Perovskite Solar Cells

Weekly Intelligence Report

2026-07-05 | 12 articles | 4 countries

troy-technical.jp

This Week's Keyword

Perovskite Acceleration

Efficiency records & commercialization push

12	4	34.85	907
articles	countries	%	W
Total Articles Analyzed	Source Countries	Record Cell Efficiency	Record Module Power

All 12 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	German Study Validates Aging	Research	●●●●○	●●●○○	●●●●○	●●●●●	●●●●●	German study validates accelerated aging tests for PSCs, enabling reliable lifetime prediction and faster commercialization.
#02	CAS Boosts PSC Efficiency	Research	●●●●○	●●○○○	●●●●○	●●●●○	●●●●○	Chinese researchers achieve 26.17% inverted PSC efficiency (23.14% in 12.5cm² modules) with glutathione additive, enhancing stability.
#03	Hanwha Qcells Leads Project	Corporate Strategy	●●●○○	●●●○○	●●●●○	●●●○○	●●●●○	Hanwha Qcells leads a South Korean government project to develop commercial-scale perovskite/silicon tandem modules (>28% eff) by 2029.
#04	LONGi Sets New World Record	Research	●●●●●	●●○○○	●●●●●	●●●●●	●●●●○	LONGi achieved a new world record 34.85% efficiency for perovskite/crystalline silicon 2-terminal tandem solar cell, verified by NREL.
#05	German Record Perovskite-CIGS	Research	●●●●●	●●○○○	●●●●○	●●●●●	●●●●●	German researchers set a new world record of 25.5% efficiency for perovskite-CIGS tandem solar cells, verified by ESTI.
#06	Trinasolar Record Module	New Product	●●●●○	●●●○○	●●●●●	●●●●○	●●●●○	Trinasolar achieved world record 907W power output and 29.2% full-area efficiency for its 210mm perovskite/silicon tandem module.
#07	German PSC Degradation	Research	●●●●○	●●○○○	●●●○○	●●●●●	●●●●●	German study details PSC outdoor degradation mechanisms, validating accelerated tests and estimating a T80 lifetime of ~15.6 months.
#08	Soochow Uni. 27.3% Stable	Research	●●●●○	●●○○○	●●●●○	●●●●○	●●●●○	Chinese scientists achieved 27.3% efficiency and 92% retention after 2000h in inverted PSCs (21.54% on 766cm²) via dual-molecule interface.
#09	CATL & CECEP Partnership	Corporate Strategy	●○○○○	●●●●○	●●●●○	●●●○○	●●●●○	CATL and CECEP expand partnership for perovskite solar commercialization; Chinese government supports GCL Optoelectronics and other projects.
#10	GRC Unconventional Semi.	Market Overview	●○○○○	●○○○○	●○○○○	●●○○○	●●●●●	Gordon Research Conference 2026 will focus on unconventional semiconductors, particularly perovskite solar cell stability.
#11	ISFH to Present at EU PVSEC	Research	●●○○○	●○○○○	●●○○○	●●○○○	●●●●●	ISFH (Germany) will present research on perovskite surface recombination and 2D perovskite formation at EU PVSEC 2026.

#	Article Title	Type	Tech Novelty	Market Proximity	Market Impact	Data Reliability	US/EU Relevance	Summary
#12	Verde Tech Appoints CEO	Corporate Strategy	●●○○○	●●●●○	●●●○○	●●○○○	●●●●●	US-based Verde Technologies appoints new CEO to accelerate commercialization of thin-film perovskite solar cells, targeting the space market.

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

Three Questions That Demand Your Decision This Week

❶ Are your R&D; roadmaps competitive with Asian efficiency records?

Chinese firms LONGi (34.85% cell) and Trinasolar (907W module, 29.2% full-area) are setting new global benchmarks. Does your internal research match this pace, or are you falling behind in next-gen PV?

❷ Is your supply chain exposed to Chinese perovskite industrialization?

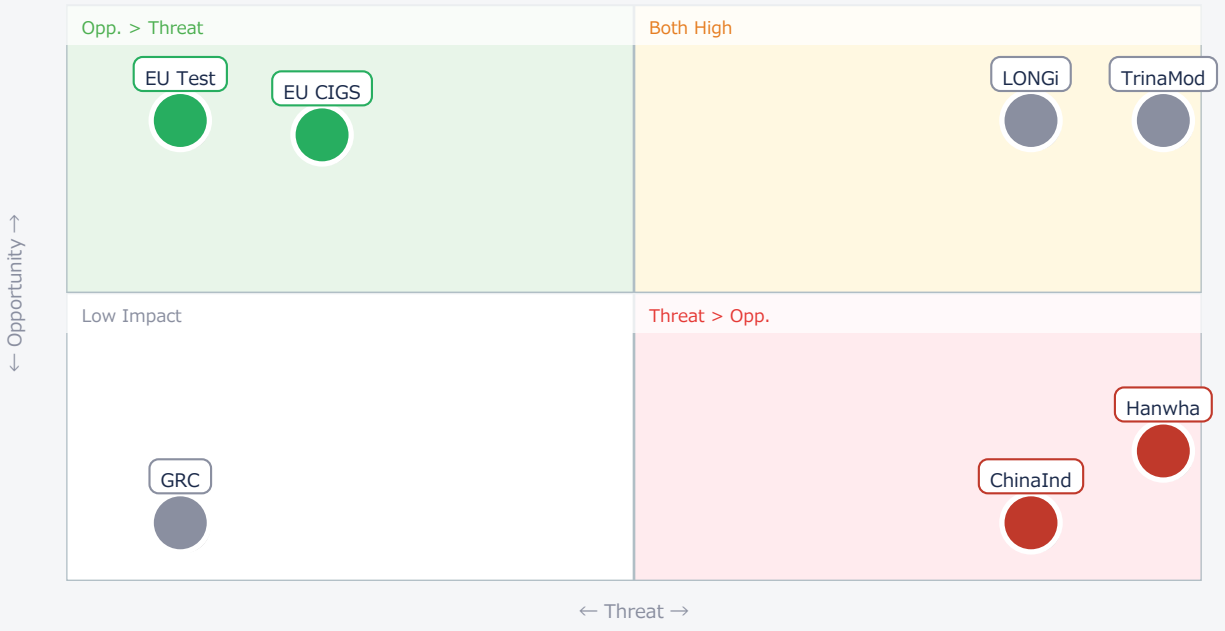
The expanded CATL/CECEP partnership and government support for GCL Optoelectronics signal a robust Chinese push for mass production. How will this impact global material and module supply, and your competitive position?

❸ Are you leveraging EU/US research on perovskite stability validation?

German studies are validating accelerated aging tests, a critical step for commercialization. Are your R&D; and quality assurance teams adopting these methods to de-risk your own PSC development?

Opportunities vs. Threats for US/European Companies

Opportunity vs. Threat Matrix for US/European Companies



Item	Quadrant	↑ Opportunity	↓ Threat
LONGi	Critical	New eff. bar	Asian tech lead
TrinaMod	Critical	Module perf.	Asian scale
ChinaInd	Threat	—	Market dominance
Hanwha	Threat	—	SK competition
EU Test	Opp.	Faster validation	—
EU CIGS	Opp.	New thin-film	—
GRC	Ref.	R&D; insight	—

Deep Dive ① — LONGi's 34.85% Perovskite-Si Tandem Record

#04 | 2026/06/29 | LONGi | Tech Novelty●●●●● Proximity●●○○○ Market Impact●●●●● Data Reliability●●●●● US/EU Relevance●●●●○

LONGi, a Chinese solar PV leader, has achieved a new world record power conversion efficiency of 34.85% for its independently developed crystalline silicon-perovskite 2-terminal tandem solar cell, verified by NREL. This breakthrough significantly surpasses the theoretical limit of single-junction silicon cells, showcasing advanced material optimization, interfacial passivation, and precise optical design.

