Perovskite solar

Weekly Intelligence Report

2026-06-13 | 12 articles | 8 countries

troy-technical.jp

This Week's Keyword

Perovskite Scale-Up

Efficiency, Stability, & Manufacturing Drive

12	8	35.2	20
articles	countries	%	years
Total Articles	Source Countries	Record Tandem Efficiency	Target Lifespan

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	Lead-Free PSC Review	Research Review	●●○○○	●○○○○	●●●○○	●●●●●	●●●○○	Review highlights 15%+ efficiency in lead-free perovskites, but stability, toxicity, and scalability remain hurdles.
#02	UNSW 35.2% Tandem Field	Corporate Strategy	●●●●○	●●●○○	●●●●●	●●●●○	●●●●●	UNSW launches field-testing for 35.2% tandem perovskite cells, aiming to validate 25-40 year stability.
#03	Asia GW Scale & Space PV	Market Overview	●●●○○	●●●●○	●●●●○	●●●○○	●●●●○	China building 3GW perovskite factory, Korea's Flexell launches space-PV pilot, INFICON QCM tech aids scale.
#04	Yan'an C-PSC 18.35%	Research	●●●●○	●●○○○	●●●○○	●●●○○	●●●○○	Yan'an University achieves 18.35% efficiency in carbon-based PSCs, boosting stability with fluorinated polymer interface.
#05	Oxford PV Durability	Industry Analysis	●●●○○	●●●○○	●●●●○	●●●○○	●●●●●	Perovskite cells hit 30.6% efficiency, but Oxford PV's 10-year lifespan needs to reach 20 years by 2027 for market.
#06	Halocell Indoor PV Scale	Corporate Strategy	●●○○○	●●●●○	●●○○○	●●●●○	●●●○○	Halocell Energy secures AUD 606.6K grant to boost indoor perovskite PV module production 14-fold.
#07	KIT/Valencia Solvent-Free	Research	●●●●○	●●○○○	●●●●○	●●●○○	●●●●●	KIT/Valencia develop high-throughput, solvent-free vacuum process for scalable tandem solar cell production with bandgap control.
#08	US DOE R&D; 27% Tandem	Government Policy	●●●○○	●●○○○	●●●●○	●●●●○	●●●●●	US DOE updates perovskite R&D;, focusing on 27% efficient tandem cells and enhanced stability via SAMs.
#09	US DOE Next-Gen PV	Government Policy	●●●○○	●●○○○	●●●●○	●●●●○	●●●●●	US DOE continues investing in next-gen PV, targeting >25% efficiency, lead-free solutions, and enhanced stability.
#10	EU PVSEC 2026 Event	Conference	●○○○○	●○○○○	●●●○○	●●●○○	●●●●●	EU PVSEC 2026 to host special event on sustainable perovskite PV commercialization, scaling, and pilot development.
#11	US DOE Startup Prize	Government Policy	●●○○○	●●●●○	●●●●○	●●●●○	●●●●●	US DOE updates $3M Perovskite Startup Prize to accelerate lab-to-market transition for US companies.
#12	nanoGe NIPHO26 Conf.	Conference	●○○○○	●○○○○	●●●○○	●●●○○	●●●●○	nanoGe NIPHO26 conference debates perovskite thin film solar cell stability and scale-up challenges.

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

Three Questions That Demand Your Decision This Week

❶ Is your perovskite durability roadmap competitive?

With UNSW aiming for 25-40 year stability (Article #02) and Oxford PV targeting 20 years by 2027 (Article #05), current 10-year lifespans are insufficient. What specific R&D; investments are needed to close this gap?

❷ How will you counter Asian GW-scale manufacturing?

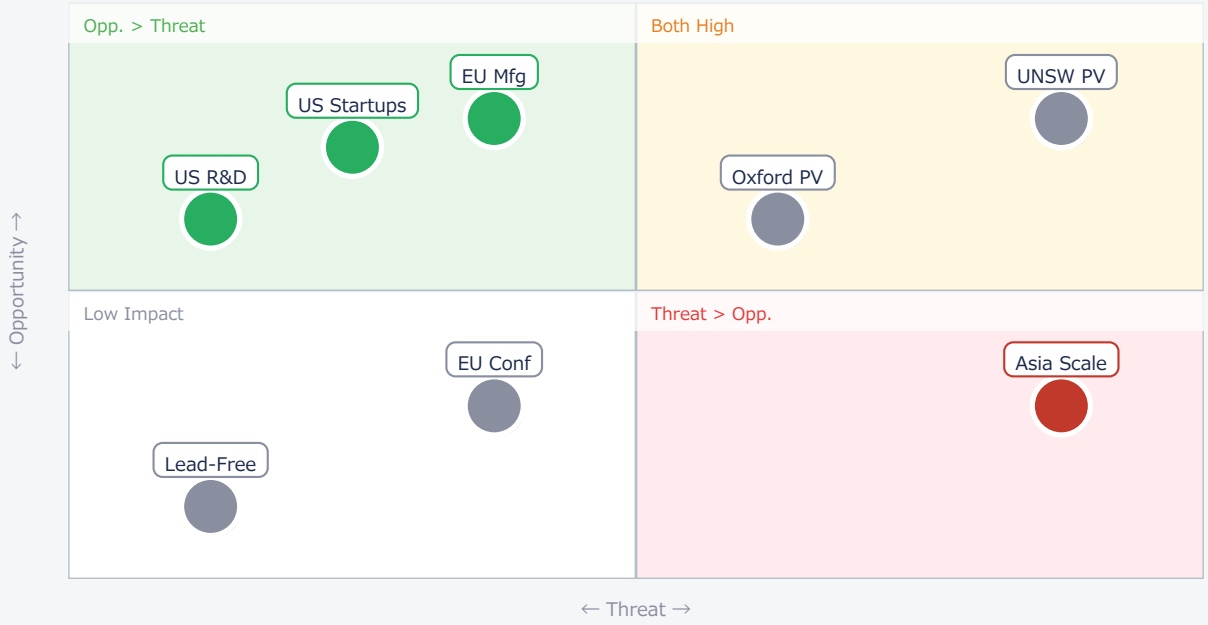
China's 3GW factory (Article #03) signals aggressive market entry. What is your strategy for cost-effective, high-volume production in the US/EU, leveraging new processes (Article #07) and government support (Articles #08, #11)?

