PerovskiteSolarCells

Weekly Intelligence Report

2026-08-30 | 28 articles | 9 countries

troy-technical.jp

This Week's Keyword

Perovskite Efficiency

New records and commercialization drive global solar market

28	9	35.5	5
articles	countries	%	GW
Total Articles	Source Countries	World Record Efficiency	India Mfg Capacity

All 28 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 34.85% Tandem	Research	●●●●○	●●●○○	●●●●○	●●●●○	●●●●○	Chinese LONGi achieves NREL-certified 34.85% efficiency for perovskite-silicon tandem cells, setting a new world record.
#02	Saule BIPV Commercial	New Product	●●●○○	●●●●●	●●●○○	●●○○○	●●●●●	Polish startup Saule Technologies installs first commercial perovskite solar panels on a building in Wrocław for BIPV.
#03	Aisin 500mm Modules	Corporate Strategy	●●●○○	●●●○○	●●●○○	●●●○○	●●●○○	Japan's Aisin accelerates mass production development of 500mm perovskite solar modules with NEDO backing.
#04	US DOE Backs R&D;	Market Overview	●○○○○	●●○○○	●●●○○	●●●○○	●●●●●	U.S. DOE supports perovskite solar cell R&D;, highlighting >26% for standalone and ~34% for tandem efficiencies.
#05	HZB 30.3% Solvent-Free	Research	●●●●○	●●○○○	●●●○○	●●●●○	●●●●●	Germany's HZB achieves 30.3% efficiency in perovskite-silicon tandem cells using solvent-free co-evaporation.
#06	Caelux India 5GW P'ships	Corporate Strategy	●●●○○	●●●●○	●●●●○	●●●○○	●●●●○	US firm Caelux partners for 5GW perovskite-integrated module production in India by 2028-29.
#07	Fraunhofer Solvent-Free	Research	●●●●○	●●○○○	●●●○○	●●●●●	●●●●●	Fraunhofer ISE develops fully solvent-free perovskite-silicon tandem cell manufacturing, achieving 27.1% efficiency and high stability.
#08	ML Lead-Free PSCs	Research	●●●●○	○○○○○	●●○○○	●●●●●	●●●○○	Machine learning optimizes charge transport layers for lead-free Cs2AgBi0.75Sb0.25Br6 perovskite solar cells.
#09	Fraunhofer QC Metrology	Research	●●●●○	●●○○○	●●●○○	●●●●○	●●●●●	Fraunhofer ISE develops millisecond-resolution subcell current metrology for tandem solar cell mass production quality control.
#10	NiOx Interface Eng.	Research	●●●○○	●●○○○	●●●○○	●●●●●	●●●○○	NiOx/perovskite interface engineering boosts performance of efficient air-processed wide-bandgap perovskite solar cells.
#11	Nanjing Uni All-PV Mod	Research	●●●●○	●●○○○	●●●●○	●●●●○	●●●●○	Nanjing University achieves world record 26.2% efficiency on 65 cm² all-perovskite tandem solar module.
#12	Kaunas Uni Stability	Research	●●●●○	●●○○○	●●●○○	●●●●○	●●●●●	Lithuanian researchers solve inverted perovskite solar cell stability issues by modifying interface layer chemistry.

#	Article Title	Type	Tech Novelty	Market Proximity	Market Impact	Data Reliability	US/EU Relevance	Summary
#13	Monochrome K2 Trial	Corporate Strategy	●●●○	●●●○	●●○○	●●○○	●●○○	Monochrome Inc. to conduct first extreme off-grid trial of perovskite solar cells at Pakistan's K2 Base Camp.
#14	HZB Carborane ETM	Research	●●●●	●●○○	●●●○	●●●●	●●●●	Germany's HZB develops carborane-based electron transport material, boosting PSC efficiency and resolving stability.
#15	Tandem PV DOE Grant	Corporate Strategy	●●●○	●●●●	●●●●	●●●○	●●●●	Tandem PV secures $7.7M DOE grant to accelerate US commercialization of 29.7% efficient perovskite-silicon tandem cells.
#16	SPIE Lead-Free PV	Research	●●●●	●○○○	●●○○	●●●○	●●●○	SPIE conference highlights breakthroughs in lead-free $FAGeI_3$ perovskites and high-efficiency wide bandgap PSCs.
#17	Osaka Uni Chiral HTMs	Research	●●●●	●○○○	●●○○	●●●●	●●●○	Osaka University boosts PSC performance with chiral hole transport materials, achieving 60% spin polarization.
#18	GCL Space-Grade Std	Corporate Strategy	●●●○	●●●○	●●○○	●●●○	●●●●	GCL Perovskite leads standardization of space-grade modules, closes over RMB 100M Series D1 funding.
#19	Mitsubishi IoT Demo	Corporate Strategy	●●●○	●●●○	●●○○	●●●○	●●●○	Mitsubishi Gas Chemical selected for Niigata City perovskite IoT device demo at Ice Arena for low-light applications.
#20	Lead Leakage Reduced	Research	●●●○	●●●○	●●●○	●●●●	●●●●	Swiss study shows lead leakage from damaged laminated perovskite solar cells reduced to 0.07% over 9 months.
#21	PeLED Degradation	Research	●●●●	●○○○	○○○○	●●●●	●●○○	ACS Energy Letters deciphers electro-ionic interplay in perovskite LED degradation, noting bias-dependent instability.
#22	Perovskite Connect '26	Market Overview	●●○○	●●●○	●●●○	●●○○	●●●●	Perovskite Connect 2026 conference spotlights reliability testing, tandem mismatch mitigation, and 96% recycling.
#23	ART-PV Triple-Junction	Research	●●●●	●●○○	●●●●	●●●●	●●●●	ART-PV India achieves 29.8% efficiency with perovskite-silicon-CdTe triple-junction tandem solar cells.
#24	Swift Solar $27M Series A	Corporate Strategy	●●●○	●●●●	●●●●	●●●○	●●●●	Swift Solar secures $27M Series A to accelerate commercialization of high-efficiency lightweight perovskite solar panels.
#25	GCL Space-Grade IEC	Corporate Strategy	●●●○	●●●○	●●○○	●●●●	●●●●	GCL Perovskite leads standardization for space-grade single-junction modules, achieves 18.04% efficiency and IEC certification.
#26	German Solvent-Free 27.3%	Research	●●●●	●●○○	●●●○	●●●●	●●●●	German researchers achieve 27.3% efficiency in solvent-free perovskite-silicon tandem cells with 6,800-hour stability.
#27	LONGi 35.5% World Rec.	Research	●●●●	●●●○	●●●●	●●●●	●●●●	LONGi achieves world record 35.5% power conversion efficiency with crystalline silicon-perovskite tandem solar cells, ESTI certified.
#28	Perovskite Connect '26	Market Overview	●○○○	●○○○	●○○○	●●○○	●●●●	Perovskite Connect 2026 conference to convene global industry leaders in Berlin for next-gen solar development.

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

Three Questions That Demand Your Decision This Week

❶ Is your PV strategy ready for 35.5% efficiency?

China's LONGi has set a new world record of 35.5% for perovskite-silicon tandem cells. This rapid efficiency gain challenges existing PV roadmaps and could make current product lines obsolete faster than anticipated.

❷ Are your supply chains exposed to Asian perovskite manufacturing dominance?

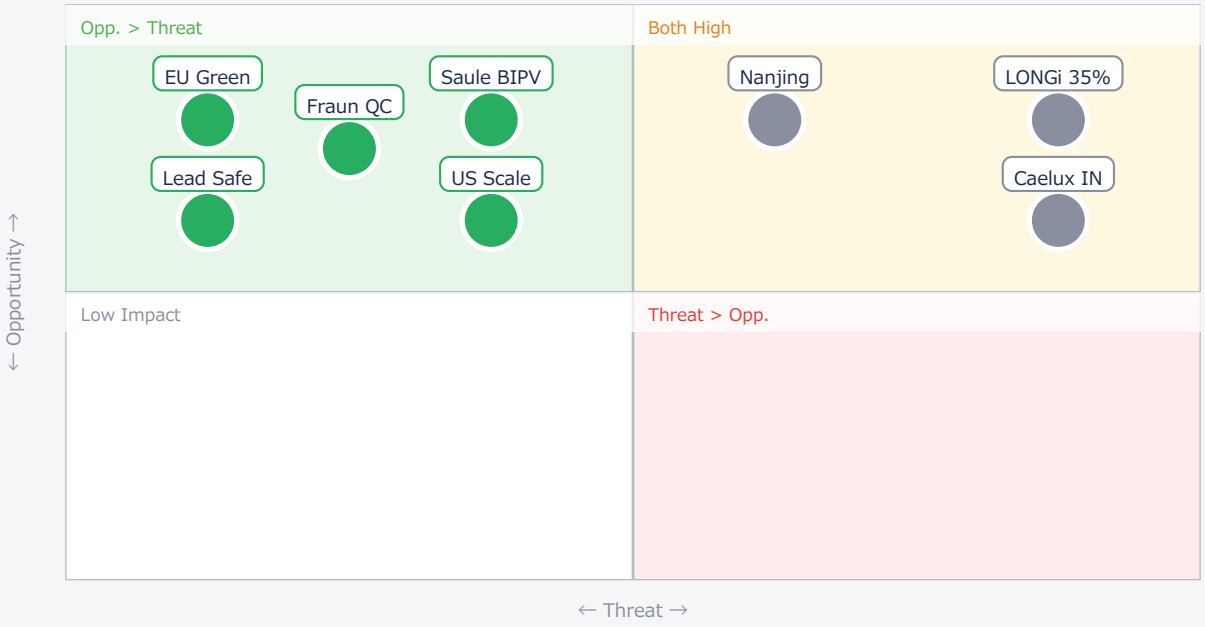
Chinese firms are not only setting efficiency records but also scaling module production (Nanjing Uni, GCL). US firms like Caelux are partnering with Indian manufacturers for 5GW capacity, indicating a shift in manufacturing hubs.

❸ Can 'sustainable' perovskite manufacturing be a US/EU competitive edge?

European research (HZB, Fraunhofer ISE) is leading in solvent-free, high-stability manufacturing processes and lead containment. This could be a critical differentiator for market acceptance and regulatory compliance against Asian competitors.

Opportunities vs. Threats for US/European Companies

Opportunity vs. Threat Matrix for US/European Companies



Item	Quadrant	↑ Opportunity	↓ Threat
LONGi 35%	Critical	Higher energy yield	Market disruption
Nanjing	Critical	Silicon-free PV	China scaling lead
Saule BIPV	Opp.	New BIPV markets	Niche competition
EU Green	Opp.	Sustainable mfg	Process complexity
US Scale	Opp.	Domestic PV growth	Global cost pressure
Caelux IN	Critical	Market access	IP leakage risk
Lead Safe	Opp.	Enhanced safety	Regulatory hurdles

● Fraun QC	Opp.	Mfg quality control	Integration cost

Deep Dive ① — LONGi Sets New 35.5% World Record

#27 | 2026/08/24 | The Economic Times | Tech Novelty●●●●● Proximity●●●○○ Market Impact●●●●● Data Reliability●●●●● US/EU Relevance●●●●○

Chinese solar giant LONGi has achieved an independently certified 35.5% power conversion efficiency for crystalline silicon-perovskite tandem solar cells, setting a new world record. This breakthrough, validated by ESTI, significantly surpasses previous benchmarks and demonstrates high efficiencies (34.3% on 261 cm², 32.2% on 274 cm²) for larger area cells, indicating strong progress towards commercial scalability.

The record was achieved through advanced interface engineering, light management, and carrier transport optimization. This marks a critical transition for perovskite technology from niche research to a mainstream component of the PV industry, with potential to dramatically reduce solar electricity costs and maximize power generation per unit area.

▶ Strategic Analyst's Perspective

Strategic Analyst's Perspective: The 35.5% efficiency is a game-changer, pushing the theoretical limits of PV. While lab-scale, LONGi's demonstration of high efficiencies on larger areas (261-274 cm²) suggests rapid commercialization is plausible within 2-3 years. [Opportunity] for US/EU OEMs to license or acquire this technology, or for materials suppliers to develop compatible high-performance components. [Threat] is significant for US/EU PV manufacturers who do not rapidly adapt, risking obsolescence against Chinese leadership. Next actions: [R&D;] immediately benchmark internal roadmaps against 35.5% and assess technical gaps; [Strategy] evaluate M&A; or licensing opportunities with leading perovskite developers by Q1 2027.

Deep Dive ② — Saule Technologies Commercial BIPV

#02 | 2026/08/28 | Facebook | Tech Novelty●●●○○ Proximity●●●●● Market Impact●●●○○ Data Reliability●●○○○ US/EU Relevance●●●●●

Polish startup Saule Technologies has installed the world's first commercial perovskite solar panels on a building in Wrocław. These lightweight, flexible, and semi-transparent panels, produced via low-cost printing, are ideal for Building-Integrated Photovoltaics (BIPV), opening new avenues for urban renewable energy integration.

This installation signifies a crucial step from lab to practical application, demonstrating perovskite's potential beyond traditional solar farms. The company plans to scale up production, indicating confidence in meeting growing demand for versatile, aesthetically pleasing solar solutions in urban and historical contexts.

▶ Strategic Analyst's Perspective

Strategic Analyst's Perspective: Saule's commercial installation is a strong validation of perovskite's near-term market readiness, particularly for BIPV. The low data reliability (press release) means performance specifics are limited, but the market entry itself is key. [Opportunity] for US/EU construction firms, architects, and smart city developers to integrate these flexible, semi-transparent solutions. Materials suppliers can target BIPV-specific encapsulants and substrates. [Threat] for traditional PV manufacturers who miss the BIPV segment, and for US/EU companies if Asian competitors quickly replicate this commercialization. Next actions: [Business Dev] initiate pilot projects with Saule or similar EU BIPV players by Q4 2026; [R&D;] investigate BIPV-optimized perovskite formulations and module designs by Q1 2027.

Deep Dive ③ — German Solvent-Free Tandem with High Stability

#26 | 2026/08/28 | PV Magazine | Tech Novelty●●●●○ Proximity●●○○○ Market Impact●●●○○ Data Reliability●●●●● US/EU Relevance●●●●●

German researchers have developed a completely solvent-free perovskite-silicon tandem solar cell using sequential vapor deposition, achieving 27.3% efficiency and exceptional stability (97.06% retention after 6,800 hours in dark nitrogen). This process significantly reduces environmental impact and is compatible with industrial-scale manufacturing.

The breakthrough centers on Physical Vapor Deposition (PVD) for perovskite layer fabrication, addressing key challenges of stability and environmental concerns associated with traditional solvent-based methods. This offers a sustainable and scalable pathway for high-performance tandem solar cells, crucial for broader adoption and cost reduction.