This record highlights the rapid progress in tandem cell technology, which combines perovskite and silicon to absorb a broader solar spectrum. While currently a lab-scale achievement, it sets a new global benchmark for PV efficiency, indicating a clear path towards substantially increasing power generation per unit area and reducing overall solar power costs.

▶ Strategic Analyst's Perspective

Strategic Analyst's Perspective: The 34.85% efficiency is a phenomenal lab record, pushing the theoretical limits of PV. While NREL-verified, scaling this to commercial production without efficiency loss remains a significant technical barrier, especially for large-area uniformity and long-term stability. [Opportunity] for US/EU technology licensors to develop and license complementary IP in advanced materials or manufacturing processes that enable such efficiencies at scale. [Threat] for US/EU OEMs and device manufacturers as Chinese firms are clearly leading the efficiency race, potentially making current platforms obsolete faster. Next actions: [R&D;] immediately benchmark internal tandem cell roadmaps against this new record and identify specific technical gaps. [Strategy] assess the long-term competitive implications of this Asian lead by Q4 2026.

Deep Dive ② — Trinasolar's 907W Perovskite-Si Module Record

#06 | 2026/07/02 | PR Newswire | Tech Novelty●●●●○ Proximity●●●○○ Market Impact●●●●● Data Reliability●●●●○ US/EU Relevance●●●●○

Trinasolar has announced a new world record, achieving 907W power output and 29.2% full-area efficiency for its perovskite/crystalline silicon tandem module. This breakthrough, based on the company's 210mm large-area tandem cell technology, was accomplished through improvements in perovskite film uniformity, interfacial passivation, and spectral absorption matching.

This achievement is particularly significant as it demonstrates high efficiency on a large-area module, moving beyond small lab cells. It indicates strong practical potential for commercial-scale modules, addressing a critical challenge in scaling up perovskite technology for mass production and accelerating the transition to clean energy by enhancing performance and reliability.

▶ Strategic Analyst's Perspective

Strategic Analyst's Perspective: Trinasolar's 907W module record is highly realistic and impactful, representing a crucial step towards commercialization. Achieving 29.2% full-area efficiency on a 210mm module is a major engineering feat, indicating advanced manufacturing capabilities. The primary technical barrier remains long-term outdoor stability under diverse conditions. [Opportunity] for US/EU materials suppliers to develop advanced encapsulation materials or defect passivation layers that can meet these high-performance, large-area requirements. [Threat] for US/EU OEMs as Chinese manufacturers are demonstrating clear leadership in scaling high-efficiency tandem technology to module level, potentially dominating future high-power PV markets. Next actions: [Procurement] evaluate potential future module performance from Asian suppliers and assess current product competitiveness by end of Q3 2026. [R&D;] investigate Trinasolar's film uniformity and interfacial passivation techniques.

Deep Dive ③ — German Validation of PSC Aging Tests

#01 | 2026/06/25 | Mirage News | Tech Novelty●●●●○ Proximity●●●○○ Market Impact●●●●○ Data Reliability●●●●● US/EU Relevance●●●●●

Researchers from Helmholtz-Zentrum Berlin (HZB) and HTW Berlin have published a study confirming that accelerated degradation tests accurately replicate real-world outdoor aging processes in perovskite solar cells (PSCs). The study identified key degradation mechanisms—phase segregation, copper corrosion, and edge patterns—and demonstrated their reproducibility under accelerated conditions.

This validation enhances confidence in accelerated testing for PSC long-term stability, accelerating the path to commercial deployment by enabling faster and more accurate durability assessments for new materials and device architectures. It addresses a major bottleneck in PSC commercialization: reliable long-term stability assessment.

▶ Strategic Analyst's Perspective

Strategic Analyst's Perspective: This German study provides a highly reliable and realistic framework for PSC lifetime prediction, crucial for market acceptance. The identified degradation mechanisms are consistent with known challenges. While the study validates testing methods, the inherent stability of PSCs still needs significant improvement for widespread commercial use (e.g., Article #07 suggests ~15.6-month T80 life). [Opportunity] for US/EU R&D; and QA teams to adopt these validated accelerated testing protocols, significantly shortening development cycles and de-risking product launches. [Threat] for any US/EU company relying on less rigorous or unvalidated testing methods, risking product failures and reputational damage. Next actions: [R&D;] and [Quality Assurance] immediately review and integrate these validated accelerated testing methodologies into all perovskite development programs. [Executive] consider advocating for industry-wide adoption of standardized testing protocols based on this research by Q4 2026.

Other Notable Articles

#02 Chinese Academy of Sciences Boosts Inverted Perovskite Solar Cell Efficiency to 26.17% with Glutathione Additive, Enhancing Stability (EurekAlert!)

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

Novel glutathione additive boosts PSC efficiency and stability, showing promising material science advancements from China.

#08 Chinese Scientists at Soochow University Achieve 27.3% Efficiency and Long-Term Stability in Inverted Perovskite Solar Cells via Dual-Molecule Interface (PV Magazine)

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

High efficiency (27.3%) and impressive stability (92% after 2000h) on large-area modules (766cm²) from China, addressing key commercialization hurdles.

#07 German Research Unveils Perovskite Solar Cell Outdoor Degradation Mechanisms, Proposing Lifetime Framework with ~15.6-Month T80 Life (AZoCleantech)

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

Detailed German study on PSC degradation, providing a predictive framework but highlighting the current short T80 lifetime (~15.6 months).

#12 Verde Technologies Appoints Jean-Noël Poirier as CEO to Accelerate Commercialization of Thin-Film Perovskite Solar Cells and Entry into Space Market (TaiyangNews)

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

US company targeting high-value niche markets like space with thin-film PSCs and roll-to-roll manufacturing, signaling strategic commercialization.

Recommended Actions This Week

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

Immediate (this week)

- [R&D;] Review and benchmark internal perovskite cell and module efficiency roadmaps against LONGi's 34.85% and Trinasolar's 907W records.
- [Strategy] Initiate an urgent assessment of the competitive threat posed by accelerated Chinese industrialization of perovskite PV (CATL, CECEP, GCL).

Short-term (1 month)

- [R&D;] Investigate the technical details of glutathione and dual-molecule interface strategies for enhancing PSC efficiency and stability from Chinese research.
- [Procurement] Conduct a preliminary supply chain risk analysis for key perovskite materials, considering potential future dominance by Asian suppliers.
- [Business Dev] Explore strategic partnerships or acquisitions to accelerate entry into high-value niche markets like space power generation, as targeted by Verde Technologies.

Medium-long term (quarter+)

- [R&D;] Prioritize long-term stability research and integrate validated accelerated aging test protocols (from German studies) into all perovskite development programs.
- [Strategy] Develop a comprehensive competitive roadmap for tandem PV technologies, including perovskite/silicon and perovskite/CIGS, considering both efficiency and stability targets.
- [Legal/IP] Proactively monitor the intellectual property landscape for perovskite breakthroughs from Asia to identify potential licensing opportunities or infringement risks.

PerovskiteSolarCells — Selected Articles

Date: 2026-07-05

Articles: 12

Table of Contents

#01 German Study Validates Accelerated Aging Tests for Accurate Perovskite Solar Cell Lifetime Prediction Outdoors

Published June 25, 2026 Mirage News Germany

OVERVIEW

Researchers from Helmholtz-Zentrum Berlin (HZB) and HTW Berlin have published a study in Joule, confirming that accelerated degradation tests accurately replicate real-world outdoor aging processes in perovskite solar cells (PSCs), making them reliable for lifetime prediction. The study identified key degradation mechanisms—phase segregation, copper corrosion, and edge patterns—and demonstrated their reproducibility under accelerated conditions. This validation enhances confidence in accelerated testing for PSC long-term stability, accelerating the path to commercial deployment by enabling faster and more accurate durability assessments for new materials and device architectures.

