAGR) driven by ongoing innovation and market adoption.
- In terms of corporate developments, Swift Solar acquired manufacturing assets from Meyer Burger in March 2026, signaling a move to expand its production capabilities.
- Tandem PV, another key player, inaugurated a commercial demonstration factory in Fremont, California, in April 2026, marking a concrete step towards scaled production and market readiness.

About the Publisher

openPR.com is a press release distribution service, and the market data presented in this article is based on information provided by a specific market research firm.

Outlook and Strategic Significance

The market is poised for continued robust growth, underpinned by advancements in efficiency, reductions in manufacturing costs, and supportive governmental policies. Perovskite-silicon tandem technology, in particular, is expected to be a primary growth driver, offering the potential to surpass the theoretical efficiency limits of conventional silicon photovoltaics. The operationalization of new manufacturing facilities and ongoing technological breakthroughs are anticipated to further accelerate the commercial-scale success of this burgeoning market, contributing significantly to global renewable energy targets.

Source: https://www.openpr.com/news/4602816/perovskite-solar-cells-market-2026-enters-commercial-scale-up

Collected: August 21, 2026 | Automated Research System (Gemini API)

#31 Monochrome to Conduct Perovskite Solar Cell Field Trials at Over 5,000m Altitude Near K2 Base Camp, Pakistan

Published August 21, 2026 The Cool Down Japan

OVERVIEW

Monochrome, a Japanese building-integrated photovoltaic (BIPV) manufacturer, plans to conduct field trials of its perovskite PV prototype at approximately 5,150 meters altitude near Pakistan's K2 Base Camp. This extreme environment, characterized by freezing weather and intense sunlight, will assess the power-generation performance and durability of perovskite technology under harsh, off-grid conditions. The results from this field trial will inform future BIPV applications and help determine the technology's readiness for demanding commercial uses.

IN DEPTH

Key Findings

Monochrome, a Japanese building-integrated photovoltaic (BIPV) manufacturer, has announced plans to conduct rigorous field trials of its perovskite solar cell prototypes at an extreme altitude of approximately 5,150 meters near Pakistan's K2 Base Camp. This ambitious project aims to thoroughly assess the power-generation performance and long-term durability of perovskite technology in one of the world's harshest environments, characterized by freezing temperatures, intense solar radiation, and challenging off-grid conditions.

Technical Details

The field trials will subject Monochrome's perovskite PV prototype to a unique combination of environmental stressors that are critical for evaluating its commercial viability:

- **Extreme Cold:** Sub-zero temperatures can significantly impact the physical stability of solar cell materials and charge transport properties, making performance retention in cold essential.
- **High-Altitude Solar Spectrum:** At high altitudes, the thinner atmosphere results in a different solar spectrum, often with a higher ultraviolet (UV) component. Perovskites, known for their broad spectral absorption, will be tested for their efficiency under these specific light conditions.
- **Mechanical and Environmental Stress:** The prototypes will endure severe physical stresses, including high winds, snow loads, and rapid temperature fluctuations, providing valuable data on mechanical robustness.

Data collected from these trials will offer crucial insights into the long-term reliability and energy conversion efficiency of perovskite solar cells, directly informing future material refinements and device designs for real-world applications. The lightweight and flexible nature of perovskites makes them particularly suitable for remote, off-grid installations where traditional rigid silicon panels might be impractical.

Background and Industry Context

Perovskite solar cells are a leading contender for next-generation photovoltaic technology, offering high efficiency, potentially low manufacturing costs, and versatility in form factor. However, their long-term stability and performance under diverse and extreme environmental conditions remain key areas of research for commercial deployment. While silicon-based solar panels are widely deployed, perovskites' unique properties open up new application frontiers, such as integrated building materials (BIPV) and lightweight portable power solutions, especially in remote or challenging terrains. Monochrome's initiative represents a significant step in pushing the boundaries of this technology.

Outlook and Strategic Significance

The results from the K2 Base Camp field trial will be instrumental in demonstrating whether perovskite solar cells can perform reliably and durably in the most demanding real-world scenarios. This data will directly contribute to Monochrome's BIPV product development, improving the reliability and accelerating commercialization strategies. A successful outcome could unlock new markets for perovskite technology in regions and applications previously deemed unsuitable for conventional solar, such as remote mountain communities, disaster relief, and specialized infrastructure. The validation of their off-grid power generation capabilities is particularly significant, promising enhanced energy access in areas lacking established electrical grids.