▶ Strategic Analyst's Perspective

Strategic Analyst's Perspective: The solvent-free PVD process is a critical technical advancement, addressing both environmental concerns and manufacturing scalability, which are major barriers for perovskite. The 27.3% efficiency is competitive, and the 6,800-hour stability is highly promising, suggesting the numbers are realistic for lab conditions. [Opportunity] for US/EU equipment manufacturers to develop PVD tools for perovskite, and for materials suppliers to provide high-purity precursors for vapor deposition. [Threat] for companies relying solely on solution-processed perovskites, as this method offers a cleaner, potentially more reliable path to mass production. Next actions: [R&D;] launch internal projects to evaluate and implement solvent-free deposition techniques by Q1 2027; [Procurement] assess availability and cost of PVD equipment and precursors for perovskite manufacturing by Q4 2026.

Other Notable Articles

Tandem PV Secures $7.7M DOE Grant (PV Tech)
Tech Novelty●●●○○ Proximity●●●●○ Market Impact●●●●○

US-based Tandem PV secures significant DOE funding to accelerate domestic commercialization of 29.7% efficient tandem cells.

Nanjing University Achieves World Record 26.2% Efficiency on 65 cm² All-Perovskite Tandem Solar Module (National Natural Science Foundation of China (NSFC))
Tech Novelty●●●●○ Proximity●●○○○ Market Impact●●●●○

China's Nanjing University sets a world record for large-area (65 cm²) all-perovskite tandem modules at 26.2% efficiency.

Caelux Forges 5GW Partnerships with Rayzon Solar and Navitas Solar in India (PV-Tech)
Tech Novelty●●●○○ Proximity●●●●○ Market Impact●●●●○

US firm Caelux partners with Indian manufacturers for 5GW perovskite-integrated module production by 2028-29, shifting manufacturing focus.

Lead Leakage from Damaged Laminated Perovskite Solar Cells Reduced to 0.07% Over 9 Months (Energies Media)
Tech Novelty●●●○○ Proximity●●●○○ Market Impact●●●○○

Swiss study shows significantly reduced lead leakage from damaged perovskite modules, addressing a key environmental safety concern.

Fraunhofer ISE Develops Novel Millisecond-Resolution Subcell Current Metrology (PV Magazine)

Tech Novelty●●●●○ Proximity●●○○○ Market Impact●●●○○

German researchers develop a purely electrical method for in-line quality control of tandem solar cells, crucial for mass production.

Recommended Actions This Week

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

Immediate (this week)

- [Executive] Review competitive intelligence on Chinese perovskite efficiency records (LONGi 35.5%) and assess potential market disruption.
- [Procurement] Identify current and future supply chain exposure to Asian perovskite manufacturing, especially for high-efficiency tandem cells.

Short-term (1 month)

- [R&D;] Evaluate solvent-free manufacturing processes (HZB, Fraunhofer ISE) for scalability, cost, and environmental benefits against current methods.
- [Business Dev] Explore partnership opportunities with EU BIPV innovators (Saule Technologies) and US commercialization startups (Tandem PV, Swift Solar).
- [Strategy] Analyze implications of lead containment advancements (Swiss study) on product design, regulatory compliance, and market acceptance in US/EU.

Medium-long term (quarter+)

- [R&D;] Investigate next-generation materials (carborane ETMs, lead-free $FAGeI_3$) and advanced metrology (Fraunhofer ISE) for long-term product roadmaps.
- [Legal/IP] Monitor global standardization efforts (GCL Perovskite for space-grade) and IP landscape for emerging perovskite applications.
- [Strategy] Develop a comprehensive strategy for sustainable perovskite manufacturing and recycling to establish a competitive advantage in US/EU markets.

PerovskiteSolarCells — Selected Articles

Date: 2026-08-30

Articles: 28

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#17 Osaka University Boosts Perovskite Solar Cell Performance with Chiral Hole Transport Materials, Achieving 60% Spin Polarization

#18 GCL Perovskite Leads Standardization of Space-Grade Perovskite Modules, Closes Over RMB 100M Series D1 Funding

#19 Mitsubishi Gas Chemical Selected for Niigata City Perovskite IoT Device Demo at Ice Arena, Advancing Low-Light Applications

#20 Lead Leakage from Damaged Laminated Perovskite Solar Cells Reduced to 0.07% Over 9 Months, Indicating Enhanced Safety

#21 ACS Energy Letters Deciphers Electro-Ionic Interplay in Perovskite LED Degradation, Noting Bias-Dependent Instability Despite 20.0% Initial EQEmax

#22 Perovskite Connect 2026 Conference Spotlights Reliability Testing, Tandem Mismatch Mitigation, and 96% Recovery Recycling for Perovskite Solar Cells

#23 ART-PV India Achieves 29.8% Efficiency with Perovskite-Silicon-CdTe Triple-Junction Tandem Solar Cells

#24 Swift Solar Secures $27M Series A to Accelerate Commercialization of High-Efficiency Lightweight Perovskite Solar Panels

#25 GCL Perovskite Leads Standardization for Space-Grade Single-Junction Perovskite PV Modules, Achieves 18.04% Efficiency and IEC Certification

#26 German Researchers Achieve 27.3% Efficiency in Solvent-Free Perovskite-Silicon Tandem Solar Cell with Exceptional 6,800-Hour Stability

#27 LONGi Achieves World Record 35.5% Power Conversion Efficiency with Crystalline Silicon-Perovskite Tandem Solar Cell

#28 Perovskite Connect 2026 to Convene Global Industry Leaders in Berlin this October for Next-Gen Solar Development

#01 LONGi Achieves 34.85% Efficiency for Perovskite-Silicon Tandem Solar Cells, Setting New World Record; Perovskite-Organic Tandem Reaches 28.04% with High Stability

Published August 23, 2026 Facebook China

OVERVIEW

Chinese solar giant LONGi has achieved a NREL-certified 34.85% power conversion efficiency for perovskite-silicon tandem solar cells, marking a new world record. Concurrently, other Chinese research teams have demonstrated a 28.04% steady-state efficiency for perovskite-organic tandem solar cells, maintaining 90% of their initial efficiency after 625 hours of continuous illumination. These advancements underscore perovskite technology's potential for high-performance and reliable next-generation renewable energy applications.

IN DEPTH

Key Findings

Chinese research institutions and industrial players have consecutively announced groundbreaking achievements in the perovskite solar cell sector, setting new world records for power conversion efficiency. Notably, leading manufacturer LONGi achieved a 34.85% efficiency for its perovskite-silicon tandem solar cells, certified by NREL (National Renewable Energy Laboratory), marking the current highest record. Separately, a research team reported a 28.04% steady-state efficiency for perovskite-organic tandem solar cells, demonstrating remarkable stability by retaining 90% of their initial efficiency after 625 hours of continuous irradiation. These breakthroughs significantly advance the commercialization prospects of perovskite solar cells as a high-performance and reliable next-generation renewable energy technology.

Technical Details

The 34.85% efficiency achieved by LONGi leverages a tandem structure that combines a perovskite layer with traditional silicon solar cells. This design effectively absorbs different parts of the solar spectrum, allowing it to surpass the theoretical limits of single-junction solar cells. The 28.04% efficiency and exceptional stability in perovskite-organic tandem solar cells are particularly promising for diverse applications requiring flexibility and light weight, such as Building-Integrated Photovoltaics (BIPV), wearable devices, drones, and even space systems. Enhanced stability has been a major challenge for practical implementation, and this achievement represents a significant step towards overcoming it, paving the way for wider adoption.

Background & Context

Perovskite solar cells have garnered significant global attention in the solar industry due to their potential for high conversion efficiency and low-cost manufacturing. China, in particular, has emerged as a leader in this field, consistently achieving record-breaking efficiencies. These technological advancements are crucial for further expanding solar power adoption and reducing overall energy costs, thereby accelerating the global energy transition. Perovskite-silicon tandems are especially promising for early market integration as they can leverage existing silicon manufacturing infrastructure. Meanwhile, perovskite-organic tandems, with their inherent flexibility and lightweight properties, are poised to open up new market segments.

Strategic Significance & Outlook

The latest record efficiencies and stability demonstrations represent significant milestones for the commercialization of perovskite solar cells. The progress in overcoming stability issues will be particularly welcomed by markets prioritizing long-term reliability. As these technologies scale up to mass production and achieve further cost reductions, they are expected to significantly accelerate the deployment of solar power and contribute substantially to global carbon neutrality goals. The continuous innovation from Chinese research institutions and companies is set to drive new competition and evolution within the global renewable energy market.

Source: https://www.facebook.com/groups/1904658670337366/posts/2330760837727145/

Collected: August 28, 2026 | Automated Research System (Gemini API)

#02 Saule Technologies Installs First Commercial Perovskite Solar Panels on Building in Poland, Paving Way for BIPV Market

Published Published August 28, 2026　Facebook　ポーランド

OVERVIEW

Polish innovator Saule Technologies has successfully deployed the world's first commercial perovskite solar panels on a building in Wrocław, marking a pivotal moment for Building-Integrated Photovoltaics (BIPV). These lightweight, flexible, and semi-transparent panels, manufactured with cost-effective printing, offer unprecedented versatility for architectural integration. Saule Technologies is now poised to scale up production, addressing the burgeoning demand for sustainable urban energy solutions.

IN DEPTH

The Dawn of Commercial Perovskite Solar

The global imperative for sustainable energy solutions, driven by escalating energy demands and climate change mitigation, has fueled intense research into next-generation photovoltaics. Among these, perovskite solar cells have emerged as a frontrunner, lauded for their high conversion efficiencies—rivaling traditional silicon—and their inherent versatility in form factor and transparency. Crucially, the Building-Integrated Photovoltaics (BIPV) market stands to play a transformative role in decarbonizing urban environments. In this context, the recent deployment by Saule Technologies represents a pivotal step forward.

Wrocław Installation: A Landmark Achievement

Polish startup Saule Technologies has officially unveiled the world's first commercial installation of perovskite solar panels on a building in Wrocław, Poland. This deployment signifies a critical inflection point, moving perovskite technology decisively from the laboratory benchtop into real-world application. It dramatically expands the horizon for integrating renewable energy directly into urban infrastructure, demonstrating a tangible pathway for broad adoption within the BIPV sector.

Engineered for Building Integration

The perovskite solar panels developed by Saule Technologies are meticulously engineered for optimal performance and integration within diverse BIPV scenarios. Their distinctive technical attributes are key to unlocking new architectural possibilities:

- **Ultra-Lightweight and Flexible:** Unlike rigid silicon panels, these perovskite modules can conform to irregular surfaces and be seamlessly integrated into a variety of building materials, accommodating complex geometries and structures with stringent weight limitations.
- **Tunable Semi-Transparency:** A standout feature, the panels can be designed to allow varying degrees of natural light transmission. This enables their deployment on windows, skylights, and facades, generating electricity while preserving ambient lighting and enhancing architectural aesthetics.

- **Cost-Efficient Printability:** Leveraging scalable manufacturing techniques such as roll-to-roll printing, Saule Technologies can produce these panels at significantly lower costs than conventional silicon photovoltaics, making sustainable energy more accessible.

These combined properties address longstanding challenges in solar integration, particularly for urban buildings and historical landmarks where traditional PV systems were often impractical. The flexibility in design ensures energy generation can now harmonize with the existing urban landscape without compromising architectural integrity. To meet anticipated market demand and accelerate commercialization, Saule Technologies is actively expanding its production capabilities at a new, dedicated factory.

Strategic Implications & Future Horizons

The successful commercial deployment by Saule Technologies represents more than just an energy installation; it marks the critical genesis of perovskite solar cells' journey from nascent research to widespread practical adoption. As manufacturing processes mature and economies of scale are achieved, perovskite technology is projected to transcend the BIPV sector, finding impactful applications across smart city infrastructure, portable electronics, and even demanding environments like the aerospace industry. This pioneering Polish innovation is set to introduce a new competitive dynamic and foster greater diversity within the global renewable energy landscape, serving as a vital accelerator towards achieving a truly sustainable future.

Source: https://www.facebook.com/groups/849994733672039/posts/1462704312401075/

Collected: August 28, 2026 | Automated Research System (Gemini API)

#03 Aisin Accelerates Mass Production Development of 500mm Perovskite Solar Modules with NEDO Green Innovation Fund Backing in Japan

Published August 21, 2026 IBTimes JP Japan

OVERVIEW

Aisin has been selected for Japan's NEDO Green Innovation Fund project to advance the mass production development of 500mm square perovskite solar modules. The project focuses on improving high-speed spray coating technology and conducting extensive demonstration tests, including at Chubu Centrair International Airport, to establish manufacturing processes and enhance product reliability. This initiative positions Aisin at the forefront of commercializing large-area perovskite technology in Japan.

IN DEPTH

Key Findings

Aisin, a major automotive parts manufacturer, has initiated the full-scale mass production development of 500mm square perovskite solar modules, a highly anticipated next-generation solar cell technology. This project is supported by Japan's New Energy and Industrial Technology Development Organization (NEDO) through its 'Green Innovation Fund Project.' Aisin's participation underscores its pivotal role in commercializing perovskite technology and is expected to bolster Japan's renewable energy industry competitiveness, particularly through establishing manufacturing techniques and conducting extensive demonstrations for large-area modules.

Technical Details

Aisin's development plan is focused on the following key technological approaches and objectives:

- **Large-Area and High Efficiency:** Developing 500mm square modules facilitates easier integration into existing solar cell production lines and enhances power generation per unit area.
- **Improvement of High-Speed Spray Coating Technology:** The core of mass production, this aims to significantly increase production speed while maintaining the uniformity and quality of the perovskite layer, directly leading to reduced manufacturing costs.
- **Multi-Location Demonstration Tests:** Long-term evaluations at various sites, including Chubu Centrair International Airport, will verify durability, reliability, and power generation performance under real-world conditions. This will provide robust data for future market introduction.

This project aims to overcome stability and durability, two of the greatest challenges for perovskite solar cells, through scalable manufacturing techniques and real-world validation. The development of large-area modules also envisions applications beyond conventional solar farms, including building rooftops and facades, agricultural facilities, and even mobility sectors like automobiles and ships.

Background & Context

The Japanese government is actively promoting the expansion of renewable energy to achieve its 2050 carbon neutrality goal. Within this context, perovskite solar cells are garnering significant expectations for widespread adoption due to characteristics like 'lightweight, flexible, and low-light power generation,' which are challenging for conventional silicon solar cells. NEDO's Green Innovation Fund plays a crucial role in supporting Japanese industries to keep pace with these technological innovations. Aisin's involvement highlights how its precision manufacturing technology and quality control expertise, honed in automotive parts manufacturing, can be leveraged for perovskite solar cell mass production.

Strategic Significance & Outlook

Aisin's mass production development of 500mm square perovskite solar modules, backed by NEDO, is a transformative initiative for Japan's renewable energy industry. The demonstration tests at Chubu Centrair International Airport are particularly critical for assessing long-term reliability under challenging conditions. Successful completion of this project is expected to lead to the widespread adoption of high-performance, low-cost perovskite solar cells in Japan's infrastructure, significantly contributing to energy self-sufficiency and greenhouse gas emission reduction. By the 2030s, perovskite solar cells could substantially increase their presence in Japan's energy mix.