IN DEPTH

Key Findings

A collaborative research effort by Helmholtz-Zentrum Berlin (HZB) and HTW Berlin has demonstrated that accelerated degradation tests effectively mirror real-world outdoor aging in perovskite solar cells (PSCs), providing a reliable framework for predicting their long-term lifespan. Published in the journal Joule, the study compared naturally aged PSCs with artificially stressed counterparts, identifying three primary degradation mechanisms: phase segregation, copper corrosion, and edge patterning. Crucially, these mechanisms were found to be reproducible under accelerated conditions, validating the predictive power of such laboratory tests.

Technical Details

The research involved subjecting various PSC device architectures to both prolonged outdoor exposure—exceeding 20 months—and a battery of accelerated laboratory tests mimicking intense heat, humidity, light, and electrical bias. A direct correlation was observed between the degradation modes in outdoor conditions and those induced by accelerated aging. Specifically, phase segregation, driven by cation migration and exacerbated by thermal and electrical stress, was confirmed as a primary intrinsic degradation pathway. The findings establish that the degradation phenomena observed in accelerated testing faithfully represent the mechanisms occurring in actual outdoor environments, thereby providing a robust tool for overcoming a key bottleneck in PSC commercialization: reliable long-term stability assessment.

Background & Context

Perovskite solar cells have garnered significant attention for their high power conversion efficiency and potential for low-cost manufacturing, positioning them as a leading contender for next-generation photovoltaics. However, concerns regarding their long-term stability have been a major hurdle for widespread commercial adoption. Historically, accelerated degradation tests have faced skepticism regarding their ability to accurately predict real-world device lifetimes. This study is groundbreaking in definitively showing that accelerated tests can indeed capture the actual degradation mechanisms, offering a critical advancement for the field. This breakthrough promises to shorten development cycles and significantly reduce the time-to-market for new PSC technologies.

Strategic Significance & Outlook

The results of this study establish a new benchmark for evaluating PSC long-term stability, enabling more reliable lifetime predictions. This will empower manufacturers to enhance product quality assurance and boost confidence among investors and consumers in PSC technology. Moving forward, continued validation across diverse environmental conditions and application to different materials and device architectures are expected to further accelerate the improvement of PSC stability and their eventual broad commercial deployment, cementing their role in the future energy landscape.

Source: https://www.miragenews.com/perovskite-solar-cells-long-term-stability-1699394/

Collected: July 03, 2026 | Automated Research System (Gemini API)

#02 Chinese Academy of Sciences Boosts Inverted Perovskite Solar Cell Efficiency to 26.17% with Glutathione Additive, Enhancing Stability

Published June 25, 2026 EurekAlert! China

OVERVIEW

Researchers at the Hefei Institutes of Physical Science, Chinese Academy of Sciences, have achieved a significant breakthrough by improving inverted perovskite solar cell (PSC) efficiency to 26.17% and dramatically enhancing stability using a novel glutathione (GSH) additive strategy. Optimized devices recorded 23.14% efficiency in 12.50 cm^2 mini-modules, exhibiting improved operational stability under heat, humidity, and UV light. This approach, integrating chemical protection and redox self-healing, resolves critical commercialization challenges by refining interfacial properties and film quality, thus mitigating environmental degradation and extending device lifespan.

IN DEPTH

Key Findings

A research team from the Hefei Institutes of Physical Science, Chinese Academy of Sciences, has reported a significant advancement in inverted perovskite solar cells (PSCs), achieving a power conversion efficiency (PCE) of 26.17% through a novel synergistic strategy utilizing glutathione (GSH) additives. This breakthrough also extended to 12.50 cm^2 mini-modules, which recorded an impressive 23.14% efficiency, coupled with substantially improved operational stability under diverse environmental stressors including heat, humidity, and UV light.

Technical Details

The team's innovative approach involves incorporating glutathione (GSH) into the perovskite layer, which acts as a multifunctional additive. GSH facilitates the precise tuning of interfacial properties and significantly enhances film quality. Mechanistically, glutathione provides chemical protection and activates redox self-healing mechanisms within the PSC. This dual action effectively suppresses defect formation and minimizes ion migration, crucial factors for maintaining device stability. By optimizing the charge extraction efficiency between the electron transport layer and the perovskite, and simultaneously bolstering resilience against environmental degradation, this strategy addresses long-standing stability challenges inherent in PSC technology, offering a viable pathway towards robust, high-performance devices.

Background & Context

Perovskite solar cells are widely regarded as a game-changer for the photovoltaic industry due to their high efficiency and potential for low-cost manufacturing. However, their commercialization has been primarily hampered by insufficient stability against environmental factors such as moisture, heat, and UV radiation. The glutathione strategy developed in this study directly tackles these issues, representing a significant step forward in both efficiency and stability. The achievement of high efficiencies in larger mini-modules is particularly noteworthy, indicating strong potential for practical application and scalability, differentiating it from purely laboratory-scale achievements.

Strategic Significance & Outlook

This novel strategy holds immense promise for accelerating the practical deployment of perovskite solar cells. The enhanced environmental stress resistance directly translates to an extended product lifespan, potentially reducing the overall levelized cost of electricity (LCOE) for solar power systems. Future work will focus on scaling up this technology for mass production and conducting extensive long-term outdoor performance assessments. The development of such multifunctional additives like glutathione marks a critical milestone, influencing the future trajectory of perovskite solar cell technology and reinforcing its position as a key component in the global renewable energy transition.

Source: https://www.eurekalert.org/news-releases/1133758

#03 Hanwha Qcells to Lead South Korean Government Project for Commercial-Scale Perovskite/Silicon Tandem Module Development

Published June 30, 2026 Perovskite-Info South Korea

OVERVIEW

Hanwha Qcells has announced it will lead a government-backed R&D project by the Korea Institute of Energy Technology Evaluation and Planning (KETEP) to develop commercial-scale perovskite/crystalline silicon tandem modules. This ambitious three-year project targets module efficiencies exceeding 28% and module areas greater than 1.7 m^2, aiming for commercialization around 2029. Qcells' strategy is to strengthen its leadership in the solar market by bringing tandem technology to market ahead of competitors. This initiative marks a crucial step towards the mass production of next-generation solar cell technology.

IN DEPTH

Key Findings

Hanwha Qcells, a division of Hanwha Solutions, has been selected to spearhead a major government-led research and development project focused on the development and demonstration of commercial-scale perovskite/crystalline silicon tandem solar cell modules. This ambitious three-year initiative, commencing in April 2026, sets specific targets of achieving over 28% module efficiency and module areas exceeding 1.7 m^2, laying critical technological groundwork for the mass production of next-generation photovoltaic solutions.

Technical Details

The project, part of the Energy Technology Development Program overseen by the Korea Institute of Energy Technology Evaluation and Planning (KETEP), involves a consortium of solar cell manufacturers, material suppliers, and research institutions led by Hanwha Qcells. Key areas of focus include developing uniform perovskite film deposition techniques for large-area modules, optimizing interface engineering, and ensuring long-term reliability through advanced encapsulation methods. By pushing beyond the theoretical efficiency limits of conventional single-junction silicon solar cells, the project aims to maximize power generation per unit area, thereby accelerating the deployment of renewable energy technologies.

Background & Context

Tandem solar cells are globally recognized as a promising technology capable of surpassing the Shockley-Queisser theoretical efficiency limit of single-junction silicon cells. By combining perovskite and crystalline silicon, these devices can absorb a broader spectrum of sunlight, leading to higher overall efficiencies. Hanwha Qcells' leadership in this area is a strategic move to establish technological dominance and secure a competitive edge in the rapidly expanding next-generation solar market. The significant backing from the South Korean government underscores the national commitment to advancing this critical renewable energy technology.