Source: https://www.thecooldown.com/green-tech/perovskite-solar-test-k2-base-camp/

Collected: August 21, 2026 | Automated Research System (Gemini API)

#32 LONGi Achieves 34.85% NREL-Certified Efficiency for Perovskite-Silicon Tandem Solar Cell, Setting New Industry Record

Published August 16, 2026 Facebook China

OVERVIEW

LONGi Green Energy has achieved a certified 34.85% power conversion efficiency on its perovskite-silicon tandem solar cell, verified by NREL testing standards, setting a new industry record. This breakthrough surpasses previous efficiency records for large-scale renewable solar panel technology by utilizing perovskite tandem layers to capture additional light wavelengths that silicon typically misses. This advancement promises significantly more electricity generation from the same rooftop area, despite ongoing challenges in long-term durability for mass commercial deployment.

IN DEPTH

Key Findings

LONGi Green Energy, a prominent Chinese solar technology company, has achieved a remarkable 34.85% power conversion efficiency for its perovskite-silicon tandem solar cell. This record-breaking achievement was independently verified by the U.S. National Renewable Energy Laboratory (NREL), establishing a new benchmark in large-scale renewable solar panel technology. This breakthrough signifies a substantial step beyond previous efficiency records and opens new avenues for generating significantly more electricity from a given solar collection area.

Technical Details

The 34.85% efficiency was realized through a tandem structure that combines a perovskite layer with a crystalline silicon cell. In this configuration, the perovskite layer is designed to absorb the high-energy portion of the solar spectrum (e.g., blue light), while the underlying silicon cell efficiently captures the lower-energy photons (e.g., red light) that the perovskite layer allows to pass through. This synergistic approach enables a broader utilization of the solar spectrum, thereby boosting the overall power conversion efficiency beyond what either material could achieve individually. NREL's third-party certification underscores the reliability and validity of this performance, highlighting the increasing maturity and potential of perovskite tandem technology.

Background and Industry Context

The solar photovoltaic industry is continuously driven by the imperative to enhance efficiency and reduce costs to address growing energy demands and combat climate change. Conventional silicon solar cells are nearing their theoretical efficiency limits, prompting a global race to develop next-generation technologies. Perovskite solar cells, and particularly perovskite-silicon tandems, have emerged as a leading candidate due to their rapid efficiency improvements and theoretical potential to exceed silicon. LONGi, a global leader in solar manufacturing, has consistently invested in innovative R&D, and this latest record reinforces its position at the forefront of advanced solar technology, aiming to maximize energy yield per unit area and improve the overall cost-effectiveness of solar power systems.