Source: https://jp.ibtimes.com/aisin-wins-nedo-backing-500mm-perovskite-solar-modules-103921

Collected: August 28, 2026 | Automated Research System (Gemini API)

#04 U.S. DOE Backs Perovskite Solar Cell R&D, Highlighting >26% for Standalone and ~34% for Tandem Efficiencies

Published August 25, 2026 U.S. Department of Energy (DOE) USA

OVERVIEW

The U.S. Department of Energy (DOE) is actively supporting research and development for perovskite solar cells, aiming to enhance efficiency, extend lifespan, and reduce manufacturing costs. NREL data shows standalone perovskite cells have already achieved over 26% power conversion efficiency, while perovskite-silicon tandem cells are approaching 34%, emphasizing their high performance and potential for low production costs. This sustained investment is crucial for next-generation solar technologies.

IN DEPTH

Key Findings

The U.S. Department of Energy (DOE) is vigorously advancing research and development in perovskite solar cells to unlock their full potential as a next-generation photovoltaic technology. Under DOE's support, researchers are targeting further improvements in power conversion efficiency, extended device lifetimes, and significant reductions in manufacturing costs. As evidenced by certified data from NREL (National Renewable Energy Laboratory), standalone perovskite cells have already surpassed 26% efficiency, and perovskite-silicon tandem cells are approaching 34% efficiency, validating the innovative potential of perovskite technology.

Technical Details

Perovskite solar cells are renowned for their exceptionally high efficiency in converting sunlight into electricity, primarily due to their unique crystal structure. The DOE's focus areas include:

- **High Efficiency:** Latest NREL data indicates single-junction perovskite cells exceeding 26% efficiency, and tandem structures combining perovskite with silicon solar cells nearing 34% efficiency, surpassing the theoretical limits of conventional silicon solar cells.
- **Potential for Low-Cost Manufacturing:** Perovskite materials are amenable to relatively inexpensive and scalable manufacturing methods, such as solution processing and vapor deposition. This promises significant cost reductions during mass production, contributing to broader solar power adoption.
- **Adaptability to Diverse Applications:** Perovskites offer flexibility and can be made semi-transparent, opening up a wide range of applications, including Building-Integrated Photovoltaics (BIPV), wearable electronics, and IoT sensors.
- **Addressing Stability and Lifetime Challenges:** A critical focus of R&D is enhancing the environmental stability of perovskite materials and ensuring long-term device longevity. The DOE aims to resolve these challenges through advancements in materials science, device physics, and manufacturing processes.

These characteristics suggest that perovskite solar cells could revolutionize existing photovoltaic markets and play a much larger role in the energy mix.

Background & Context

As the global transition to renewable energy accelerates, solar power remains one of the most vital clean energy sources. The DOE is making substantial investments in innovative solar cell technologies to achieve U.S. energy independence and climate change mitigation goals. Perovskite solar cells, given their high efficiency and potential for manufacturing cost reduction, are positioned as a core technology within this strategy. The department is strengthening collaborations with national laboratories, universities, and industry to accelerate the entire development process from fundamental research to commercialization.

Strategic Significance & Outlook

With continued DOE support and advancements in R&D, perovskite solar cells are projected to see accelerated commercial-scale deployment in the coming years. Further improvements in efficiency and stability, coupled with expanded manufacturing scales, will drive down the cost of solar power even further, promoting broader adoption across more regions. This technology is poised to become an indispensable component in shaping the future of energy, contributing significantly to the realization of a clean and sustainable society.

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

Collected: August 28, 2026 | Automated Research System (Gemini API)

#05 HZB Achieves 30.3% Efficiency in Perovskite-Silicon Tandem Solar Cells Using Solvent-Free Co-Evaporation with Ultra-Thin CsCl Layer

Published August 27, 2026 XenoSpectrum Germany

OVERVIEW

Germany's Helmholtz-Zentrum Berlin (HZB) has achieved a 30.3% (certified 29.7%) power conversion efficiency for perovskite-silicon tandem solar cells, employing a solvent-free co-evaporation method and an ultra-thin cesium chloride (CsCl) seed layer. While not surpassing the current world record of 35.5%, this represents an excellent figure for deposition-based manufacturing, contributing to uniform perovskite growth and suppressing interface impurities. This breakthrough paves the way for more sustainable and scalable production.

IN DEPTH

Key Findings

Researchers at Germany's Helmholtz-Zentrum Berlin (HZB) have achieved a new breakthrough in perovskite-silicon tandem solar cells. By implementing an innovative solvent-free co-evaporation method and introducing an ultra-thin cesium chloride (CsCl) seed layer, measuring just a few nanometers, they reached a power conversion efficiency of 30.3% (certified 29.7%). Although this does not surpass the world record of 35.5% held by China's LONGi, it represents an exceptionally high value for deposition-based manufacturing methods, in contrast to solution processes, indicating a significant advance in perovskite layer quality and the sustainability of the manufacturing process.

Technical Details

The key to this achievement lies in the combination of the solvent-free 'co-evaporation method' and the introduction of the 'CsCl seed layer.' Traditional solution processes for forming perovskite layers often rely on organic solvents, presenting challenges related to manufacturing complexity, environmental impact, and layer uniformity. The co-evaporation method overcomes these issues, making it suitable for industrial-scale production. Furthermore, the research team utilized an ultra-thin CsCl seed layer to control the growth of the perovskite layer. This CsCl layer performs two critical functions:

- **Promoting Uniform Perovskite Growth:** The formation of the CsCl layer on the substrate facilitates uniform nucleation of subsequent perovskite crystals, leading to the formation of high-quality, defect-free perovskite layers.
- **Suppressing Undesirable Lead Iodide Formation at the Interface:** It effectively inhibits the formation of unwanted byproducts, such as lead iodide, which can occur at the interface between the perovskite and other layers. This prevents device performance degradation and enhances stability.

These technological approaches have significantly improved the efficiency of perovskite-silicon tandem solar cells, marking a major step towards their practical application.

Background & Context

Perovskite solar cells are globally recognized as a next-generation renewable energy technology due to their potential to achieve efficiencies that exceed the theoretical limits of conventional silicon solar cells. Tandem structures, particularly those combining perovskite with existing silicon solar cells, are highly anticipated for their ability to efficiently utilize a broader range of the solar spectrum, with expectations of achieving efficiencies over 30%. HZB's achievement is significant because it demonstrates high efficiency using a scalable vapor deposition method, which provides a clear pathway for mass production and cost reduction. The solvent-free process is also highly attractive to industry due to its environmental friendliness and enhanced safety in manufacturing environments.

Strategic Significance & Outlook

This achievement of 30.3% efficiency will provide strong momentum for the commercialization of perovskite-silicon tandem solar cells. The solvent-free manufacturing process, in particular, will be a highly attractive option amid increasing environmental regulations and demands for sustainable production. As HZB's technology further develops and production scales expand, it is expected that high-efficiency, low-environmental-impact next-generation solar cells will play a crucial role in the global energy market. This represents an indispensable technological innovation for accelerating efforts against global warming and transitioning to clean energy.

Source: https://xenospectrum.com/en/hzb-perovskite-tandem-vapor-deposition/

Collected: August 28, 2026 | Automated Research System (Gemini API)

#06 Caelux Forges 5GW Partnerships with Rayzon Solar and Navitas Solar in India, Targeting Perovskite-Integrated Module Production by 2028-29

Published August 25, 2026 PV-Tech USA

OVERVIEW

Next-gen PV technology firm Caelux has signed two 5GW commercialization agreements with Indian solar manufacturers Rayzon Solar and Navitas Solar. These partnerships aim to integrate Caelux's proprietary perovskite solar cell technology into solar module glass, ensuring compatibility with existing supply chains. Both companies plan to commence integrated production of n-type TOPCon modules with perovskite glass by 2028-29, positioning India as a key manufacturing hub for this advanced technology.

IN DEPTH

Key Findings

Caelux, a developer of next-generation photovoltaic (PV) technology, has announced strategic partnerships with leading Indian manufacturers Rayzon Solar and Navitas Solar to accelerate the commercialization of its perovskite solar cell technology in the Indian market. These commercialization agreements, each spanning 5GW, aim to seamlessly integrate Caelux's perovskite technology into solar module glass, aligning with existing solar cell supply chains. This collaboration has the potential to position India as a major manufacturing hub for perovskite solar cells.

Technical Details

Caelux's technology involves directly integrating a perovskite layer into the glass substrate used for solar modules. This approach offers significant advantages:

- **Compatibility with Existing Supply Chains:** Caelux's perovskite-integrated glass can be incorporated into conventional silicon solar cell manufacturing lines with minimal modifications. This enables the production of high-performance tandem modules while minimizing initial investment costs.
- **Enhanced Efficiency:** By integrating n-type TOPCon modules with perovskite-glass, the technology captures a broader range of the solar spectrum, achieving significantly higher power conversion efficiencies than single-junction silicon modules.
- **Scalability:** The agreements with Indian partners envision a massive combined production capacity of 10GW, demonstrating Caelux's strong commitment to the mass production of perovskite technology. The target for integrated production commencement is set for 2028-2029.

This technology holds the potential to reduce electricity generation costs and improve profitability, particularly for high-efficiency demanding applications in residential, commercial, and utility-scale solar farms.

Background & Context

As global energy demand escalates, India is vigorously promoting the adoption of renewable energy, especially solar power. Under its 'Make in India' policy, the Indian government aims to strengthen domestic solar cell manufacturing capabilities. Caelux's partnerships with Indian companies align perfectly with this national strategy. Perovskite solar cells are seen as a promising next-generation technology capable of exceeding the theoretical efficiency limits of silicon solar cells, and companies like Caelux are playing a crucial role in bridging this technology to the global market. This will enhance India's presence not just as a solar power market but also as a manufacturing hub for advanced PV technology.

Strategic Significance & Outlook

The partnerships between Caelux and key Indian manufacturers could mark a turning point in the commercialization of perovskite solar cells. The concrete timeline for integrated production starting in 2028-29 reflects the technology's maturity and confidence in its market entry. If this large-scale deployment proves successful, perovskite solar cells are poised to become a major option in the global solar power market, either alongside or complementing silicon-based technologies. Particularly in emerging markets demanding low-cost, high-efficiency energy supply, perovskite technology is expected to make a significant impact and play a crucial role in accelerating the global energy transition.

Source: https://www.pv-tech.org/caelux-perovskite-us-solar-manufacturing-interview/

Collected: August 28, 2026 | Automated Research System (Gemini API)

#07 Fraunhofer ISE and University of Freiburg Develop Fully Solvent-Free Perovskite-Silicon Tandem Solar Cell Manufacturing Process, Achieving 27.1% Efficiency and High Stability

Published August 27, 2026 Fraunhofer ISE Germany

OVERVIEW

Researchers from the University of Freiburg and Fraunhofer ISE have developed a novel, completely solvent-free manufacturing process for perovskite-silicon tandem solar cells. Published in Joule, this breakthrough achieves a power conversion efficiency of 27.1% and demonstrates remarkable stability, retaining 97.06% of its initial efficiency after 6800 hours of dark nitrogen storage. This marks a critical milestone for the sustainable mass production of perovskite solar cells.

IN DEPTH

Key Findings

A research team from the University of Freiburg and the Fraunhofer Institute for Solar Energy Systems (Fraunhofer ISE) has developed a groundbreaking 'fully solvent-free' process for manufacturing perovskite-silicon tandem solar cells, significantly reducing environmental impact. This innovative method, published in Joule, not only achieved a high power conversion efficiency of 27.1% but also demonstrated exceptional stability, maintaining 97.06% of its initial efficiency after 6800 hours of storage in dark nitrogen. This represents a crucial milestone towards the sustainable and scalable mass production of perovskite solar cells.

Technical Details

The core of this research lies in the introduction of industrially scalable, solvent-free manufacturing methods, such as Physical Vapor Deposition (PVD), for forming the perovskite layer. Traditional perovskite solar cell manufacturing often involves the use of harmful organic solvents, leading to environmental concerns, process complexity, and increased costs. The fully solvent-free process fundamentally addresses these challenges.

- **Enhanced Manufacturing Sustainability:** Eliminating the use of organic solvents minimizes environmental impact and enables a cleaner production environment, aligning with global sustainability goals.
- **Ensured Scalability:** Vapor deposition technologies like PVD are widely adopted and proven in industries such as semiconductor manufacturing, making them easy to integrate into large-scale production lines. This will accelerate the mass production of perovskite solar cells and contribute to cost reduction.
- **Achieving High Efficiency and Stability:** The developed tandem solar cell not only boasts 27.1% conversion efficiency but also demonstrated long-term stability. The 97.06% efficiency retention after 6800 hours is remarkably high, alleviating one of the primary concerns for the practical application of perovskite solar cells.

This technology is expected to contribute to the broader adoption of perovskite solar cells in various fields, particularly in Building-Integrated Photovoltaics (BIPV) and other outdoor applications requiring high durability.

Background & Context

Perovskite solar cells are garnering significant global attention as a next-generation photovoltaic technology, with the potential to achieve efficiencies exceeding 30%, surpassing the theoretical limits of conventional silicon solar cells. However, challenges related to environmental stability, lead content, and the use of solvents in manufacturing processes have been barriers to commercialization. This achievement by Fraunhofer ISE and the University of Freiburg will have a significant impact on the industry, particularly from the perspective of 'sustainability' in manufacturing processes. Solvent-free manufacturing offers a highly attractive option for the industry as environmental regulations become increasingly stringent.

Strategic Significance & Outlook

The development of a fully solvent-free manufacturing process is a pivotal advancement for the future of perovskite solar cells. If this technology further matures and is successfully applied to large-scale commercial production, it will enable the creation of high-efficiency solar cells through cleaner, cheaper, and more sustainable methods. This will accelerate the adoption of solar power and significantly contribute to achieving global carbon neutrality. This innovation has the potential to redefine the landscape of next-generation clean energy technologies.

Source: https://www.ise.fraunhofer.de/en/press-media/news/2026/a-new-milestone-for-photovoltaics-solvent-free-tandem-solar-cells.html

Collected: August 28, 2026 | Automated Research System (Gemini API)

#08 Machine Learning Optimizes Charge Transport Layers and Fabrication Parameters for Lead-Free Cs2AgBi0.75Sb0.25Br6 Perovskite Solar Cells

Published August 24, 2026 The Royal Society of Chemistry Unknown

OVERVIEW

This study utilized a machine learning-driven framework to optimize charge transport layer selection and fabrication parameters for eco-friendly, lead-free Cs2AgBi0.75Sb0.25Br6 perovskite solar cells (PSCs). By integrating large-scale SCAPS-1D simulations with computationally efficient machine learning models, a robust data-driven paradigm was established to accelerate the development of high-performance lead-free PSCs. This approach significantly streamlines the design and optimization process for sustainable energy technologies.