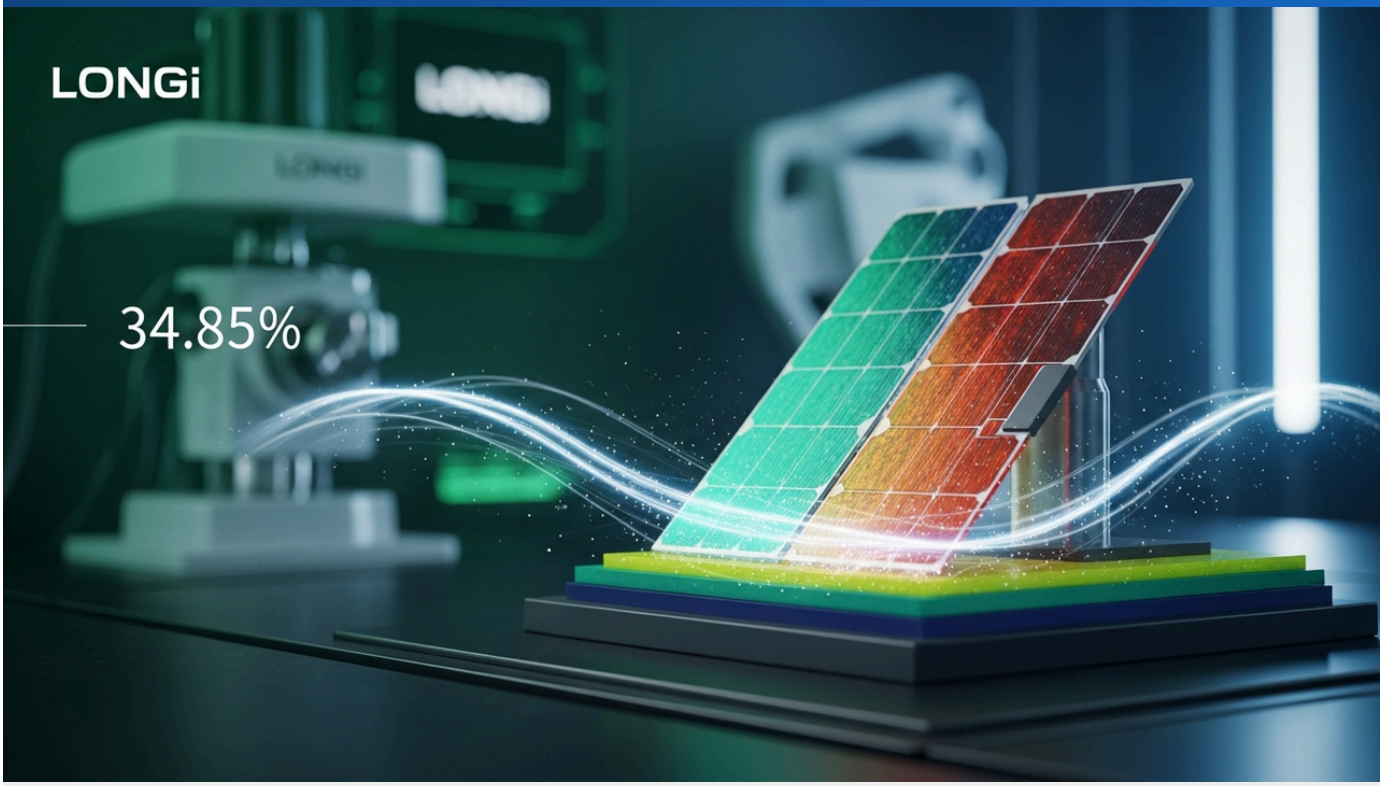
Strategic Significance & Outlook

Through this project, Hanwha Qcells aims to leverage the technological advancements for commercialization around 2029. The successful mass production of commercial-scale tandem modules could significantly transform the existing solar power market. High-efficiency modules are particularly valuable for applications with limited installation space, such as residential and commercial rooftops, and for utility-scale projects requiring maximal power output. This progress is expected to further improve the cost-effectiveness of solar power, accelerating the global transition towards a carbon-neutral society and reinforcing the company's position as a leader in advanced PV technology.

Source: https://www.perovskite-info.com/hanwha-qcells-lead-korean-government-project-commercial-scale-perovskitesilicon

#04 LONGi Sets New World Record with 34.85% Efficiency for Perovskite/Crystalline Silicon 2-Terminal Tandem Solar Cell

Published June 29, 2026 LONGi China



OVERVIEW

LONGi, a global leader in solar PV solutions, announced it has achieved a new world record power conversion efficiency of 34.85% for its independently developed crystalline silicon-perovskite 2-terminal tandem solar cell, as verified by NREL. This breakthrough significantly surpasses the theoretical limit of single-junction silicon cells, underscoring LONGi's strong commitment to driving photovoltaic technology innovation. This high efficiency will contribute to reducing solar power costs and accelerating widespread adoption, critically advancing the global energy transition.

IN DEPTH

Key Findings

LONGi, a preeminent global supplier of solar PV solutions, has announced a groundbreaking achievement: its independently developed crystalline silicon-perovskite 2-terminal tandem solar cell has attained a remarkable 34.85% power conversion efficiency, verified by the U.S. National Renewable Energy Laboratory (NREL). This new world record, an improvement upon previous benchmarks, marks a pivotal milestone in the evolution of photovoltaic technology.

Technical Details

The 34.85% efficiency record significantly exceeds the theoretical Shockley-Queisser limit of approximately 29% for single-junction silicon solar cells. LONGi's R&D team achieved this by optimizing perovskite material composition, innovating interfacial passivation techniques, and employing precise optical design to efficiently capture a broader spectrum of sunlight. The 2-terminal architecture, in particular, allows for simplified manufacturing and easier module integration while delivering superior efficiency. This technological triumph showcases advanced thin-film deposition techniques and seamless integration with crystalline silicon substrates.

Background & Context

The solar photovoltaic industry is in a perpetual race for higher efficiencies, driven by the urgent need for climate change mitigation and sustainable energy supply. Tandem solar cells, which stack multiple absorber layers with different bandgaps, represent a next-generation technology designed to overcome the efficiency limitations of single-material devices. Continuous record-breaking achievements by industry leaders like LONGi indicate that perovskite tandem technology is transitioning from purely academic success to tangible progress toward commercialization. This advancement is crucial for substantially increasing the power generated per unit area, maximizing energy output from limited land resources.