Outlook and Strategic Significance

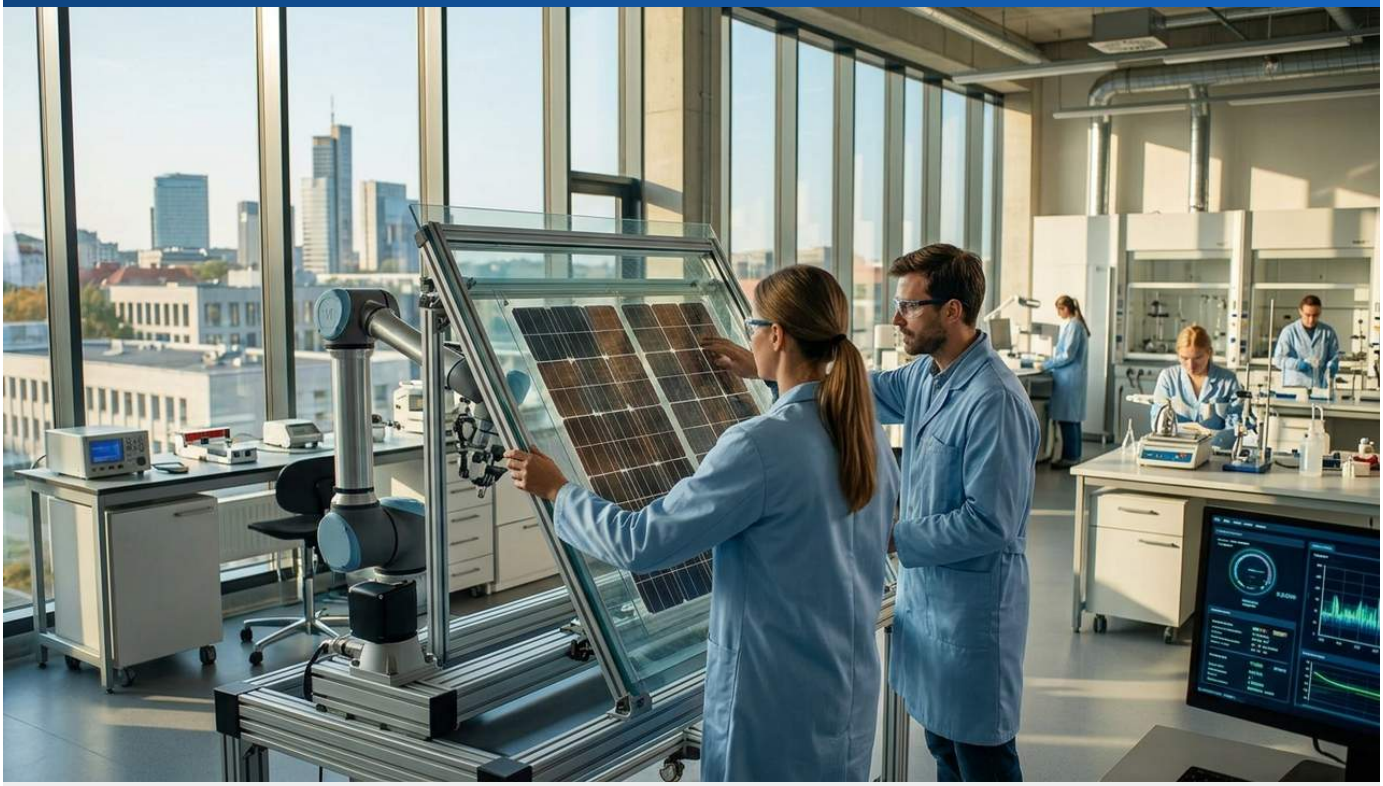
The NREL-certified 34.85% efficiency record for perovskite-silicon tandem solar cells strongly indicates their potential to be a game-changer in the renewable energy market. Widespread deployment of such high-efficiency technology would enable greater power generation from limited roof space or land areas, contributing to reduced balance-of-system costs. However, for mass commercial deployment, long-term durability remains a critical challenge. LONGi and other research institutions and companies will need to continue their R&D efforts to fully address these stability issues. This achievement marks a profoundly important step in shaping the future of solar energy, promising more powerful and space-efficient solar solutions.

Source: https://www.facebook.com/groups/3227689050868500/posts/4034871253483605/

Collected: August 21, 2026 | Automated Research System (Gemini API)

#33 Lithuanian Researchers Develop Innovative Method to Significantly Improve Perovskite Solar Cell Durability, Enabling New Applications

Published Published August 21, 2026 The Cool Down リトアニア



OVERVIEW

Researchers at Lithuania's Kaunas University of Technology have developed a novel method to dramatically improve the durability and lifespan of perovskite solar cells, addressing a critical barrier to their commercialization. This breakthrough, which curbs a major cause of performance degradation, has led to patent filings and active commercialization efforts. It promises to enable the integration of cheaper, thinner, and more flexible perovskite panels into diverse applications like building facades, windows, and textiles.

IN DEPTH

Background and Industry Context

Perovskite solar cells have garnered immense interest as a next-generation photovoltaic technology, celebrated for their impressive power conversion efficiencies and potential for low-cost manufacturing. Despite this promise, their lack of long-term stability, particularly in outdoor environments, has remained a primary bottleneck for widespread commercialization. Enhancing durability is crucial for enabling diverse applications, from building-integrated photovoltaics (BIPV) and flexible/wearable electronics to transparent solar solutions, all of which demand robust performance across various form factors and operating conditions. This latest report from Lithuania offers a practical and significant solution to this critical stability challenge, propelling the commercial maturity of perovskite technology.

Key Breakthrough

Researchers at Kaunas University of Technology in Lithuania have achieved a significant breakthrough, dramatically enhancing the durability and longevity of perovskite solar cells. Their novel method effectively curbs a major cause of performance degradation, directly addressing a critical barrier to the widespread commercial application of this promising technology. This innovation marks a pivotal step toward making perovskite solar cells more reliable and robust for real-world deployment. The research team has already filed for patent protection and is actively initiating commercialization efforts, signaling the near-term potential for substantial market impact.