IN DEPTH

Key Findings

The development of high-performance lead-free perovskite solar cells (PSCs) is a crucial objective for achieving sustainable energy technologies. This research successfully implemented a machine learning (ML)-driven framework to optimize both the selection of charge transport layers and fabrication parameters for eco-friendly Cs2AgBi0.75Sb0.25Br6 perovskite solar cells. This approach established a robust data-driven paradigm, capable of identifying development pathways for high-efficiency lead-free PSCs more rapidly and efficiently than traditional methods.

Technical Details

The research team began by generating a large-scale simulation dataset for Cs2AgBi0.75Sb0.25Br6-based PSC structures and material properties using SCAPS-1D, a solar cell simulation software. This dataset encompassed a wide range of fabrication parameters, including various combinations of charge transport materials, film thicknesses, and doping concentrations. Subsequently, computationally efficient machine learning models were applied to this data to predict the optimal charge transport layer combinations and manufacturing conditions.

- **SCAPS-1D Simulation:** Employed to model the physical properties of solar cells in detail and predict performance across a vast number of design variations, enabling the down-selection of promising candidates before costly experimental work.
- **Machine Learning Models:** Analyzed simulation data to learn how material properties of charge transport layers and fabrication parameters influence PSC efficiency. This facilitated efficient exploration of the optimal design space without relying on human intuition or extensive trial-and-error.
- **Lead-Free Materials:** Cs2AgBi0.75Sb0.25Br6, a relatively low-toxicity material, was selected to eliminate the lead toxicity risk associated with conventional PSCs. This marks a significant step in developing environmentally conscious devices.

This approach has the potential to accelerate the entire process, from novel material discovery to device design and optimization, thereby speeding up the commercialization of high-performance lead-free PSCs.

Background & Context

Perovskite solar cells hold immense promise as next-generation photovoltaics due to their high power conversion efficiency and potential for low-cost manufacturing. However, the presence of lead in many high-performance PSCs raises environmental and health concerns due to its toxicity. Consequently, the development of lead-free perovskite materials and high-performance devices utilizing them has become an urgent priority for the entire industry. Machine learning is gaining traction as a powerful tool in materials science for exploring complex design spaces and accelerating the optimization of new materials and processes, with this study providing a concrete application example.

Strategic Significance & Outlook

The machine learning-driven framework established by this research has the potential to significantly accelerate the development of lead-free PSCs. By employing this method, researchers and engineers can more efficiently identify promising material combinations and manufacturing processes, ultimately bringing high-performance, environmentally friendly perovskite solar cells to market. This represents a crucial step towards promoting the widespread adoption of sustainable energy solutions and realizing next-generation solar cell technologies with reduced environmental impact. In the future, this framework is expected to be applied to the development of other novel materials and devices.

Source: https://pubs.rsc.org/ra/article/doi/10.1039/d6ra07290a/1293949/Intelligent-engineering-of-Cs2AgBi0-75Sb0-25Br6

#09 Fraunhofer ISE Develops Novel Millisecond-Resolution Subcell Current Metrology, Revolutionizing Mass Production Quality Control for Tandem Solar Cells

Published August 26, 2026 PV Magazine Germany

OVERVIEW

Researchers at Germany's Fraunhofer Institute for Solar Energy Systems (Fraunhofer ISE) have developed a groundbreaking purely electrical method to individually measure subcell currents in perovskite-silicon tandem solar cells with millisecond resolution. This innovative technique is integrable into standard current-voltage (j-V) tests without additional hardware, enabling in-line subcell current monitoring in mass production. This significantly enhances manufacturing quality control and efficiency for tandem photovoltaics.

IN DEPTH

Key Findings

As perovskite-silicon tandem solar cells continue to achieve higher performance, quality control in their mass production remains a critical challenge. To address this, researchers at Germany's Fraunhofer Institute for Solar Energy Systems (Fraunhofer ISE) have developed a groundbreaking purely electrical method capable of individually measuring the current of each subcell within a tandem solar cell at millisecond resolution. This innovative metrology can be directly integrated into standard current-voltage (j-V) tests, eliminating the need for additional external hardware. This enables real-time, in-line subcell current monitoring in manufacturing lines, substantially enhancing product uniformity and reliability.

Technical Details

Tandem solar cells achieve higher conversion efficiencies than single-junction cells by stacking multiple solar cells with different bandgaps, efficiently utilizing a broader range of the solar spectrum. However, in tandem structures, it is crucial that the currents generated by each subcell are matched; current mismatch leads to a reduction in overall performance. Conventional measurement methods have struggled to accurately and rapidly evaluate the current of each subcell independently.

Key features of the new method developed by Fraunhofer ISE include:

- **Pure Electrical Measurement:** It measures and separates the current of each subcell using only electrical signals, without requiring additional optical filters or spectrometers.
- **Millisecond-Level High-Speed Response:** Capable of capturing current fluctuations on very short timescales, allowing for real-time detection of subtle changes during the manufacturing process.
- **Integration into Existing j-V Tests:** Easily incorporated into standard current-voltage (j-V) measurement systems, facilitating relatively straightforward implementation into manufacturing lines.
- **In-line Monitoring:** Real-time monitoring of individual module subcell currents on the production line helps in early detection of manufacturing defects and optimization of processes.

This technology is expected to improve yields and tighten quality control in tandem solar cell manufacturing, contributing to the stable supply of high-performance products.

Background & Context

Perovskite-silicon tandem solar cells are regarded as a prime candidate for next-generation photovoltaic technology due to their potential for achieving over 30% conversion efficiency. However, replicating laboratory results in mass production and maintaining quality requires sophisticated manufacturing process control and accurate diagnostic tools. The subcell current metrology developed by Fraunhofer ISE addresses a critical bottleneck in the commercialization of tandem solar cells, and is expected to have a significant impact on stabilizing manufacturing quality and ensuring reliability across the industry.

Strategic Significance & Outlook

This new subcell current metrology will be an indispensable tool for accelerating the mass production of perovskite-silicon tandem solar cells. Reductions in manufacturing costs and improvements in product reliability directly contribute to the wider adoption of solar power. In the future, this technology is also expected to be utilized in optimizing tandem solar cell designs, further promoting the development of more efficient and stable products. This represents a crucial step towards expanding the use of clean energy and realizing a sustainable society.

Source: https://www.pv-magazine.com/2026/08/26/new-subcell-current-metrology-for-perovskite-silicon-tandem-solar-cells/

Collected: August 28, 2026 | Automated Research System (Gemini API)

#10 NiOx/Perovskite Interface Engineering Boosts Performance of Efficient Air-Processed Wide-Bandgap Perovskite Solar Cells

Published August 25, 2026 ACS Applied Energy Materials Unknown

OVERVIEW

A recent study published in ACS Applied Energy Materials reports that NiOx/perovskite interface engineering has been bifunctionally utilized to enhance the performance of efficient, air-processed wide-bandgap perovskite solar cells. This research highlights the critical importance of precise material composition and interface control for improving perovskite solar cell performance. The findings provide a pathway for achieving higher efficiency and stability under practical manufacturing conditions.

IN DEPTH

Key Findings

To enhance the performance of perovskite solar cells (PSCs), precise control over not only material composition but also the interface properties between different layers is essential. A recent study published in ACS Applied Energy Materials demonstrates that engineering the interface between NiOx (nickel oxide) and perovskite bifunctionally contributes to improving the performance of wide-bandgap PSCs that can be efficiently processed in ambient air. This breakthrough presents a new pathway for simultaneously increasing the efficiency and stability of PSCs under practical manufacturing conditions.

Technical Details

The 'bifunctional' nature of NiOx/perovskite interface engineering in this study refers to two key aspects:

- **Optimizing Charge Transport:** The NiOx layer functions as a hole transport layer, efficiently collecting and transporting holes generated in the perovskite layer. When the interface is appropriately designed, recombination losses of charge carriers are minimized, leading to improvements in the device's photocurrent density and open-circuit voltage.
- **Interface Passivation and Stability Enhancement:** The NiOx layer also effectively passivates (deactivates) defects on the surface of the perovskite layer. This suppresses non-radiative recombination and enhances the environmental stability of the perovskite material, particularly its resistance to degradation in ambient air.

This interface engineering is particularly important for PSCs utilizing 'wide-bandgap' perovskite materials. Wide-bandgap materials efficiently absorb light in the blue region of the visible spectrum and are suitable for the top cells in tandem solar cells, transparent solar cells, and high-intensity light applications. However, optimizing their stability and charge transport properties has been a challenge. A notable aspect of this research is enabling 'air processing' for PSC manufacturing, which reduces production costs and increases manufacturing scalability.

Background & Context

Perovskite solar cells are anticipated as a next-generation technology with the potential to exceed the theoretical efficiency of silicon solar cells. However, long-term stability and the development of low-cost manufacturing processes that do not require cleanroom environments have been significant barriers to commercialization. Interface engineering is a crucial research area for maximizing material performance and improving stability. NiOx, known for its stability and hole transport capability, is one of the materials widely used to enhance PSC performance, and this study further unlocks its potential.

Strategic Significance & Outlook

Advancements in NiOx/perovskite interface engineering will significantly contribute to realizing high-efficiency and stable wide-bandgap PSCs that can be manufactured in ambient air. This will accelerate the commercialization of a wide range of next-generation PV applications, including tandem solar cells, transparent solar cells, and flexible solar cells. Specifically, if air processing becomes practical, manufacturing costs will be substantially reduced, dramatically improving the market competitiveness of perovskite solar cells and strongly supporting the global transition to clean energy.

Source: https://pubs.acs.org/aaemcq/issue/9/16

#11 Nanjing University Achieves World Record 26.2% Efficiency on 65 cm^2 All-Perovskite Tandem Solar Module, Overcoming Scaling Challenges

Published August 25, 2026 National Natural Science Foundation of China (NSFC) China

OVERVIEW

Professor Hairen Tan's team at Nanjing University has developed a novel nano-crystal regulated recombination strategy, successfully addressing the scaling challenges for all-perovskite tandem solar modules. As a result, they achieved a JET-certified power conversion efficiency of 26.2% on a large-area 65 cm^2 module, setting a new world record for all-perovskite tandem modules. This breakthrough represents a significant milestone towards the commercialization of next-generation solar cells.

IN DEPTH

Key Findings

A research team led by Professor Hairen Tan at Nanjing University has announced a breakthrough that simultaneously addresses two major challenges in all-perovskite tandem solar modules: scaling up and achieving high efficiency. By introducing a novel strategy called 'nano-crystal regulated recombination,' they suppressed efficiency degradation typically observed in large-area devices. This led to a JET (Japan Electrical Safety & Environment Technology Laboratories) certified power conversion efficiency of 26.2% on a practical 65 cm^2 module, setting a new world record for all-perovskite tandem modules and marking a crucial milestone for the commercialization of next-generation solar cells.

Technical Details

All-perovskite tandem solar cells use perovskite materials in both the top and bottom layers. This structure can efficiently utilize a broader solar spectrum than single-junction perovskite cells, with expectations of achieving efficiencies over 30%. However, challenges such as perovskite layer uniformity, interface defects, and charge transport optimization have hindered their manufacturing process, particularly when scaling to large areas.

Key technical features of the 'nano-crystal regulated recombination' strategy developed by Professor Hairen Tan's team include:

- **Nanocrystal Control:** Precise control over the crystalline structure within the perovskite layer at the nanoscale enhances charge carrier lifetime and mobility. This enables efficient charge collection even in large-area modules.
- **Suppression of Recombination Losses:** The strategy effectively suppresses non-radiative recombination of charge carriers at interfaces and in the bulk, which is a primary cause of efficiency loss and a key factor in their success.
- **Large-Area Uniformity:** The new strategy facilitates the formation of high-quality, uniform perovskite layers even on large substrates, stabilizing the overall module performance.

Achieving 26.2% efficiency on a 65 cm^2 module demonstrates that perovskite technology is overcoming challenges in scaling up from small lab cells to practical large-area modules.

Background & Context

As the demand for renewable energy grows, improving solar power efficiency is an urgent global priority. Perovskite solar cells are seen as a promising next-generation technology, potentially replacing or complementing existing silicon solar cells due to their high efficiency and low-cost manufacturing potential. All-perovskite tandem solar cells, being silicon-free, can further reduce manufacturing costs and offer advantages in specific applications (e.g., flexible, lightweight). This achievement from Nanjing University reconfirms China's leading position in perovskite solar cell research and development.

Strategic Significance & Outlook

The world record achieved by Professor Hairen Tan's team with a 65 cm^2 all-perovskite tandem module significantly advances the commercialization of this technology. High efficiency on large areas enhances product competitiveness and will accelerate adoption in a wide range of applications, including Building-Integrated Photovoltaics (BIPV), portable devices, and large-scale solar farms. As this nano-crystal regulated recombination strategy is further refined and manufacturing costs are reduced, all-perovskite tandem solar cells are increasingly likely to play a central role in the global energy transition.

Source: https://www.nsfc.gov.cn/english/site_1/news/A2/2026/08-25/573.html

#12 Lithuanian Researchers at Kaunas University of Technology Solve Inverted Perovskite Solar Cell Stability Issues by Modifying Interface 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 unveiled a method to address a major cause of performance degradation in inverted perovskite solar cells. By precisely engineering the chemical composition of the device's interface layers, they successfully minimized interlayer corrosivity, leading to significantly more efficient and stable cells. This breakthrough critically enhances the long-term viability of this promising next-generation photovoltaic technology.

IN DEPTH

Background

Perovskite solar cells have garnered significant attention in the renewable energy sector due to their impressive power conversion efficiency and potential for low-cost manufacturing. Inverted structures, in particular, offer compatibility with flexible substrates and transparent electrodes, making them ideal for diverse applications such as Building-Integrated Photovoltaics (BIPV) and wearable devices. However, achieving long-term stability comparable to conventional silicon solar cells has been a critical hurdle for their commercialization. This latest achievement by the Lithuanian research team directly addresses this essential stability challenge, with profound implications for accelerating the practical implementation of perovskite solar cells.

Key Findings

A research team at Kaunas University of Technology in Lithuania has made a pivotal discovery, directly addressing a major challenge in the long-term stability of inverted perovskite solar cells (IPSCs) – a highly promising next-generation photovoltaic technology. The researchers successfully mitigated the corrosive interactions between adjacent layers by precisely modifying the chemical composition of the critical interface layers. These interactions were previously a primary cause of IPSC efficiency degradation. This fundamental improvement dramatically enhances device stability, promising reliable performance over extended periods while maintaining high power conversion efficiency.

Technical Details

While inverted perovskite solar cells offer advantages like ease of manufacturing and high performance compared to conventional normal structures, their vulnerability to environmental factors such as moisture and oxygen has been a significant drawback. The Kaunas University team focused their efforts on the interface between the charge transport layer and the perovskite layer – critical components within IPSCs. They identified chemical reactions and material degradation occurring specifically at this interface as primary drivers of device performance loss.