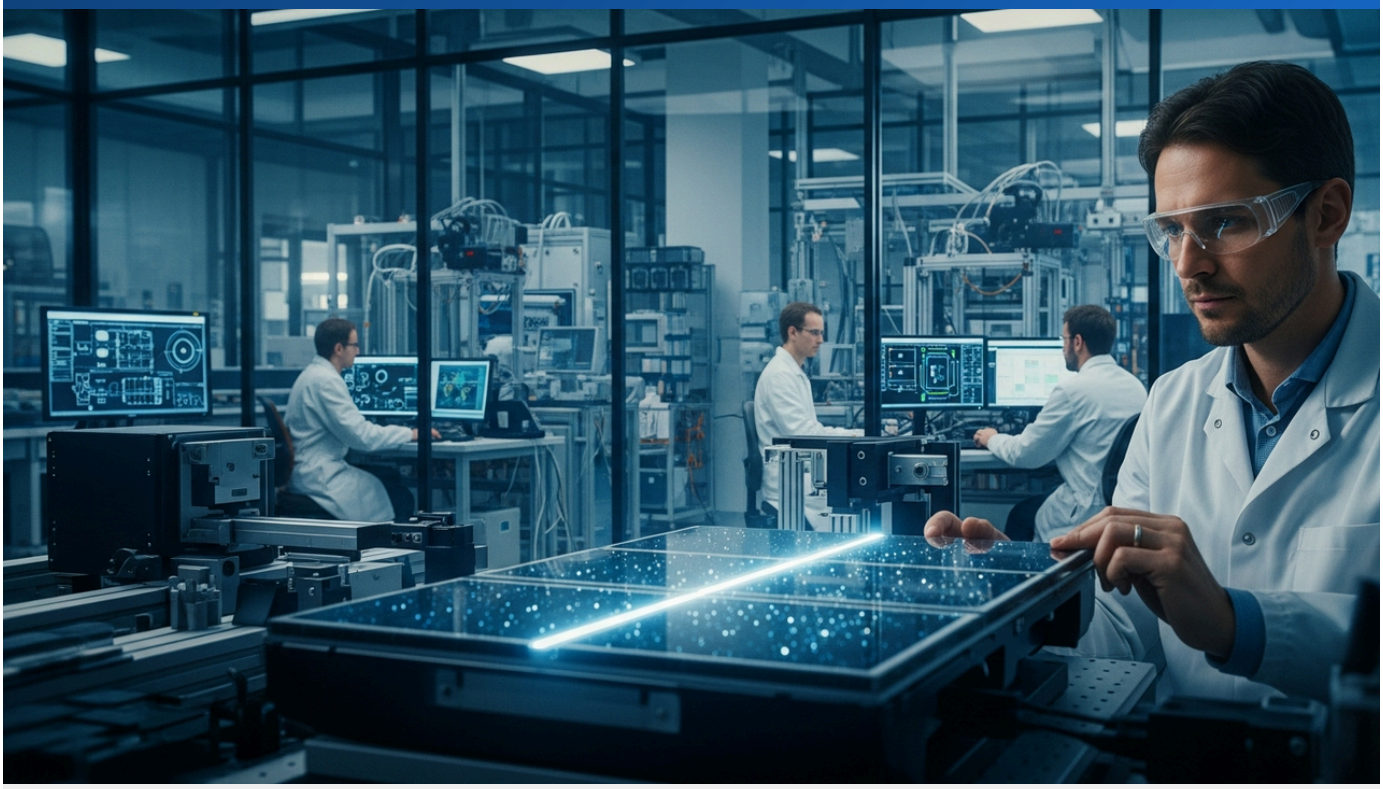
Strategic Significance & Outlook

Achieving a 34.85% world record demonstrates LONGi's unparalleled innovation capabilities, further solidifying its competitive edge in the global market. Such high-efficiency technologies are instrumental in reducing balance-of-system (BOS) costs for solar power installations and lowering the overall levelized cost of electricity (LCOE). Moving forward, LONGi is expected to leverage this research outcome to scale up manufacturing processes for larger modules and conduct extensive long-term reliability validations, aiming for the early commercialization of high-efficiency perovskite tandem solar cells. This represents a critical stride towards accelerating the global energy transition and realizing a more sustainable future.

Source: https://www.longi.com/en/

#05 German Researchers Achieve World Record 25.5% Efficiency for Perovskite-CIGS Tandem Solar Cell

Published July 01, 2026 pv magazine Global Germany



OVERVIEW

Researchers from Helmholtz-Zentrum Berlin (HZB) and Humboldt-Universität in Germany have set a new world record power conversion efficiency of 25.5% for a perovskite-CIGS (Copper, Indium, Gallium, Selenium) tandem solar cell. Verified by the European Solar Test Installation (ESTI), this achievement surpasses the previous record of 25.17%. This breakthrough opens new avenues for highly efficient, low-cost thin-film solar cell technology, holding significant implications for accelerating the energy transition by combining the best attributes of both materials.

IN DEPTH

Key Findings

A collaborative research team from Helmholtz-Zentrum Berlin (HZB) and Humboldt-Universität in Germany has established a new world record for power conversion efficiency in a perovskite-CIGS (Copper, Indium, Gallium, Selenium) tandem solar cell, achieving an impressive 25.5%. This significant breakthrough has been independently verified by the European Solar Test Installation (ESTI), surpassing the previous record of 25.17% and highlighting a major advance in hybrid thin-film photovoltaic technologies.

Technical Details

The record efficiency was achieved through a meticulous optimization of both the perovskite top cell and the CIGS bottom cell. Specifically, the researchers engineered CIGS-based bottom cells with precisely tuned band gaps of 1.05 eV and 1.1 eV, integrating them with varying thicknesses of aluminum-doped zinc oxide (AZO) layers. The team systematically screened combinations of nickel oxide (NiOx) and self-assembled monolayers (SAMs) as hole transport layers, identifying optimal interface properties. Further refinement involved controlling the thermal evaporation rate of C60 onto a lithium fluoride (LiF) passivation layer to enhance contact formation. These strategic optimizations enabled the fabrication of a 2.25 cm^2 module that reached an efficiency of approximately 19.7%, demonstrating excellent scalability potential.

Background & Context

Perovskite solar cells and CIGS solar cells are both promising next-generation thin-film photovoltaic technologies, each offering high efficiency and manufacturing flexibility. Combining them in a tandem architecture allows for a more efficient utilization of the solar spectrum, potentially surpassing the theoretical limits of single-junction devices. Perovskites excel at absorbing visible light, while CIGS is highly efficient in the near-infrared region, making them highly complementary materials. This new record underscores the immense potential of integrating distinct thin-film technologies to achieve higher efficiencies, marking a critical development for the future solar energy industry.

Strategic Significance & Outlook

The achievement of a 25.5% world record efficiency is a substantial step towards the commercialization of perovskite-CIGS tandem solar cells. This technology can be built on low-cost, flexible thin-film substrates, opening up a wide range of applications, including flexible and transparent solar cells. The success of HZB and Humboldt-Universität researchers holds the potential to catalyze the development of even more efficient and versatile solar cells through the integration with other thin-film technologies. Moving forward, continued efforts in improving long-term stability and scaling up manufacturing processes will be crucial for widespread practical deployment.

Source: https://www.pv-magazine.com/2026/07/01/german-researchers-achieve-world-record-25-5-efficiency-for-perovskite-cigs-tandem-solar-cell/

Collected: July 03, 2026 | Automated Research System (Gemini API)

#06 Trinasolar Achieves World Record 907W Power Output and 29.2% Full-Area Efficiency for Perovskite/Crystalline Silicon Tandem Module

Published July 02, 2026 PR Newswire China

OVERVIEW

Trinasolar has announced a new world record, achieving 907W power output and 29.2% full-area efficiency for its perovskite/crystalline silicon tandem module. This breakthrough, based on the company's 210mm large-area tandem cell technology system, was accomplished through improvements in perovskite film uniformity, interfacial passivation, and spectral absorption matching within the tandem structure. This achievement marks a significant milestone in scaling up and increasing efficiency in the PV industry, poised to greatly enhance the performance of next-generation modules and accelerate the transition to clean energy.

IN DEPTH

Key Findings

Trinasolar, a global leader in photovoltaic (PV) solutions, has set a new world record with its perovskite/crystalline silicon tandem module, achieving an unprecedented 907W power output and 29.2% full-area efficiency. This monumental accomplishment leverages the company's advanced 210mm large-area tandem cell technology system, representing a significant leap forward in the performance capabilities of next-generation solar modules.

Technical Details

The record-breaking efficiency was achieved through a combination of several key technological innovations: exceptional uniformity of the perovskite thin film, advanced interfacial passivation techniques, and precise spectral absorption matching within the tandem structure. Trinasolar’s R&D team focused particularly on achieving uniform film deposition and suppressing defects across large-area devices, thereby minimizing recombination losses of charge carriers. The attainment of this efficiency in a 210mm large-area format demonstrates strong practical potential for commercial-scale modules, moving beyond small, laboratory-sized cells. This technological advancement simultaneously enhances both the performance and reliability of solar cell modules.