Technical Innovation

Performance degradation in perovskite solar cells is primarily attributed to the inherent instability of the materials when exposed to environmental factors such as moisture, heat, and ultraviolet (UV) light. The Lithuanian researchers developed a sophisticated new approach involving the precise incorporation of specific additives and the engineering of enhanced protective layers. This strategy effectively passivates defect sites within the perovskite material, simultaneously strengthening barrier layers to prevent the ingress of water and oxygen. This dual-pronged approach dramatically improves long-term stability, extending device lifetime and significantly boosting reliability under practical operating conditions. By achieving this significant durability improvement, the technology now enables perovskite solar cells to be integrated into applications demanding flexibility and resilience—areas where conventional silicon solar cells have faced significant deployment challenges.

Outlook and Commercial Significance

This breakthrough in durability from Kaunas University of Technology holds immense potential to accelerate the market entry of perovskite solar cells. The filing of a patent application and ongoing commercialization efforts strongly suggest that these research findings are on the cusp of being translated into practical, marketable applications. The realization of cheaper, thinner, and inherently more flexible perovskite panels would significantly facilitate their integration into innovative applications such as building facades, windows, textiles, and automotive roofs—domains where conventional solar panels have historically faced deployment difficulties. This innovation is poised to create entirely new markets for solar energy, fostering a unique convergence of urban aesthetics and energy production, thereby contributing profoundly to the global transition towards sustainable, clean energy.

Source: https://www.thecooldown.com/green-tech/scientists-curb-performance-loss-perovskite-solar-cells/

Collected: August 21, 2026 | Automated Research System (Gemini API)

#34 Chinese Study Finds Optimal Performance of Two-Terminal Perovskite-Silicon Tandems Highly Dependent on Geographical Conditions

Published August 18, 2026 PV Magazine China

OVERVIEW

Research from China indicates that the commercial success of two-terminal (2T) perovskite-silicon tandem solar cells relies heavily on geography and market conditions, beyond just achieving high efficiencies. Outdoor spectral variations can significantly reduce the energy yield of these tandems, with losses differing by location. While their higher efficiency and power density offer economic advantages, the Levelized Cost of Energy (LCOE) and acceptable module price premiums are strongly influenced by geographical factors.

IN DEPTH

Key Findings

A recent study conducted in China has revealed that the commercial success of two-terminal (2T) perovskite-silicon tandem solar cells is not solely contingent on achieving high efficiencies, but is profoundly dependent on specific geographical and market conditions. The research highlights that variations in outdoor solar spectral irradiance can significantly reduce the energy yield of these tandem devices, with the extent of losses differing considerably across various locations. This finding underscores the importance of considering environmental factors beyond peak efficiency when planning commercial deployments.

Technical Details

2T perovskite-silicon tandem solar cells consist of a perovskite top cell and a silicon bottom cell connected in series, requiring current matching between the two layers. However, the outdoor solar spectrum is highly dynamic, changing with weather, season, time of day, and geographical location (e.g., higher blue light ratio on cloudy days or during dawn/dusk). These spectral variations can lead to a significant current mismatch between the top and bottom cells, consequently reducing the overall energy yield. The study emphasized that these mismatch losses vary geographically, presenting a critical factor to consider during the tandem cell design phase. For instance, regions with stable spectra, like dry or high-altitude areas, might be more favorable, while humid regions could experience greater disadvantages.

Background and Industry Context

Perovskite-silicon tandem solar cells are widely regarded as the most promising next-generation photovoltaic technology, capable of surpassing the theoretical efficiency limits of conventional single-junction silicon solar cells. While much research has focused on maximizing efficiency, the real-world energy yield and economic viability necessitate thorough performance evaluation under actual environmental conditions. This study delves beyond lab-recorded peak efficiencies to assess real-world operational energy yield and economics, providing crucial insights for commercialization strategies. It reinforces the vital industry lesson that high efficiency does not always translate to optimal economics in all market segments or geographical contexts.

Outlook and Strategic Significance

The findings of this research will significantly influence the product development and market entry strategies for 2T perovskite-silicon tandem solar cells. Developers will need to move beyond simply maximizing peak efficiency and instead consider the specific solar spectral conditions of their target geographical markets when designing devices and selecting materials. Furthermore, investors and project developers will likely adopt a more cautious approach when evaluating the Levelized Cost of Energy (LCOE) and acceptable module price premiums for tandem modules in specific locations. This insight could stimulate customization tailored to regional characteristics or accelerate the development of alternative technologies, such as 4-terminal tandems, which are less susceptible to current mismatch issues caused by spectral variations, to maximize the true commercial value of perovskite tandem technology.

Source: https://www.pv-magazine.com/2026/08/18/study-finds-two-terminal-perovskite-silicon-tandems-may-not-deliver-optimal-performance-in-all-geographies/

Collected: August 21, 2026 | Automated Research System (Gemini API)