To counter this, the researchers targeted specific chemical compositions within these interface layers, introducing novel materials and modification methodologies. Their specific approaches encompassed:

- **Precise Interface Material Design:** Developing new interface material compositions engineered to optimize charge transport pathways while simultaneously suppressing undesirable chemical interactions between distinct layers.
- **Blocking Corrosive Pathways:** Implementing effective inhibition of ion migration and parasitic reactions at the critical interface. This dramatically slows down intrinsic device corrosion processes, representing a significant leap forward in long-term stability.

Strategic Significance & Outlook

The interface stabilization technology pioneered by Kaunas University of Technology holds the potential to be a significant game-changer for the commercialization of inverted perovskite solar cells. Should this technology be further refined and successfully integrated into mass production processes, it will enable the widespread availability of more durable and higher-performing perovskite solar cells in the market. This, in turn, will facilitate their adoption in applications previously challenging for conventional solar cell installation, such as building windows and facades, thereby significantly expanding the scope of clean energy utilization. This breakthrough from Lithuania is poised to introduce new competitiveness and sustainable solutions into the global renewable energy market.

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

Collected: August 28, 2026 | Automated Research System (Gemini API)

#13 Monochrome Inc. to Conduct First Extreme Off-Grid Trial of Perovskite Solar Cells at Pakistan's K2 Base Camp

Published Published August 21, 2026　The Cool Down (via pv magazine)　パキスタン

OVERVIEW

Monochrome Inc. is launching a pioneering demonstration trial of perovskite solar cell technology at Pakistan's K2 base camp, an extreme high-altitude environment exceeding 5,150 meters. This project will rigorously evaluate the performance and long-term reliability of these next-generation solar panels under freezing temperatures, intense UV radiation, and complete off-grid conditions. The trial aims to validate perovskite technology's viability in one of Earth's most challenging climates, paving the way for wider remote and demanding power applications.

IN DEPTH

Background

Monochrome Inc. is embarking on a large-scale demonstration trial near Pakistan's K2 base camp in the Karakoram mountain range, the world's second-highest peak. This ambitious project aims to evaluate the potential of perovskite solar cell technology in one of Earth's most extreme environments. Situated at an altitude exceeding 5,150 meters, the K2 base camp region is characterized by severe climatic conditions: sub-zero temperatures, intensely strong solar radiation (including high UV exposure), and complete isolation from any existing power infrastructure. This trial offers a crucial opportunity to validate the durability and reliability of next-generation solar panels in such demanding settings.

Globally, reliable off-grid power solutions are vital for remote communities and critical specialized equipment, such as observation and communication facilities, situated far from established electricity grids. Traditional portable silicon solar cells have struggled with achieving both high efficiency and lightweight designs, and their reliability in extreme conditions has often proven insufficient. Perovskite solar cells, with their inherent superior characteristics, present a promising opportunity to revolutionize this off-grid market. Monochrome Inc.'s initiative underscores the transition of this technology from a laboratory breakthrough to a practical solution for real-world energy challenges.

Key Findings

Perovskite solar cells are distinguished by their lightweight, flexible, and potentially high-efficiency characteristics, making them ideal for deployment in locations where traditional rigid silicon solar cells are impractical. The K2 base camp trial will rigorously evaluate how these intrinsic properties perform under such exceptionally demanding environmental conditions:

- **Performance in Extreme Cold:** The trial will assess the ability of perovskite materials to maintain their electrical properties in sub-zero, high-altitude temperatures, as well as quantify degradation caused by repeated freeze-thaw cycles.

- **Resistance to High-Intensity UV Radiation:** Given the significantly higher ultraviolet (UV) radiation intensity at high altitudes compared to sea level, this test will precisely measure the perovskite layer's UV resistance and its impact on long-term performance stability.
- **Reliability as an Off-Grid Power Source:** Delivering consistent power in completely isolated environments, such as the K2 base camp, demands not only robust panels but also seamless integration with battery storage systems. This trial will verify the viability of perovskite solar cells as a reliable energy source for such remote and critical applications.

This demonstration is expected to yield invaluable data on 'long-term reliability and durability' – widely recognized as one of the most critical challenges hindering the broader commercialization of perovskite solar cells. The findings will be particularly significant for exploring their potential as independent, robust power sources for uncharted remote areas and crucial disaster relief operations. The insights gained from the K2 trial will be instrumental in refining perovskite material compositions, optimizing module designs, and developing international standards for practical deployment. Ultimately, its success could position perovskite solar cells as a leading and reliable option for extremely demanding applications, including off-grid power in remote or disaster-stricken regions, and even future space exploration, thereby significantly advancing global energy access.

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

Collected: August 28, 2026 | Automated Research System (Gemini API)

#14 Germany's HZB Develops Carborane-Based Electron Transport Material, Boosting Perovskite Solar Cell Efficiency by 2.4% Points and Resolving Stability Issues

Published August 21, 2026 Facebook (pveurope.eu) Germany

OVERVIEW

Researchers at Germany's Helmholtz-Zentrum Berlin (HZB) have developed a novel carborane-based electron transport material (ETM) that increases perovskite solar cell (PSC) efficiency by up to 2.4 percentage points. This material simultaneously resolves a long-standing stability issue in PSCs, significantly improving both device performance and lifetime. This breakthrough is critical for accelerating the commercialization of next-generation solar cell technology.

IN DEPTH

Key Findings

A research team at Germany's Helmholtz-Zentrum Berlin (HZB) has developed a new electron transport material (ETM) that dramatically enhances the performance and long-term stability of perovskite solar cells (PSCs). By introducing this innovative 'carborane-based' ETM, they not only succeeded in increasing the power conversion efficiency of PSCs by up to 2.4 percentage points but also simultaneously resolved one of the major stability issues that perovskite solar cells have faced for years on the path to practical implementation. This represents a significant breakthrough for the commercialization of next-generation solar cell technology.

Technical Details

The performance of perovskite solar cells depends not only on their constituent materials but also critically on the efficiency and stability of the charge transport layers. ETMs play a vital role in efficiently extracting electrons generated in the perovskite layer and transporting them to the electrode. Conventional ETMs have faced challenges such as low chemical stability and degradation at the interface with the perovskite layer. The main advantages of the carborane-based ETM developed by HZB are:

- **Efficiency Improvement:** The new ETM enhances electron extraction efficiency and transport speed, improving the device's photocurrent density and fill factor (FF), ultimately boosting overall power conversion efficiency by up to 2.4 percentage points. Although specific efficiency values are not provided, this improvement margin is very significant.
- **Significant Stability Enhancement:** Carborane compounds are known for their high chemical and thermal stability. Applying this property to ETMs allowed for a remarkable improvement in the device's long-term stability. This is crucial for effectively suppressing degradation caused by environmental factors such as moisture, oxygen, and heat, thereby extending the PSC's lifespan.
- **Optimized Interface Properties:** The new ETM forms a stable charge transport pathway at the interface with the perovskite layer, minimizing non-radiative recombination. This leads to improved overall device performance and reliability.

This development directly contributes to overcoming 'durability,' one of the biggest challenges for perovskite solar cells, and reduces barriers to their practical application.

Background & Context

Perovskite solar cells are considered a 'game-changer' in the renewable energy sector due to their potential for conversion efficiencies comparable to or exceeding silicon solar cells, along with expectations for low-cost manufacturing. However, long-term stability, understanding, and controlling material degradation mechanisms have been long-standing research challenges. Improvements in functional materials like ETMs are essential for enhancing the overall device performance. Progress in fundamental research at institutions like HZB plays a crucial role in solving the practical challenges faced by industry in commercialization.

Strategic Significance & Outlook

The development of carborane-based electron transport materials represents a major step towards the commercialization of perovskite solar cells. If stability issues are resolved, it opens the door for high-performance perovskite solar cells to be introduced into a wider range of applications (e.g., Building-Integrated Photovoltaics, flexible devices, off-grid power). As research progresses on the scalability and cost-effectiveness of this ETM, perovskite solar cells will gain even greater competitiveness in the global clean energy market and become an indispensable technology for accelerating the energy transition.

Source: https://www.facebook.com/pveurope/posts/researchers-at-helmholtz-zentrum-berlin-for-materials-and-energy-have-developed-/2147795312782652/

Collected: August 28, 2026 | Automated Research System (Gemini API)

#15 Tandem PV Secures $7.7M DOE Grant to Accelerate US Commercialization of 29.7% Efficient Perovskite-Silicon Tandem Solar Cells

Published August 26, 2026 PV Tech USA

OVERVIEW

Tandem PV, a California-based startup, has been awarded a $7.7 million grant from the U.S. Department of Energy's ARPA-E SCALEUP Ready program. This funding will expedite the commercial-scale production and domestic manufacturing of their high-efficiency perovskite-silicon tandem solar cell technology, which has achieved 29.7% conversion efficiency in internal testing. The company, already operating a 40MW commercial demonstration facility, also announced nearly $1 billion in letters of intent for uncertified panels, signaling strong market confidence.

IN DEPTH

Key Findings

Tandem PV has successfully secured a $7.7 million grant from the U.S. Department of Energy's (DOE) ARPA-E SCALEUP Ready program. This substantial funding is specifically earmarked to accelerate the commercial-scale production and bolster domestic manufacturing capabilities for their advanced perovskite-silicon tandem solar cell technology. The company has reported achieving an impressive 29.7% conversion efficiency in internal tests, marking a significant step forward in solar energy performance.

Technical / Clinical Details

The perovskite-silicon tandem solar cell technology developed by Tandem PV integrates a thin perovskite layer atop conventional silicon solar cells. This innovative architecture enables the cell to absorb a broader spectrum of sunlight more efficiently, leading to a substantial increase in overall conversion efficiency compared to single-junction cells. Tandem PV is already operating a 40MW commercial demonstration facility, underscoring its readiness for scaled production. The DOE grant will be crucial for transitioning from pilot-scale production to full commercial manufacturing. Furthermore, the company has announced that it holds approximately $1 billion in letters of intent for uncertified panels, which points to robust market demand and investor confidence in their technology's potential.

Background & Context

As the global push for renewable energy intensifies, the quest for higher efficiency and lower cost in solar photovoltaic (PV) technology remains paramount. Perovskite solar cells have emerged as a frontrunner in next-generation PV due to their high power conversion efficiencies and potential for low-cost manufacturing processes. Tandem configurations, which combine perovskites with established silicon technology, are particularly promising as they leverage existing infrastructure while dramatically boosting performance. The U.S. government, through initiatives like the DOE's ARPA-E program, is actively investing in domestic clean energy manufacturing to enhance national energy independence and competitiveness in the global clean energy market.

Strategic Significance & Outlook

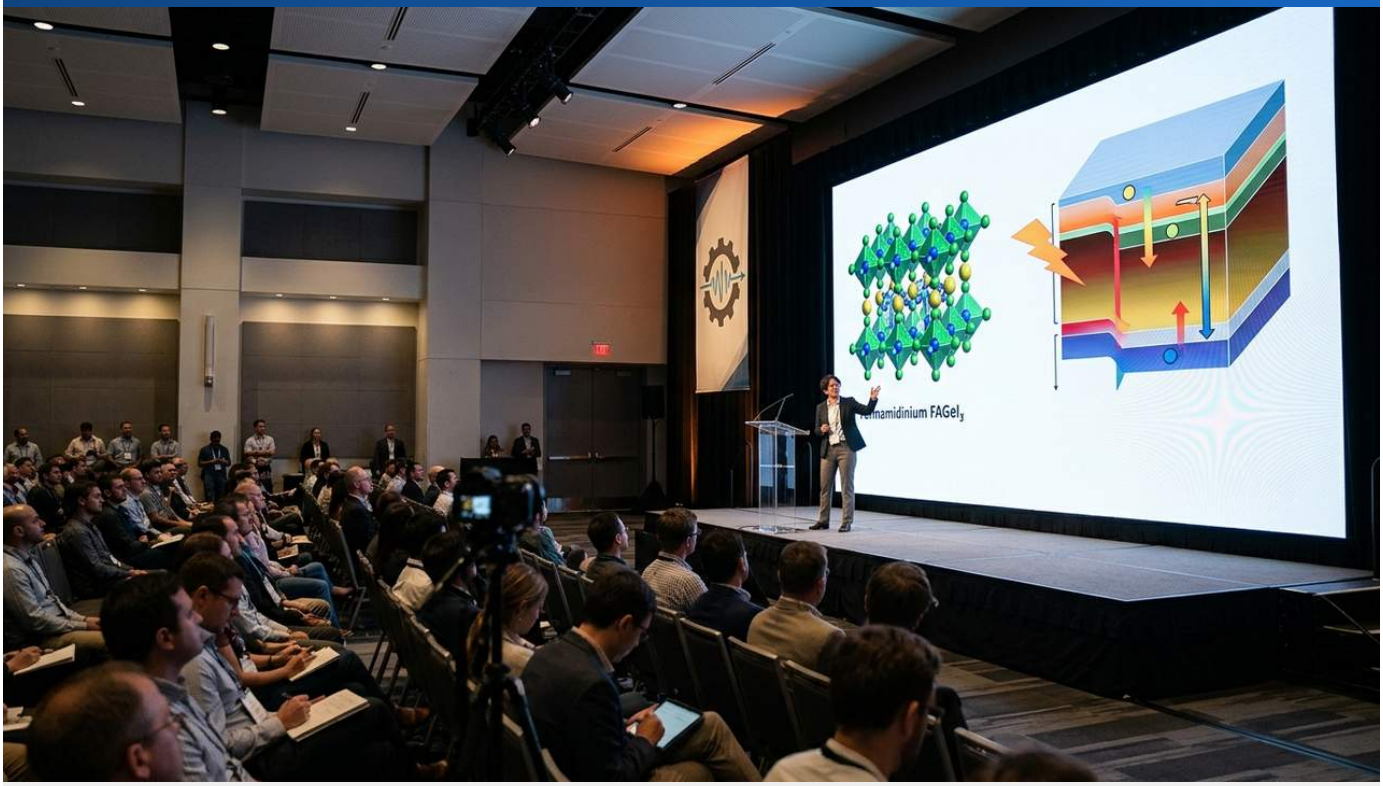
This grant is a pivotal moment for Tandem PV, enabling them to scale up production and strengthen their position in the rapidly expanding U.S. solar market. The successful commercialization of high-efficiency perovskite-silicon tandem cells could lead to more affordable and sustainable solar energy solutions, contributing significantly to reduced energy costs and accelerated climate change mitigation efforts. As Tandem PV's technology gains broader adoption, it is expected to spur further innovation across the solar industry and play a crucial role in driving the global energy transition.

Source: https://www.pv-tech.org/tandem-pv-doe-grant-commercialisation-perovskite/

Collected: August 28, 2026 | Automated Research System (Gemini API)

#16 SPIE Conference Unveils Breakthroughs in Lead-Free $FAGeI_3$ Perovskites and High-Efficiency Wide Bandgap Perovskite Solar Cells

Published August 24, 2026 SPIE International



OVERVIEW

The 'Organic, Hybrid, and Perovskite Photovoltaics XXVII' conference, held from August 24-26, 2026, highlighted significant advancements in perovskite material science. Key discussions included a novel absorber technology for lead-free PV using $FAGeI_3$ perovskite and surface reconstruction methods to enhance high-efficiency wide bandgap perovskite solar cells. These developments signify a deepening of fundamental research aimed at achieving more sustainable and higher-performing perovskite solar technologies, marking crucial steps towards their widespread adoption.