Background & Context

The current solar PV industry is fiercely pursuing both efficiency improvements and manufacturing cost reductions. Tandem technology, in particular, is seen as the key to surpassing the theoretical efficiency limits of conventional single-junction silicon solar cells. Trinasolar's latest achievement substantiates the immense potential of combining perovskite and crystalline silicon for high-efficiency, large-scale module manufacturing. High power output in large-area modules is critically important for maximizing power generation per unit of installation area and improving project profitability, especially for large-scale solar projects and space-constrained environments.

Strategic Significance & Outlook

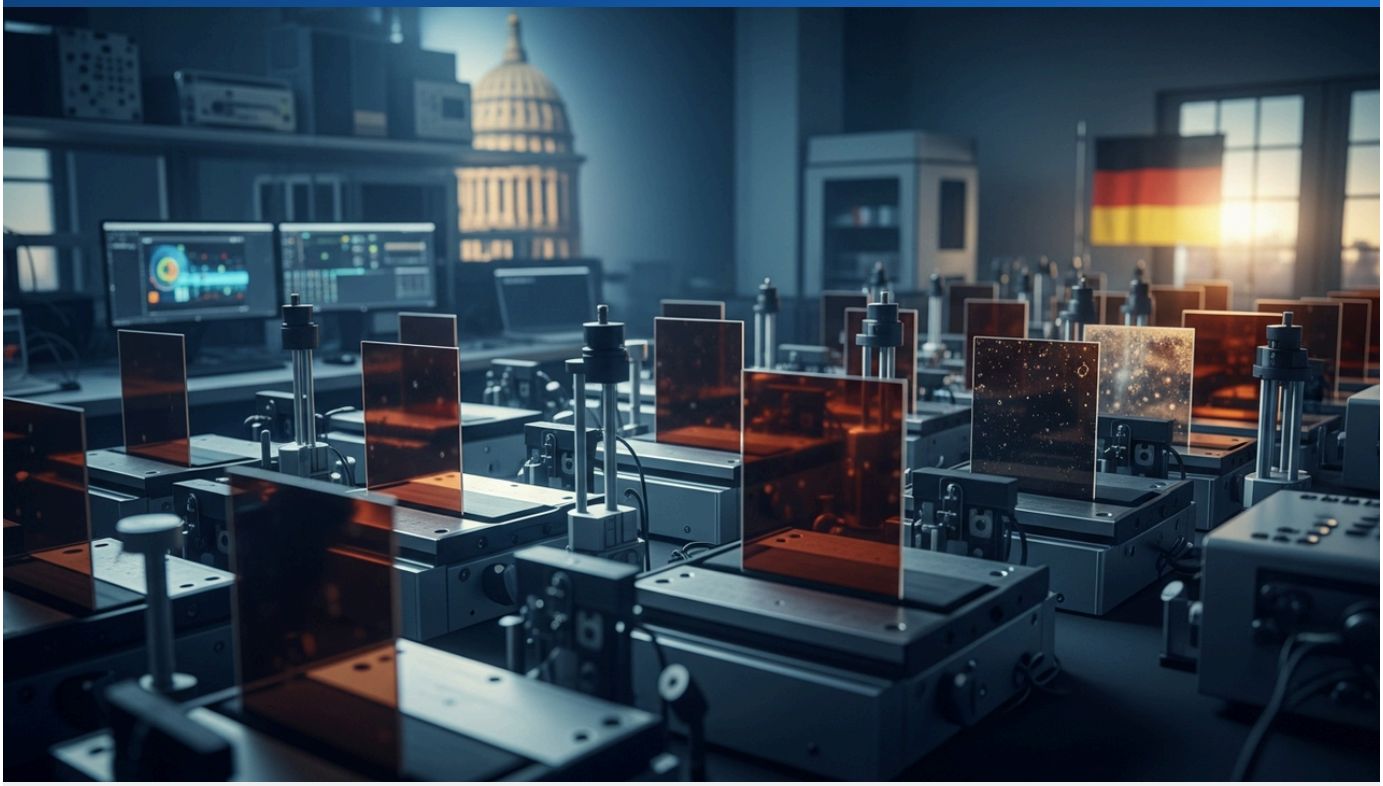
The achievement of 907W output and 29.2% full-area efficiency by Trinasolar establishes a new benchmark for the development of next-generation solar cell modules. The company is expected to accelerate the development of large-scale production technologies for commercialization based on this innovation. Such high-efficiency modules are anticipated to further reduce the levelized cost of electricity (LCOE) for solar power systems, vigorously driving the global transition towards clean energy. This achievement represents a vital step towards realizing more powerful and sustainable energy solutions.

Source: https://www.prnewswire.com/apac/news-releases/trinasolar-achieves-907w-power-output-for-perovskitecrystalline-silicon-tandem-module-setting-new-world-record-302816737.html

Collected: July 03, 2026 | Automated Research System (Gemini API)

#07 German Research Unveils Perovskite Solar Cell Outdoor Degradation Mechanisms, Proposing Lifetime Framework with ~15.6-Month T80 Life

Published July 03, 2026 AZoCleantech Germany



OVERVIEW

A new study from Germany has elucidated the real-world outdoor degradation mechanisms of perovskite solar cells (PSCs), establishing a reliable framework for lifetime prediction. Accelerated aging tests identified three distinct degradation modes: phase segregation, copper corrosion, and edge patterns. Crucially, phase segregation, driven by cation migration and intensified by thermal and electrical stress, was found to be the primary intrinsic degradation pathway. The research revealed that increased light intensity non-linearly accelerates degradation rates, with an estimated T80 lifetime of approximately 15.6 months, contributing significantly to addressing stability challenges for PSC commercialization.

IN DEPTH

Key Findings

New research led by teams from Helmholtz-Zentrum Berlin (HZB) and HTW Berlin in Germany has comprehensively elucidated the actual outdoor degradation mechanisms of perovskite solar cells (PSCs), establishing a robust framework for reliable lifetime prediction. This study demonstrates that accelerated aging tests can effectively replicate real-world degradation, revealing an estimated T80 lifetime of approximately 15.6 months. These findings provide crucial scientific underpinnings for assessing the long-term stability of PSCs, an essential factor for their commercial viability.

Technical Details

The study involved extensive comparative analysis between PSCs aged under accelerated laboratory conditions and those exposed to actual outdoor environments. Three distinct degradation modes were identified: phase segregation, copper corrosion, and edge patterning. A key finding was that phase segregation is the predominant intrinsic degradation pathway, driven by cation migration and significantly accelerated by both thermal and electrical stress. Furthermore, the research highlighted that increased light intensity non-linearly amplifies the degradation rate of PSCs, indicating that operation under high illumination significantly impacts device longevity. By confirming that accelerated aging tests accurately reproduce outdoor damage, researchers have gained a powerful tool for reliable lifetime prediction.

Background & Context

Perovskite solar cells are highly promising for next-generation photovoltaics due to their high efficiency and low manufacturing cost potential. However, long-term reliability and stability have been the most significant barriers to their commercialization. Previous research often noted discrepancies between laboratory-based accelerated tests and actual outdoor performance, making accurate lifetime prediction challenging. This study bridges that gap by meticulously validating the extent to which accelerated tests can replicate real degradation mechanisms, thereby enhancing their reliability. This advancement will enable more efficient progress in material design and device structure optimization aimed at improving PSC reliability.

Strategic Significance & Outlook

The findings from this research deepen the understanding of PSC long-term stability and will facilitate the design of more robust devices. While an estimated T80 lifetime of approximately 15.6 months suggests further improvements are needed for widespread practical application, the clear identification of degradation mechanisms and the establishment of a predictive framework provide a clear direction for future R&D. Manufacturers can leverage this knowledge to develop more durable PSC products and accelerate their market entry. In the long term, these technological advancements are expected to further improve the cost-effectiveness of solar power and play a crucial role in accelerating the adoption of renewable energy globally.