IN DEPTH

Key Findings

The 'Organic, Hybrid, and Perovskite Photovoltaics XXVII' conference, held from August 24 to 26, 2026, served as a platform for announcing two pivotal breakthroughs in the material science and device physics of perovskite solar cells. One significant development involved a novel absorber material for lead-free photovoltaics utilizing $FAGeI_3$ perovskite. Concurrently, researchers discussed advanced surface reconstruction methods aimed at significantly enhancing the performance of high-efficiency wide bandgap perovskite solar cells.

Technical / Clinical Details

The pursuit of lead-free perovskite solar cells is driven by urgent environmental concerns regarding lead toxicity in conventional perovskite formulations. The presented $FAGeI_3$ perovskite, a combination of formamidinium (FA) and germanium iodide (GeI_3), represents a promising new absorber material that exhibits excellent optoelectronic properties while entirely avoiding lead. This advancement is crucial for developing more environmentally benign and sustainable solar cell technologies. Additionally, wide bandgap perovskite solar cells are critical components for high-efficiency tandem and multi-junction solar cells, typically serving as the top cell. The discussed surface reconstruction methods are designed to optimize charge carrier transport and reduce recombination losses, thereby boosting the overall power conversion efficiency. These technical refinements are essential for pushing the performance limits of perovskite solar cells and unlocking new application areas.

Background & Context

Perovskite solar cells are recognized as a leading contender for next-generation photovoltaics due to their high power conversion efficiencies and potential for low-cost, versatile manufacturing. However, environmental concerns associated with lead content and challenges related to long-term stability remain significant hurdles. Research into lead-free alternatives is therefore paramount for enhancing market acceptance, particularly as environmental regulations become more stringent. Improving the efficiency of wide bandgap materials is also key to maximizing the overall efficiency of tandem solar cells. The presentations at this conference underscore the academic community's focused efforts on these fundamental and critical challenges, which will likely have a profound impact on the future commercialization roadmap.

Strategic Significance & Outlook

The development of lead-free perovskites will significantly improve the environmental profile of perovskite solar cells, fostering broader adoption in various markets, including building-integrated photovoltaics (BIPV) and portable electronics where human contact is more frequent. The enhanced efficiency of wide bandgap perovskites promises to contribute to new world records for tandem solar cells, further driving down the levelized cost of solar electricity. These advancements offer researchers, engineers, and investors a compelling reason to re-evaluate the future viability and market potential of perovskite technology, pushing towards a more sustainable and efficient global energy landscape.

Source: https://spie.org/OP26P/conferencedetails/ohpvs

#17 Osaka University Boosts Perovskite Solar Cell Performance with Chiral Hole Transport Materials, Achieving 60% Spin Polarization

Published August 27, 2026 EurekAlert! Japan

OVERVIEW

Researchers at Osaka University have developed chiral hole transport materials (HTMs) based on a double-sided IDT structure, significantly improving perovskite solar cell performance. This groundbreaking work reveals a direct correlation between molecular chirality and electron spin, presenting a novel mechanism for enhanced charge transport efficiency. Utilizing the new HTMs, spin polarization reached up to 60%, suppressing charge recombination and boosting overall solar cell efficiency, opening new avenues for HTM design.

IN DEPTH

Key Findings

A research team at Osaka University has made a significant advancement in perovskite solar cell technology by developing novel chiral hole transport materials (HTMs) based on a double-sided IDT structure. This groundbreaking research not only improved charge transport efficiency but also demonstrated, for the first time, a direct link between molecular chirality and electron spin. By achieving up to 60% spin polarization, the developed HTM effectively suppresses charge carrier recombination, leading to an overall enhancement in solar cell performance.

Technical / Clinical Details

The newly developed chiral HTM possesses an asymmetric molecular structure that selectively promotes specific electron spin directions during charge carrier transport, a phenomenon known as spin polarization. When integrated into the hole transport layer of perovskite solar cells, the researchers confirmed spin polarization reaching up to 60%. This high degree of spin polarization is critical because it disrupts spin-selective recombination pathways between electrons and holes within the device, thereby extending the lifetime of charge carriers. Consequently, a greater number of charge carriers can reach the electrodes, leading to improved current density and open-circuit voltage, ultimately boosting the power conversion efficiency of the solar cell. This technology introduces a fundamentally new charge transport mechanism not achievable with conventional inorganic or non-chiral organic HTMs.

Background & Context

For perovskite solar cells to achieve higher performance, it is crucial not only to maximize charge generation efficiency but also to optimize charge transport and minimize recombination losses. Hole transport materials are key components responsible for efficiently extracting holes generated in the perovskite layer and preventing their recombination. Prior research on HTMs primarily focused on energy level alignment and mobility. Osaka University's work introduces a novel perspective by demonstrating the influence of 'spin' and chirality on charge transport. This exemplifies how a deeper understanding of fundamental science can directly translate into practical device performance improvements, highlighting the significant contributions of Japanese research institutions in this field.

Strategic Significance & Outlook

The development of this chiral HTM holds the potential to introduce a new paradigm in the design of perovskite solar cells. Optimizing charge transport through spin polarization control could not only contribute to further increases in current conversion efficiencies but also pave the way for achieving performances closer to theoretical efficiency limits. In the future, this technology might become a critical performance metric for perovskite solar cells in commercial applications, alongside durability and cost-effectiveness. Researchers and engineers will be keenly interested in further verifying the scalability of this new HTM for large-scale production and its long-term stability. This represents an important step towards the next evolution of photovoltaic technology.

Source: https://www.eurekalert.org/news-releases/1141670

#18 GCL Perovskite Leads Standardization of Space-Grade Perovskite Modules, Closes Over RMB 100M Series D1 Funding

Published August 26, 2026 China Solar PV News Snippets China

OVERVIEW

GCL Perovskite is spearheading the drafting of a group standard for single-junction perovskite solar cell modules for space applications, accelerating the industrialization of this technology. This standardization effort aims to streamline the transition from technical verification to industrial-scale deployment. Concurrently, the company successfully completed a Series D1 funding round exceeding RMB 100 million (approximately $20 million USD) from institutional investors, including Jinxin Capital, establishing a strong foundation for future R&D and production capacity expansion.

IN DEPTH

Key Findings

GCL Perovskite has taken a leading role in drafting a group standard for single-junction perovskite solar cell modules specifically designed for space applications, thereby paving the way for the standardized industrial application of this innovative technology. Concurrently, the company successfully completed a Series D1 funding round, securing over RMB 100 million (approximately $20 million USD) from institutional investors, including Jinxin Capital, establishing a robust financial foundation for its future expansion efforts.

Technical / Clinical Details

Solar cells used in space environments must meet exceptionally stringent requirements for reliability and durability, enduring harsh conditions such as extreme temperature fluctuations, intense radiation, and vacuum. The group standard spearheaded by GCL Perovskite aims to establish precise technical specifications, testing methodologies, and quality benchmarks for single-junction perovskite solar cell modules that can withstand these severe demands. This standardization is expected to guarantee the reliability of perovskite solar cells for space applications, thereby accelerating their practical deployment. The recent funding of over RMB 100 million is anticipated to be directly allocated towards advancing this standardization effort, strengthening research and development, and expanding future production capacities for space-grade perovskite solar modules. This signifies a growing recognition of perovskite technology's value, even in highly demanding sectors like the space industry.

Background & Context

Perovskite solar cells, with their high conversion efficiency, lightweight nature, and flexibility, hold immense potential not only for terrestrial applications but also for space. Their use as power sources for spacecraft and satellites could contribute significantly to reducing launch costs and stabilizing power supply in orbit. However, as a nascent technology, the absence of established standards to assure their reliability and durability has been a major hurdle. GCL Perovskite's standardization initiative is a critical step towards overcoming this challenge, facilitating the seamless integration of perovskite solar cells into the space industry's supply chain. Furthermore, the substantial funding round indicates that investors are keenly aware of the future prospects of perovskite technology, particularly its potential profitability in niche, high-value markets.

Strategic Significance & Outlook

The standardization of space-grade perovskite solar cell modules, coupled with GCL Perovskite's successful funding, positions the company as a key player in the nascent space solar cell market. This standard will serve as a crucial guideline for other companies developing and manufacturing perovskite solar cells for extraterrestrial applications, thereby fostering the overall development of the industry. In the long term, this technology could contribute to the realization of lighter and higher-performance spacecraft and satellites, potentially revolutionizing areas such as space exploration and satellite communications. For investors, the focus will be on the revenue generation potential of this technology within the growing space industry, while engineers will critically assess the performance and reliability of standardized products.

Source: https://taiyangnews.info/markets/china-solar-pv-news-snippets-august-26-2026

Collected: August 28, 2026 | Automated Research System (Gemini API)

#19 Mitsubishi Gas Chemical Selected for Niigata City Perovskite IoT Device Demo at Ice Arena, Advancing Low-Light Applications

Published August 26, 2026 IBTimes JP Japan

OVERVIEW

Mitsubishi Gas Chemical has been selected for a Niigata City grant program supporting perovskite solar cell and related technology demonstration projects. Collaborating with EneCoat Technologies and Scholars Co., the company will test self-powered IoT devices integrating high-performance polycarbonate components at the unique Niigata City Ice Arena. This project aims to validate the practicality of perovskite solar cells as sustainable power sources in low-light, low-temperature indoor environments, representing a groundbreaking effort towards battery-free IoT devices.

IN DEPTH

Key Findings

Mitsubishi Gas Chemical has been successfully selected for a grant program under Niigata City's demonstration project for perovskite solar cells and related technologies. This initiative will see Mitsubishi Gas Chemical, in collaboration with EneCoat Technologies and Scholars Co., commence a pilot test of self-powered IoT devices integrating high-performance polycarbonate components at the Niigata City Ice Arena. The project is designed to explore the feasibility of perovskite solar cells as sustainable power sources in challenging low-light and low-temperature indoor environments, promising a significant step towards battery-free IoT solutions.

Technical / Clinical Details

The perovskite solar cells demonstrated in this project will leverage their unique ability to maintain high power generation efficiency even under low-light conditions, making them ideal for powering indoor IoT devices. Mitsubishi Gas Chemical will contribute its expertise in manufacturing high-performance polycarbonate components, essential for developing lightweight and durable solar cell modules. EneCoat Technologies will provide the core perovskite solar cell manufacturing technology, while Scholars Co. will be responsible for the IoT devices and system integration. The specific environment of the Niigata City Ice Arena, characterized by consistently low temperatures and low light, offers an ideal setting to rigorously evaluate the real-world performance and reliability of perovskite solar cells. Data collected from this demonstration will provide crucial insights for realizing sustainable, battery-free IoT devices powered by perovskite technology.

Background & Context

The proliferation of IoT devices has brought to the forefront challenges related to their power supply. Traditional battery-powered solutions often entail high operational costs and environmental burdens due to the need for regular replacement or recharging. Perovskite solar cells, with their superior light absorption characteristics and ability to generate power even in low-light environments, are seen as a key to resolving these issues. Their particular ability to generate electricity from weak indoor light makes self-powered systems feasible for a diverse range of IoT applications in offices, factories, and public facilities. The Japanese government and local authorities are actively supporting the practical application of renewable energy technologies, and Niigata City's project contributes to both regional industrial promotion and the achievement of a decarbonized society.

Strategic Significance & Outlook

The success of the Niigata City demonstration project will validate the capability of perovskite solar cells to serve as sustainable power sources for IoT devices in low-light, low-temperature environments, opening doors for widespread application. This is expected to accelerate the adoption of battery-free IoT devices across various sectors, including smart cities, smart agriculture, and environmental monitoring. Investors will be keen to observe the revenue opportunities perovskite solar cells create in this new market segment, while engineers will show significant interest in detailed data regarding durability, maintainability, and cost-effectiveness in real-world operating conditions. This project holds the potential to become a tangible example of how advanced Japanese technology contributes to solving societal challenges.

Source: https://jp.ibtimes.com/mitsubishi-gas-chemical-wins-niigata-perovskite-solar-cell-project-104000

Collected: August 28, 2026 | Automated Research System (Gemini API)

#20 Lead Leakage from Damaged Laminated Perovskite Solar Cells Reduced to 0.07% Over 9 Months, Indicating Enhanced Safety

Published August 26, 2026 Energies Media Switzerland

OVERVIEW

A Swiss study revealed that lead leakage from a hail-damaged, roof-mounted perovskite solar cell module was remarkably low, at just 0.07% over nine months. This figure represents a significant improvement compared to the 4.81% lead release from unlaminated laboratory devices tested under similar conditions, indicating substantial progress in lead containment strategies for perovskite solar cells. This finding addresses environmental safety concerns and marks a crucial step towards commercialization.

IN DEPTH

Key Findings

Groundbreaking research conducted in Switzerland has demonstrated that lead leakage from a roof-mounted, laminated perovskite solar cell module damaged by hail was exceptionally low, registering just 0.07% over a nine-month observation period. This result represents a dramatic improvement compared to the 4.81% lead release from unlaminated laboratory devices tested under identical conditions, strongly indicating significant advancements in the environmental safety of perovskite solar cells.

Technical / Clinical Details

The study focused on a perovskite solar cell module that was actually installed on a roof in Switzerland and subsequently subjected to hail damage. The measured lead leakage of 0.07% suggests that the release of lead into the environment, even under physically damaged conditions, is effectively suppressed by advanced lamination (encapsulation) technologies. These encapsulation techniques are designed not only to protect the perovskite material from degradation due to moisture and air but also to minimize the outflow of hazardous substances in the event of physical damage. When contrasted with the high leakage rate of 4.81% observed in earlier unlaminated laboratory devices, it becomes clear that lead containment technologies in laminated, commercial-grade modules have undergone a significant leap forward. This effectively demonstrates that concerns regarding the environmental impact of lead can be substantially mitigated through robust technical solutions.

Background & Context

Perovskite solar cells hold immense promise as a next-generation photovoltaic technology due to their high power conversion efficiency and potential for low-cost manufacturing. However, the toxicity of lead, a key constituent in many perovskite formulations, has been a primary concern. This has driven extensive research into lead-free perovskites, while simultaneously making the development of stringent containment technologies for lead-containing perovskites indispensable. The findings of this study reinforce confidence within the industry that even existing lead-containing perovskite solar cells can have their environmental risks effectively managed through appropriate design and manufacturing processes, thus bolstering their path to commercialization.