Source: https://www.azocleantech.com/news.aspx?newsID=36475

Collected: July 03, 2026 | Automated Research System (Gemini API)

#08 Chinese Scientists at Soochow University Achieve 27.3% Efficiency and Long-Term Stability in Inverted Perovskite Solar Cells via Dual-Molecule Interface

Published July 03, 2026 PV Magazine China

OVERVIEW

A research group led by Soochow University in China has achieved 27.3% efficiency in inverted perovskite solar cells (PSCs) using a novel dual-molecule interfacial layer. This innovative design effectively locks molecular ordering, suppresses defects and stress, and significantly enhances charge extraction and interfacial stability. The technology also recorded 21.54% efficiency on large-area modules (766 cm^2) and maintained 92% of initial efficiency after 2000 hours of continuous light soaking, demonstrating exceptional operational stability. This breakthrough significantly addresses the critical challenge of balancing high efficiency with long-term stability for PSC commercialization.

IN DEPTH

Key Findings

A research group spearheaded by Soochow University in China has reported a significant breakthrough in inverted perovskite solar cells (PSCs), achieving an impressive 27.3% power conversion efficiency (PCE) through the implementation of a novel dual-molecule interfacial layer. As reported by PV Magazine, this innovative design not only delivers high efficiency but also demonstrates exceptional long-term operational stability, with a large-area module (766 cm^2) recording 21.54% efficiency and retaining 92% of its initial performance after 2000 hours of continuous light soaking.

Technical Details

The dual-molecule interfacial layer developed by the research team plays a pivotal role in stabilizing the perovskite material. It effectively locks the molecular ordering within the perovskite film, simultaneously suppressing the formation of defects (trap states) and mitigating mechanical stress within the device. This multi-faceted approach leads to a substantial enhancement in charge extraction efficiency for both electrons and holes, while dramatically improving interfacial stability. The suppression of non-radiative recombination at the interfaces contributes to a higher open-circuit voltage (Voc), ultimately boosting the overall PCE. This design also fortifies the device's robustness against external environmental stresses such as heat, humidity, light, and operational bias, providing the crucial long-term reliability required for commercial applications.

Background & Context

Perovskite solar cells have garnered significant attention as a next-generation photovoltaic technology, primarily due to their high efficiency potential and low manufacturing costs. However, one of the main obstacles to their commercialization has been the challenge of simultaneously achieving both high efficiency and long-term stability, particularly when scaling up to larger areas where efficiency tends to drop and degradation becomes more pronounced. Soochow University's achievement, through its innovative dual-molecule interfacial layer, effectively addresses these persistent challenges, marking a critical breakthrough for the practical application of perovskite solar cells.

Strategic Significance & Outlook

This technology, which combines 27.3% efficiency with outstanding long-term stability, holds immense potential for accelerating the commercialization of perovskite solar cells. The ability to maintain high efficiency and durability in large-area modules will facilitate widespread adoption across various applications, from residential rooftops to large-scale power plants. Future efforts will likely focus on simplifying the manufacturing process of this dual-molecule interfacial layer, further scaling up production, and conducting extensive long-term field tests under actual outdoor conditions. This advancement represents a significant step towards realizing a more sustainable and efficient energy future.

Source: https://www.pv-magazine.com/2026/07/03/chinese-scientists-build-27-3-efficient-inverted-perovskite-solar-cell-based-on-dual-molecule-interface/

Collected: July 03, 2026 | Automated Research System (Gemini API)

#09 CATL and CECEP Expand Strategic Partnership to Accelerate Perovskite Solar Commercialization; Chinese Government Supports GCL Optoelectronics and Other Projects

Published June 29, 2026 Perovskite-Info China

OVERVIEW

CATL and China Energy Conservation and Environmental Protection Group (CECEP) have expanded their strategic cooperation agreement to accelerate the commercialization of perovskite solar technology. The partnership focuses on industrialization and large-scale manufacturing of perovskite solar products, with CATL contributing energy materials expertise and CECEP providing diverse application scenarios. Concurrently, China's Ministry of Industry and Information Technology (MIIT) included GCL Optoelectronics' "Full-size High Conversion Rate Perovskite Photovoltaic Modules" and other perovskite projects in its 2026 list of typical smart PV projects, signaling strong government support for practical implementation. These initiatives highlight a robust drive towards industrializing perovskite technology in China.

IN DEPTH

Key Findings

CATL, a global leader in battery manufacturing, has expanded its strategic cooperation agreement with China Energy Conservation and Environmental Protection Group (CECEP) to accelerate the commercialization of perovskite solar technology. This partnership specifically targets the industrialization and large-scale manufacturing of perovskite solar products. In parallel, China's Ministry of Industry and Information Technology (MIIT) has included several perovskite projects, including GCL Optoelectronics' "Full-size High Conversion Rate Perovskite Photovoltaic Modules" and projects from Quzhou FiberNano New Energy Technology, in its 2026 list of typical smart PV projects, indicating significant national support for technological application.

Technical Details

The collaboration between CATL and CECEP aims to optimize the manufacturing process and market deployment of perovskite solar cells by combining CATL's advanced expertise in energy materials with CECEP's extensive application scenarios. This strategy is expected to contribute to the development of mass production techniques, improve cost efficiency, and enhance product reliability. The MIIT-selected projects, on the other hand, focus not only on developing high-efficiency perovskite modules but also on addressing challenges in their practical implementation, underscoring a move towards concrete commercialization phases.

Background & Context

China holds a leading position in the renewable energy sector globally and has invested heavily in photovoltaic technology innovation. Perovskite solar cells are particularly highlighted as a next-generation technology due to their potential for efficiency comparable to, or even surpassing, traditional silicon-based solar cells, coupled with lower manufacturing costs. The strategic alliance between major corporations like CATL and CECEP, alongside direct government support for specific projects, clearly indicates that China is vigorously pursuing the industrialization of perovskite technology as a national strategic imperative. This positions perovskite technology as a major pillar in China's contribution to the global energy transition.

Strategic Significance & Outlook

The reinforced cooperation between CATL and CECEP, complemented by MIIT's government support, is expected to significantly accelerate the commercialization of perovskite solar cell technology in China. This will lead to the introduction of efficient and cost-effective solar power solutions into the market, further boosting the adoption of renewable energy. These developments mark a crucial turning point, as perovskite technology transitions from laboratory research to serious industrial application, potentially reshaping the global solar energy market's competitive landscape in the future. China's strong impetus in this domain will undoubtedly stimulate perovskite technology development in other regions worldwide.

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

Collected: July 03, 2026 | Automated Research System (Gemini API)

#10 Gordon Research Conference to Host 2026 Unconventional Semiconductors Meeting, Focusing on Perovskite Solar Cell Stability

Published June 28, 2026 GRC (Gordon Research Conferences) USA

OVERVIEW

The Gordon Research Conferences (GRC) has announced its 2026 meeting on "Unconventional Semiconductors and Their Applications," focusing on the fundamental materials physics and chemistry of metal-halide perovskites and their applications in solar energy, lighting, and radiation detection. A dedicated session, "What Doesn't Kill Perovskite Solar Cells? In-Operando Characterization Tools to Develop Regeneration Strategies," highlights the critical ongoing research into perovskite stability and degradation mechanisms. This conference serves as a vital platform for knowledge exchange and fostering new breakthroughs among researchers.

IN DEPTH

Key Findings

The Gordon Research Conferences (GRC) has announced its 2026 meeting, titled "Unconventional Semiconductors and Their Applications." This conference will offer an in-depth focus on the fundamental materials physics and chemistry of metal-halide perovskites, exploring their diverse applications in solar energy harvesting, energy-efficient lighting, and radiation detection. A particularly noteworthy session, "What Doesn't Kill Perovskite Solar Cells? In-Operando Characterization Tools to Develop Regeneration Strategies," underscores the paramount importance of ongoing research into perovskite stability and degradation mechanisms, addressing one of the most critical challenges in the field.

Technical Details

The conference agenda will feature cutting-edge presentations on perovskite material synthesis, structural properties, and electronic characteristics. The session dedicated to stability and degradation mechanisms will specifically address strategies for material regeneration and the development of in-operando characterization tools. This includes real-time monitoring of degradation processes, advancements in defect passivation techniques, and the design of novel device architectures. Such research is key to overcoming the major hurdle of long-term reliability in perovskite solar cells for their successful commercialization. The application deadline for participation was June 28, 2026.

Background & Context

Metal-halide perovskites have garnered significant attention from both the scientific and industrial communities over the past decade due to their exceptional optoelectronic properties and flexible synthetic processes. However, their instability in the presence of humidity, heat, and light remains a primary challenge limiting widespread application. The GRC conference provides a unique platform to bridge the gap between fundamental and applied research, bringing together top researchers globally to foster new ideas and collaborations aimed at resolving these complex issues. The very organization of this conference highlights the continuous need for scientific exploration and innovation within the perovskite field.

Strategic Significance & Outlook

The "Unconventional Semiconductors and Their Applications" conference is poised to accelerate advancements in perovskite science and stimulate the development of a new generation of materials and devices. The focused discussions on stability are indispensable for enhancing the commercial viability of perovskite solar cells. New insights and technological innovations presented at this meeting are expected to improve the efficiency and durability of solar photovoltaics, ultimately contributing to the transition towards more sustainable energy systems. Through inter-researcher collaboration, perovskite technology holds the potential to open new frontiers not only in energy but also in diverse fields such as lighting and detection.

Source: https://www.grc.org/unconventional-semiconductors-and-their-applications-conference/2026/

Collected: July 03, 2026 | Automated Research System (Gemini API)

#11 ISFH to Present Latest Perovskite Research, Including Surface Recombination Velocity Measurement, at EU PVSEC in September 2026

Published June 29, 2026 ISFH (Institute for Solar Energy Research Hamelin) Germany

OVERVIEW

The Institute for Solar Energy Research Hamelin (ISFH) in Germany has announced its participation in the 43rd European Photovoltaic Solar Energy Conference and Exhibition (EU PVSEC) in Rotterdam from September 14-18, 2026, where it will present its latest research on perovskite solar cells. Benjamin Grimm will deliver a talk on "Measurement of surface recombination velocities on perovskite layers," while Johannes Löhr will present a poster on 2D perovskite formation at $EDAI_2$-passivated surfaces leading to high efficiencies. This participation highlights ISFH's contributions to perovskite technology and the latest advancements in the PV sector.

IN DEPTH

Key Findings

The Institute for Solar Energy Research Hamelin (ISFH) in Germany has announced its active participation in the 43rd European Photovoltaic Solar Energy Conference and Exhibition (EU PVSEC), scheduled to take place in Rotterdam, Netherlands, from September 14-18, 2026. This international conference will serve as a crucial platform for ISFH to share its specialized knowledge and recent groundbreaking discoveries concerning perovskite solar cells with the global photovoltaic community.

Technical Details

ISFH has several presentations lined up for EU PVSEC 2026, notably a talk by Benjamin Grimm on the "Measurement of surface recombination velocities on perovskite layers." Surface recombination is one of the primary factors limiting solar cell efficiency, and precise measurement of this phenomenon is essential for optimizing device performance. Additionally, Johannes Löhr will present a poster on "2D perovskite formation at the $EDAI_2$-passivated surface [...] resulting in high efficiencies." 2D perovskites are known for their enhanced environmental stability compared to 3D perovskites, suggesting this research could lead to new technologies that balance both efficiency and stability. The conference is set to delve into various aspects of advanced PV technologies, module reliability, and manufacturing methods through these and other research presentations.

Background & Context

The European Photovoltaic Solar Energy Conference and Exhibition (EU PVSEC) is one of the world's leading scientific and technological conferences in the photovoltaic field, serving as a convergence point for the latest research, technological innovations, and market trends. The active participation of top research institutions like ISFH underscores the rapid evolution of perovskite solar cell technology and its tangible steps towards practical application. Specifically, research aimed at suppressing surface recombination and developing 2D perovskites represents critical directions for overcoming the efficiency and long-term stability challenges of perovskite solar cells, contributing to the overall advancement of the industry.

Strategic Significance & Outlook

ISFH's presence at EU PVSEC 2026 highlights the significant role German research institutions play at the forefront of perovskite solar cell technology. The presented research findings will directly contribute to the development of higher-performance and more durable perovskite solar cells, potentially shaping the future direction of photovoltaic technology. The knowledge exchange and collaborative opportunities fostered at the conference will further accelerate the commercialization of perovskite technology, serving as a critical step towards a global transition to clean energy.

Source: https://isfh.de/en/events/43-eu-pvsec-2026-en

Collected: July 03, 2026 | Automated Research System (Gemini API)

#12 Verde Technologies Appoints Jean-Noël Poirier as CEO to Accelerate Commercialization of Thin-Film Perovskite Solar Cells and Entry into Space Market

Published June 30, 2026 TaiyangNews USA

OVERVIEW

Verde Technologies, a U.S. thin-film perovskite solar cell technology company, has appointed solar industry veteran Jean-Noël Poirier as its new CEO. The company aims to accelerate the commercialization of its thin-film perovskite solar technology, targeting high-value markets, starting with the space power generation sector. Verde believes its roll-to-roll manufacturing approach can significantly reduce production costs compared to conventional silicon-based solar cell technology. This strategic decision marks a crucial step to accelerate the company's growth and market deployment under new leadership.

IN DEPTH

Key Findings

Verde Technologies, a U.S.-based company specializing in thin-film perovskite solar cell technology, has announced the appointment of Jean-Noël Poirier, a seasoned veteran in the solar industry, as its new Chief Executive Officer (CEO). This strategic leadership change is designed to accelerate Verde Technologies' commercialization efforts for its thin-film perovskite solar cells, with an initial focus on penetrating the space power generation market before expanding into other high-value sectors.

Technical Details

Verde Technologies emphasizes its proprietary roll-to-roll manufacturing approach, which it believes holds the potential for substantial production cost reductions compared to traditional silicon-based solar cell technologies. The roll-to-roll process is highly efficient and scalable for mass production, as it allows for continuous thin-film deposition on flexible substrates. Under Poirier's leadership, the company aims to leverage this technical advantage, particularly in the space market where high reliability and performance under harsh environmental conditions are critical. Verde's products are uniquely suited for space applications due to their lightweight, flexible nature, and inherent resistance to radiation.

Background & Context

Perovskite solar cells are widely anticipated as a next-generation photovoltaic technology, offering a combination of high efficiency and low-cost manufacturing potential. Thin-film perovskites, in particular, bring advantages of lightweightness and flexibility, enabling applications that are challenging for rigid silicon solar cells, such as in space, IoT devices, and wearable electronics. Companies like Verde Technologies focusing on such niche, high-growth markets and bringing in experienced leadership demonstrate the diverse commercialization strategies emerging within the perovskite technology landscape.

Strategic Significance & Outlook

The appointment of Jean-Noël Poirier as CEO marks a significant juncture in Verde Technologies' growth phase. Under his guidance, the company is poised to further refine its roll-to-roll manufacturing capabilities and accelerate product deployment in the space power generation market. Initial success in this specialized market is expected to serve as a springboard for expansion into other high-value applications, ultimately aiming to establish broader competitiveness within the general solar market. Verde Technologies' trajectory illustrates the significant potential of perovskite solar cells not just for conventional terrestrial installations but also for specialized markets, driving diverse evolution within the industry.

Source: https://taiyangnews.info/people/verde-names-jean-no%C3%ABl-poirier-ceo-to-scale-perovskite-solar

Collected: July 03, 2026 | Automated Research System (Gemini API)