Strategic Significance & Outlook

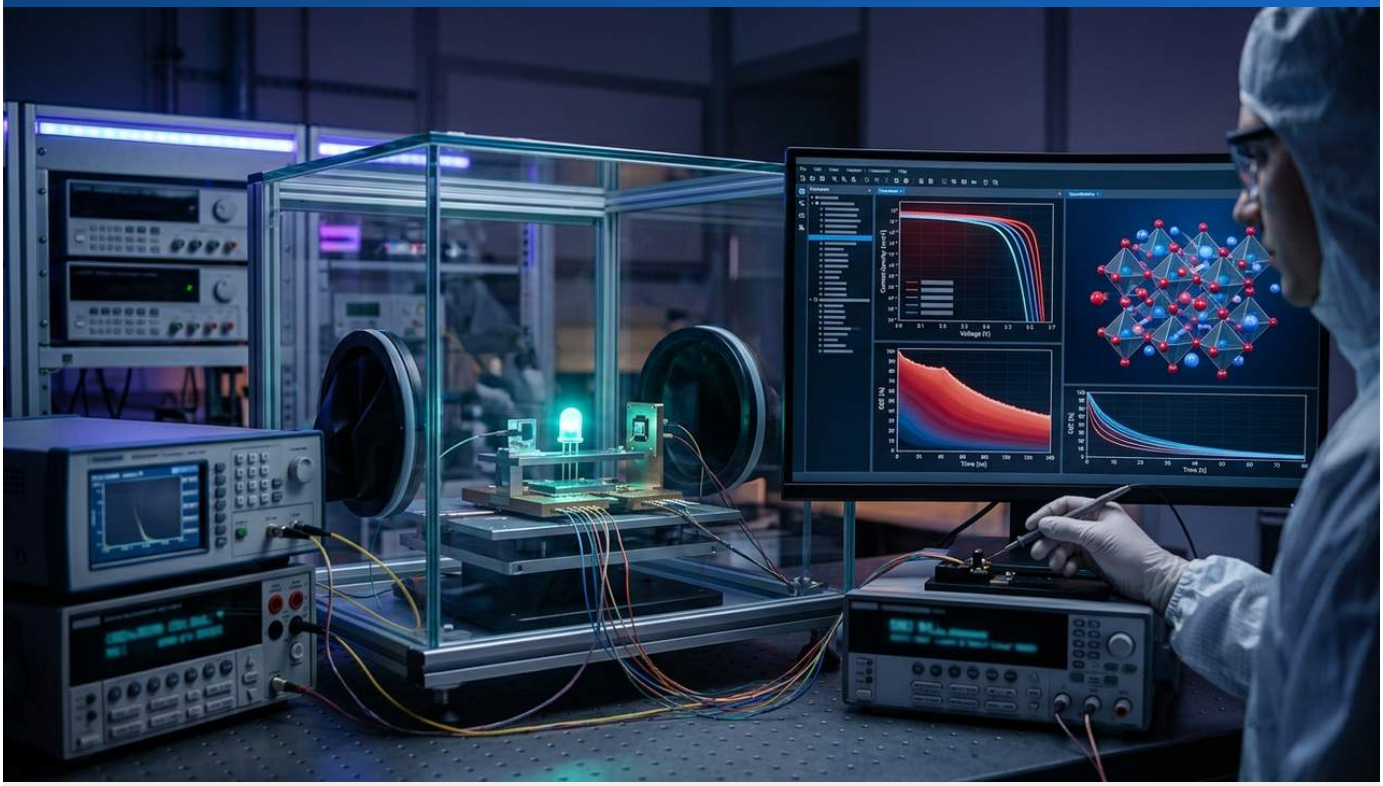
This research demonstrating significantly reduced lead leakage is critically important for allaying environmental safety concerns and promoting wider market adoption of perovskite solar cells. Safety is a paramount selection criterion, particularly when considering installations in residential and public areas, such as in building-integrated photovoltaics (BIPV). This technical advancement could positively influence regulatory approval processes, potentially accelerating the market introduction of perovskite solar cells. For investors and policymakers, this data provides compelling justification for continued investment and support in perovskite technology, paving the way for more sustainable and high-performance solar energy solutions in the future.

Source: https://energiesmedia.com/built-harvest-light-record-efficiency-perovskite/

Collected: August 28, 2026 | Automated Research System (Gemini API)

#21 ACS Energy Letters Deciphers Electro-Ionic Interplay in Perovskite LED Degradation, Noting Bias-Dependent Instability Despite 20.0% Initial EQEmax

Published August 27, 2026 ACS Energy Letters International



OVERVIEW

A study published in ACS Energy Letters elucidated the complex role of electro-ionic interplay in perovskite LED (PeLED) degradation mechanisms. Despite achieving a high initial external quantum efficiency (EQEmax) of 20.0%, the devices exhibited bias-dependent operational instability with reported half-lives ranging from minutes to hours, strongly correlating with current injection levels. This research provides crucial insights into PeLED long-term stability and will guide future design improvements for high-performance devices.

IN DEPTH

Key Findings

A recent study published in ACS Energy Letters has meticulously unraveled the complex mechanisms of electro-ionic interplay driving degradation in perovskite light-emitting diodes (PeLEDs). While the research reported PeLED devices achieving a remarkably high initial external quantum efficiency (EQEmax) of 20.0%, it simultaneously highlighted a significant operational instability that is highly dependent on the current injection level, with observed half-lives ranging from mere minutes to several hours.

Technical / Clinical Details

The study demonstrated that PeLED degradation is driven by a complex interplay of electrical stress and ion migration. Despite their excellent emissive properties, making PeLEDs promising for next-generation displays and lighting, long-term stability remains a major challenge. The reported devices exhibited high initial performance, with an EQEmax of 20.0% for blue emission, but suffered from rapid performance decline under continuous current injection. Specifically, bias-dependent operational instability was observed; for example, at low current densities, the half-life was several hours, whereas at high current densities, it shortened to just a few minutes. This instability is attributed to the interaction between charge carriers and ions, particularly the migration of halide ions within the perovskite layer, which is accelerated by the electric field. This migration leads to changes in the material structure and an increase in non-radiative recombination pathways. The research provides a deep analysis of how these ion movements contribute to device degradation, offering critical design guidelines for improving PeLED stability.

Background & Context

Perovskite LEDs are gaining significant attention as a potential next-generation light source to replace or complement organic LEDs (OLEDs), thanks to their advantages such as high color purity, wide color gamut, and low-cost manufacturing potential. However, the greatest barrier to commercialization has been achieving both high luminous efficiency and long-term stability. Understanding the degradation mechanisms during operation is essential for optimizing device design. Previous studies primarily focused on external factors like moisture, oxygen, and heat, but this research delves into the fundamental mechanism of internal electro-ionic interplay, shedding light on its complex role. This represents a crucial advancement in deepening the fundamental scientific understanding essential for the progress of PeLED technology.

Strategic Significance & Outlook

The elucidated relationship between electro-ionic interplay and PeLED degradation will guide new design strategies for enhancing device stability. Researchers and engineers will now focus on exploring materials that suppress ion migration, refining device architectures, or optimizing operating conditions to significantly improve the long-term stability of PeLEDs. This is expected to enable high-performance, high-stability PeLEDs that are comparable to or even surpass currently commercialized OLEDs, accelerating their commercial deployment across a wide range of applications, including displays, lighting, and even optical communications. Investors are keenly watching whether this technology can establish long-term reliability and ultimately gain market competitiveness.

Source: https://pubs.acs.org/aelccp/article/doi/10.1021/acsenergylett.6c01829/5329796/Disentangling-the-Electro-Ionic-Interplay-in

#22 Perovskite Connect 2026 Conference Spotlights Reliability Testing, Tandem Mismatch Mitigation, and 96% Recovery Recycling for Perovskite Solar Cells

Published August 27, 2026 Perovskite-Info International

OVERVIEW

A preview of the Perovskite Connect 2026 conference, scheduled for October, highlighted key focuses for perovskite solar cell commercialization. Presentations will include CubicPV's reliability assessment via multi-factor accelerated stress testing and SolarEdge's MLPE-driven mismatch loss mitigation for tandem modules. Eternal Sun will showcase stability testing technologies for commercial perovskite PV, while Germany's ZSW will unveil an industrial-scale recycling process capable of recovering over 96% of perovskite materials, underscoring comprehensive efforts towards durability, efficiency, and sustainability.

IN DEPTH

Key Findings

A preview of the upcoming 'Perovskite Connect 2026' conference, scheduled for October, has unveiled a multifaceted approach aimed at accelerating the commercialization of perovskite solar cells. Noteworthy presentations include CubicPV's comprehensive reliability assessment methodology using multi-factor accelerated stress testing (MFAST), SolarEdge's strategies for mitigating mismatch losses in tandem modules through Module-Level Power Electronics (MLPE), and an industrial-scale recycling process from Germany's ZSW promising over 96% material recovery from perovskite solar cells.

Technical / Clinical Details

CubicPV will present its robust approach to reliability assessment, essential for guaranteeing the long-term performance of perovskite solar cells. Their method, utilizing Multi-Factor Accelerated Stress Testing (MFAST), allows for accelerated prediction of degradation behavior under real-world environmental conditions. SolarEdge will detail how its MLPE technology can effectively manage and maximize energy yield from tandem modules, addressing common mismatch losses that can occur between sub-cells. Eternal Sun is slated to introduce its latest solar simulation technology, enabling rigorous stability testing for commercial-grade perovskite PV modules. Furthermore, Germany's ZSW will unveil a groundbreaking recycling process designed to reduce environmental impact and enhance resource efficiency. This industrial-scale technology is capable of recovering over 96% of high-purity perovskite materials from end-of-life solar cells, marking a significant step towards establishing a sustainable supply chain.

Background & Context

While perovskite solar cells offer high power conversion efficiencies and the potential for low-cost manufacturing, their long-term reliability, performance uniformity in large-scale production, and overall environmental sustainability throughout their lifecycle remain key challenges for commercialization. The presentations at this upcoming conference directly address these critical issues. Reliability assessment is indispensable for product warranties and market acceptance, and MLPE is crucial for managing the complex characteristics of tandem solar cells. Furthermore, recycling technology is an essential component for alleviating environmental concerns, particularly regarding heavy metals like lead contained in some perovskite materials, and contributing to a circular economy.

Strategic Significance & Outlook

The technical advancements to be presented at the Perovskite Connect 2026 conference signify the increasing maturity of the perovskite solar cell ecosystem for commercial deployment. The standardization of reliability assessment methodologies, effective mitigation of mismatch losses, and the establishment of high-efficiency recycling processes will create an environment where investors can anticipate long-term returns and engineers can design and manufacture more robust and sustainable products. These initiatives represent crucial steps for perovskite solar cells to gain competitiveness in the existing solar PV market and become an indispensable component of the future energy mix.

Source: https://www.perovskite-info.com/glimpse-perovskite-connect-2026-testing-reliability-and-sustainability-road

Collected: August 28, 2026 | Automated Research System (Gemini API)

#23 ART-PV India Achieves 29.8% Efficiency with Perovskite-Silicon-CdTe Triple-Junction Tandem Solar Cells

Published August 27, 2026 YourStory India

OVERVIEW

ART-PV India, an IIT Bombay-incubated startup, has developed an innovative two-terminal monolithic tandem cell combining perovskite, silicon, and CdTe, achieving a 29.8% conversion efficiency in laboratory settings. This technology aims to surpass the physical limits of single-material cells while maintaining high compatibility with existing photovoltaic systems, presenting significant potential for next-generation solar cell technology. This achievement highlights India's position at the forefront of solar energy innovation.

IN DEPTH

Key Findings

ART-PV India, a startup incubated at IIT Bombay, has achieved a remarkable 29.8% conversion efficiency in laboratory tests with its innovative two-terminal monolithic tandem solar cell. This groundbreaking device combines three distinct semiconductor materials: perovskite, silicon, and Cadmium Telluride (CdTe), signifying a major step forward in high-efficiency photovoltaic technology.

Technical / Clinical Details

The 2-terminal monolithic tandem cell developed by ART-PV India utilizes multiple layers of materials with different bandgaps to efficiently absorb a broader spectrum of sunlight. In this design, a high-efficiency perovskite layer is placed on top, followed by a silicon layer, and then a CdTe layer. This configuration allows each material to capture light at the wavelengths it absorbs most effectively. By doing so, the technology aims to overcome the physical conversion efficiency limits (Shockley-Queisser limit) of single-material cells, significantly boosting theoretical efficiency. The achieved 29.8% conversion efficiency substantially surpasses the efficiency of many current commercial silicon solar cells, indicating broad applicability from large-scale solar farms to residential panels. A key aspect of this technology's design is its emphasis on high compatibility with existing photovoltaic infrastructure, which lowers adoption barriers and enhances its market potential.

Background & Context

Reducing costs and improving the performance of solar power are primary drivers for the global energy transition. Tandem solar cells are one of the most promising approaches to surpass the physical limits of single-junction devices, leading to intense research and development efforts worldwide. While perovskite-silicon two-layer tandems have been prevalent, ART-PV India's three-layer composite structure—perovskite, silicon, and CdTe—represents a novel direction aimed at achieving even higher efficiencies. For countries like India, which are experiencing rapidly increasing energy demands, the development of such high-efficiency solar cell technologies holds strategic significance, directly contributing to energy independence and reduction of greenhouse gas emissions.

Strategic Significance & Outlook

ART-PV India's achievement of 29.8% efficiency in its tandem cell holds the potential to set a new performance benchmark for the solar photovoltaic industry. If this technology can be mass-produced at a commercial scale, it will further drive down the cost of solar electricity and accelerate its widespread adoption. Investors will closely monitor how effectively this technology can be scaled from laboratory achievements to large-scale production and whether it can establish long-term stability and cost competitiveness. For engineers, the reliability and manufacturing process of this complex tandem structure will be key focus areas, with future expectations for its integration into repowering existing solar PV systems and deployment in new, high-performance installation projects.

Source: https://yourstory.com/2026/08/art-pv-tandem-solar-cells

Collected: August 28, 2026 | Automated Research System (Gemini API)

#24 Swift Solar Secures $27M Series A to Accelerate Commercialization of High-Efficiency Lightweight Perovskite Solar Panels

Published August 20, 2026 Energy.Media USA

OVERVIEW

Swift Solar has successfully closed a $27 million Series A funding round, earmarked to accelerate the development and commercialization of its high-efficiency, lightweight, and flexible perovskite solar panels. This capital infusion will significantly bolster the company's manufacturing capabilities and expedite market entry for its innovative perovskite technology. The successful funding round underscores robust investor confidence in next-generation solar technologies and the transformative potential of perovskites in the renewable energy sector.

IN DEPTH

Key Findings

Swift Solar has successfully raised $27 million in its latest Series A funding round, a significant financial injection poised to accelerate the development and commercialization of its high-efficiency perovskite solar panel technology. This capital will be instrumental in scaling up production and bringing their innovative, lightweight, and flexible solar solutions to market, marking a pivotal moment in the company's growth trajectory and the broader perovskite solar industry.

Technical Details

Swift Solar's perovskite technology distinguishes itself through superior power conversion efficiency coupled with lightweight and flexible form factors, addressing limitations of traditional silicon-based photovoltaics. This makes their technology uniquely suited for niche applications such as aerospace, unmanned aerial vehicles (UAVs), portable power solutions, and integration into curved architectural surfaces. The company is focused on optimizing material formulations and scalable manufacturing processes to ensure not only high performance but also long-term stability and cost-effectiveness. The advanced fabrication techniques employed aim to reduce manufacturing complexity and material waste, making their perovskite panels a compelling alternative for next-generation solar energy harvesting.

Background and Context

The global demand for sustainable energy solutions continues to intensify, placing immense pressure on the development of highly efficient and cost-effective renewable energy technologies. Perovskite solar cells have emerged as a leading contender due to their promising efficiency gains and lower manufacturing thresholds compared to crystalline silicon. Swift Solar's successful Series A funding round reflects a strong venture capital appetite for innovative clean energy technologies and validates the market's belief in perovskites' disruptive potential. As research institutions and companies worldwide race to commercialize perovskite technology, Swift Solar's ability to secure substantial funding positions it favorably in the competitive landscape, signaling confidence in their specific approach and product roadmap.

Strategic Significance and Outlook

With this $27 million investment, Swift Solar plans to expand its research and development initiatives, scale up its pilot production facilities, and prepare for initial product launches. The company anticipates introducing its first commercial products to market within the next few years, promising to deliver novel value propositions to the solar energy sector. The lightweight and flexible nature of Swift Solar's perovskite panels will enable deployment in locations previously inaccessible to conventional solar technology, contributing to new energy solutions for smart cities, electric vehicles, and off-grid applications. This advancement could unlock significant market opportunities and accelerate the global transition to a more decentralized and adaptable renewable energy infrastructure.

Source: https://energy.media/energy-deals/swift-solar-raises-27m-in-series-a/

Collected: August 28, 2026 | Automated Research System (Gemini API)

#25 GCL Perovskite Leads Standardization for Space-Grade Single-Junction Perovskite PV Modules, Achieves 18.04% Efficiency and IEC Certification

Published August 28, 2026 Perovskite-Info China

OVERVIEW

GCL Perovskite is leading the formulation of group standards for single-junction perovskite solar modules specifically for space applications, aiming to bridge the gap from technical verification to standardized industrial deployment. The company has demonstrated its technological robustness by achieving 18.04% module efficiency and securing certification in three IEC accelerated aging tests. This standardization effort is a crucial step towards establishing technical requirements and testing methodologies for perovskite modules in space, accelerating their adoption in the aerospace industry.

IN DEPTH

Key Findings

GCL Perovskite (GCL Photoelectric Materials) is spearheading the development of group standards for single-junction perovskite solar modules tailored for space applications. This initiative is designed to facilitate the transition from technical verification to standardized industrial-scale applications, marking a significant milestone for the practical implementation of perovskite solar cells in space. The company has demonstrated a robust 18.04% power conversion efficiency for its single-junction perovskite modules and has secured certification in three IEC accelerated aging tests, validating their high reliability and performance under simulated extreme conditions.

Technical Details

The proposed standards will explicitly define the technical requirements and testing methodologies for single-junction perovskite modules operating in the extremely harsh space environment. This is expected to include criteria for radiation tolerance, thermal cycling stability, and performance in vacuum. The 18.04% module efficiency achieved by GCL Perovskite represents a high benchmark for a single-junction architecture, significantly enhancing the viability of perovskite cells as primary power sources for spacecraft and satellites. The successful completion of three IEC accelerated aging tests further underscores the long-term reliability and durability of these modules, critical factors directly impacting the operational lifespan and stability of equipment on space missions.

Background and Context

The aerospace industry consistently seeks lightweight, high-efficiency power systems. While conventional silicon solar cells offer proven reliability, they present limitations in terms of weight and flexibility. Perovskite solar cells, with their high power conversion efficiency, inherent lightness, flexibility, and potential for reduced manufacturing costs, have been identified as a promising next-generation solution for space photovoltaics. GCL Perovskite's leadership in establishing these standards will lay the groundwork for the systematic integration of this novel technology into the space industry, aiming to ensure consistent quality and performance across the supply chain. This move is expected to accelerate advancements in space technology and enable the development of more affordable and higher-performing satellites.

Strategic Significance and Outlook

This standardization effort by GCL Perovskite signifies a clear pathway for perovskite solar cells to be extensively utilized not only on Earth but also in extraterrestrial environments. The initiative is anticipated to foster new competition and technological innovation within the space power market. Looking ahead, the development of even more efficient and longer-lasting perovskite modules could enable more ambitious space missions, such as lunar bases or Mars exploration. Furthermore, success in space applications will positively influence the reliability assessment of perovskite solar cells for terrestrial uses, potentially accelerating their global adoption and market penetration.

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

Collected: August 28, 2026 | Automated Research System (Gemini API)

#26 German Researchers Achieve 27.3% Efficiency in Solvent-Free Perovskite-Silicon Tandem Solar Cell with Exceptional 6,800-Hour Stability

Published August 28, 2026 PV Magazine Germany

OVERVIEW

German researchers have developed a completely solvent-free perovskite-silicon tandem solar cell using sequential vapor deposition, achieving a power conversion efficiency of 27.3%. This innovative manufacturing process significantly reduces environmental impact and demonstrates remarkable stability, retaining 97.06% of its initial efficiency after 6,800 hours of dark storage under a nitrogen atmosphere. The breakthrough centers on industrially viable, solvent-free processes like Physical Vapor Deposition (PVD) for perovskite layer fabrication, marking a critical step towards large-scale commercialization.

IN DEPTH

Key Findings

Researchers in Germany have developed a perovskite-silicon tandem solar cell fabricated entirely without solvents, utilizing sequential vapor deposition, including Physical Vapor Deposition (PVD). This novel cell not only achieved a remarkable power conversion efficiency of 27.3% but also demonstrated exceptional stability, retaining 97.06% of its initial efficiency after 6,800 hours of dark storage under a nitrogen atmosphere. This breakthrough underscores the strong potential for environmentally friendly and industrially scalable manufacturing processes for next-generation solar cells.

Technical Details

The core of this breakthrough lies in the solvent-free sequential vapor deposition approach for fabricating the perovskite layer. This method involves the PVD of precursor layers followed by thermal annealing to grow the perovskite crystals. This process circumvents the environmental concerns and precise control challenges associated with conventional solvent-based deposition methods. The high efficiency of 27.3% was achieved through optimized interface engineering between the perovskite and silicon layers, maximizing light absorption and charge extraction. Furthermore, the outstanding stability, with 97.06% efficiency retention after 6,800 hours, significantly improves the long-term viability of perovskite layers in tandem structures. This stability is crucial for addressing durability concerns, which are paramount for commercial product adoption, and represents a substantial leap forward compared to previous solution-processed cells that often suffered from rapid degradation.

Background and Context

Perovskite solar cells are widely anticipated as a 'game-changer' in the photovoltaic sector due to their high theoretical efficiencies and potential for low-cost manufacturing. However, two of the most significant hurdles to their commercialization have been long-term stability and the environmental impact of solvent-based manufacturing processes. High-quality perovskite layer formation traditionally required toxic solvents, posing a major impediment to large-scale production. The development of this solvent-free method offers a direct solution to these challenges, representing a transformative step towards sustainable solar cell manufacturing. Tandem architectures are considered the most promising technology to surpass the theoretical efficiency limit of single-junction silicon solar cells (approximately 29%), and this achievement further validates that potential, aligning with global efforts to push solar energy boundaries.

Strategic Significance and Outlook

The realization of solvent-free, high-efficiency, and stable perovskite-silicon tandem solar cells has profound implications for the photovoltaic industry. If this technology can be scaled to mass production, it could further reduce the cost of solar electricity, expand the addressable market for solar installations, and accelerate the global adoption of renewable energy. Notably, the process is designed with compatibility with existing silicon manufacturing infrastructure in mind, potentially easing the adoption of tandem technology by established solar cell manufacturers. Future research will likely focus on further enhancing efficiency and rigorously testing long-term durability under actual outdoor operating conditions, bridging the gap from laboratory success to real-world deployment.

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

Collected: August 28, 2026 | Automated Research System (Gemini API)

#27 LONGi Achieves World Record 35.5% Power Conversion Efficiency with Crystalline Silicon-Perovskite Tandem Solar Cell

Published August 24, 2026 The Economic Times China

OVERVIEW

LONGi's research team has established a new world record for power conversion efficiency in crystalline silicon-perovskite tandem solar cells, achieving 35.5%, as independently certified by the European Solar Test Installation (ESTI). This breakthrough underscores the dramatic advancement of perovskite solar cell technology, which began with 3.8% efficiency in 2009. The company also reported high efficiencies for larger area tandem cells (34.3% at 261 cm^2 and 32.2% at 274 cm^2) and tandem modules (31.4% and 29.4%), indicating significant progress toward commercial scalability.

IN DEPTH

Key Findings

LONGi's research team has set a new world record for power conversion efficiency in crystalline silicon-perovskite tandem solar cells, reaching an astounding 35.5%. This groundbreaking achievement has been independently certified by the European Solar Test Installation (ESTI), firmly establishing a new benchmark in photovoltaic technology. This dramatic leap highlights the extraordinary progress of perovskite solar cell technology, which has evolved from a modest 3.8% efficiency in 2009. Furthermore, LONGi demonstrated impressive efficiencies for larger area tandem cells, achieving 34.3% on 261 cm^2 and 32.2% on 274 cm^2, with tandem modules recording 31.4% and 29.4%, respectively, strongly signaling scalability and practical applicability for commercial deployment.

Technical Details

Tandem solar cells enhance power conversion efficiency by stacking two distinct semiconductor materials, each optimized to absorb different parts of the solar spectrum, thereby surpassing the theoretical limits of single-junction devices. LONGi's 35.5% efficiency record was achieved through sophisticated optimization of interface engineering between the perovskite and crystalline silicon layers, meticulous light management, and advanced carrier transport properties. This breakthrough is a testament to cutting-edge research in perovskite material composition, film deposition techniques, and the design of intermediate layers. Independent certification by ESTI validates the reliability of these measurements, establishing a new global benchmark for the industry. The successful achievement of high efficiencies on larger-area cells and modules indicates a remarkable capability to minimize efficiency losses during the transition from laboratory scale to industrial production, overcoming a significant hurdle for mass commercialization.

Background and Context

The efficiency of conventional silicon solar cells is approaching its physical limits, necessitating breakthrough advancements for further performance improvements. Perovskite solar cells have emerged as the most promising technology to address this challenge, owing to their high photoelectric conversion efficiency and relatively straightforward manufacturing processes. The tandem structure strategically combines the proven stability of silicon with the high efficiency potential of perovskites, leveraging the advantages of both. LONGi, a global leader in solar manufacturing, establishing a world record in this domain unequivocally signals that perovskite technology is transitioning from a niche research area to a mainstream component of the photovoltaic industry. This development holds the potential to further reduce the cost of solar electricity and maximize power generation per unit area, accelerating the adoption of renewable energy globally.

Strategic Significance and Outlook

LONGi's establishment of a 35.5% world record is immensely significant for the future of solar photovoltaic technology. Commercialization of this technology would dramatically outperform existing solar products, enabling more power generation from smaller footprints. This would have a particularly profound impact in regions with land-use constraints and for large-scale solar farms where cost reduction and maximum power output are paramount. LONGi is expected to leverage this technology to introduce innovative solar products to the market, driving the global energy transition. Future challenges will involve demonstrating long-term reliability and durability while maintaining high efficiency, and further enhancing cost-competitiveness to ensure widespread market adoption.

Source: https://m.economictimes.com/news/international/us/science-in-2009-scientists-began-with-a-3-8-perovskite-solar-cell-17-years-later-longis-silicon-perovskite-tandem-set-a-35-5-world-record/articleshow/133470672.cms

#28 Perovskite Connect 2026 to Convene Global Industry Leaders in Berlin this October for Next-Gen Solar Development

Published August 20, 2026 Perovskite-Info Germany

OVERVIEW

Perovskite Connect 2026, the world's only dedicated event for the perovskite industry, will take place in Berlin from October 21-22, with an early bird registration discount expiring September 12. This crucial conference will gather applied researchers, material suppliers, equipment manufacturers, producers, and end-users to discuss the perovskite supply chain, PV applications, and the latest innovations in materials and processes. It serves as a vital platform for fostering collaborations and charting the commercialization pathway for perovskite technology.

IN DEPTH

Key Findings

The premier global conference dedicated solely to advancements in perovskite technology, 'Perovskite Connect 2026,' is scheduled to take place in Berlin, Germany, from October 21-22, 2026. This pivotal event will bring together all key stakeholders in the perovskite industry, ranging from applied researchers and material suppliers to equipment manufacturers, producers, and end-users. With early bird registration discounts available until September 12, the conference is poised to be a crucial platform for discussing the latest industry trends and shaping future strategies for perovskite solar cell development and deployment.

Technical Details

Perovskite Connect 2026 will delve deeply into the challenges and opportunities spanning the entire perovskite solar cell supply chain. Key areas of focus for the conference include:

- **Supply Chain Optimization:** Discussions will cover material sourcing, quality control mechanisms, and establishing robust supply networks for large-scale production.
- **Photovoltaic Applications:** The latest advancements across diverse application areas, including building-integrated photovoltaics (BIPV), flexible devices, and tandem cell technologies, will be explored.
- **Latest Innovations:** Presentations will showcase cutting-edge research findings concerning perovskite material composition, device structures, and strategies for enhancing durability and stability.
- **Manufacturing Processes:** Emphasis will be placed on scalable and cost-efficient manufacturing techniques, particularly improvements in both solution-based and vapor deposition processes.

Through these thematic discussions, participants will share concrete solutions and strategies to accelerate the commercialization of perovskite technology and explore new business opportunities, driving the industry forward.

Background and Context

Perovskite solar cells have garnered significant global attention as a next-generation photovoltaic technology due to their high power conversion efficiency and potential for low-cost manufacturing. However, transitioning from laboratory-scale achievements to industrial-scale mass production presents numerous challenges, including material stability, manufacturing process scalability, and long-term reliability. Specialized conferences like Perovskite Connect are essential for addressing these hurdles and consolidating the collective knowledge and experience of the industry. By bringing together key players, the event is expected to accelerate the establishment of industry standards, foster collaborative research initiatives, and stimulate the creation of new business models that will underpin widespread adoption.

Strategic Significance and Outlook

Perovskite Connect 2026 is set to play a critical role in shaping the future trajectory of perovskite technology. The topics discussed will extend beyond mere technical breakthroughs to encompass market trends, regulatory landscapes, and funding opportunities, directly influencing industry growth strategies. The new partnerships and collaborations expected to emerge from this conference are anticipated to be vital drivers for perovskite solar cells to assume a more prominent role in the global energy transition. This event promises to be an indispensable opportunity for the perovskite community, aiming to accelerate technological advancements and contribute to a more sustainable future by bridging the gap between research and commercial reality.

Source: https://www.perovskite-info.com/?page=1

Collected: August 28, 2026 | Automated Research System (Gemini API)