❸ Are your materials ready for lead-free regulations?

The push for sustainable, lead-free perovskites is growing (Article #01, #09). Does your R&D; pipeline include viable, high-efficiency lead-free alternatives, and how will you mitigate potential toxicity concerns?

Opportunities vs. Threats for US/European Companies

Opportunity vs. Threat Matrix for US/European Companies



Item	Quadrant	↑ Opportunity	↓ Threat
UNSW PV	Critical	New efficiency records	Stability validation
Asia Scale	Threat	Niche market entry	Production dominance
Oxford PV	Critical	Lifespan extension	Market trust gap
EU Mfg	Opp.	Scalable EU process	Slow adoption risk
US R&D;	Opp.	US tech leadership	Missed funding
US Startups	Opp.	New US ventures	Limited market share
Lead-Free	Ref.	Sustainable materials	Regulatory pressure
EU Conf	Ref.	Collaboration forum	Slow progress

Deep Dive ① — UNSW Targets 35.2% Tandem PV Stability

#02 | 2026/06/04 | UNSW Sydney | Tech Novelty●●●●○ Proximity●●●○○ Market Impact●●●●● Data Reliability●●●●○ US/EU Relevance●●●●●

Professor Martin Green of UNSW is establishing a field-testing facility to validate the long-term durability of perovskite solar modules, aiming to commercialize 35.2% efficient perovskite-on-silicon tandem cells. This initiative addresses the critical hurdle of achieving 25-40 year stability, comparable to silicon, which is essential for widespread adoption.

The 35.2% efficiency, confirmed by NREL, surpasses the Shockley-Queisser limit for single-junction cells. The field tests will provide crucial real-world data on perovskite behavior under various environmental factors, accelerating material optimization and protective layer development.

▶ Strategic Analyst's Perspective

Strategic Analyst's Perspective: The 35.2% efficiency is a lab record, and field testing is a crucial step towards commercialization, but achieving 25-40 year stability in real-world conditions remains a significant technical barrier. The published numbers are realistic for lab conditions, but long-term degradation mechanisms are complex. [Opportunity] for US/EU OEMs to integrate these high-efficiency tandem cells if stability is proven, potentially leapfrogging current silicon limits. [Threat] if Asian competitors validate stability first, gaining a significant market advantage. Next actions: [R&D;] Immediately benchmark internal stability roadmaps against this 25-40 year target. [Strategy] Evaluate potential partnerships with research institutions or startups focused on long-term encapsulation and material science by end of quarter.

Deep Dive ② — KIT/Valencia's Scalable Solvent-Free Process

#07 | 2026/06/08 | Photonics Spectra | Tech Novelty●●●●○ Proximity●●○○○ Market Impact●●●●○ Data Reliability●●●○○ US/EU Relevance●●●●●

Researchers from KIT and the University of Valencia have developed a high-throughput, solvent-free vacuum process for fabricating single-junction and two-terminal perovskite-silicon tandem solar cells. This method allows for uniform perovskite layer formation on textured silicon and precise bandgap control, crucial for high-efficiency tandem devices.

Eliminating hazardous solvents reduces environmental impact and manufacturing costs, while vacuum deposition enhances layer uniformity and purity. This breakthrough addresses key challenges in scalability and reproducibility for complex tandem structures, paving the way for industrial deployment.

▶ Strategic Analyst's Perspective

Strategic Analyst's Perspective: This solvent-free vacuum process is a significant technical advancement, addressing both environmental concerns and manufacturing scalability, which are major barriers for perovskite commercialization. The published claims appear realistic for lab-scale proof-of-concept. Technical barriers include scaling the vacuum deposition equipment for large-area substrates and ensuring cost-effectiveness at industrial throughputs. [Opportunity] for US/EU equipment manufacturers and OEMs to license or develop similar clean, high-throughput processes, gaining a competitive edge in sustainable manufacturing. [Threat] if Asian manufacturers adopt and optimize such processes faster, solidifying their production dominance. Next actions: [Procurement] Investigate availability and cost of vacuum deposition equipment compatible with this technology within 1 month. [R&D;] Initiate internal R&D; projects to evaluate solvent-free deposition techniques for perovskite films by next quarter.

Deep Dive ③ — US DOE Accelerates Perovskite Startups

#11 | 2026/06/04 | U.S. Department of Energy (DOE) Solar Energy Technologies Office (SETO) | Tech Novelty●●○○○ Proximity●●●●○ Market Impact●●●●○ Data Reliability●●●●○ US/EU Relevance●●●●●

The U.S. Department of Energy (DOE)'s SETO has updated its $3 million "American-Made Challenges: Perovskite Startup Prize." This two-stage competition aims to accelerate the transition of perovskite solar cell research from labs to new U.S. businesses, fostering domestic manufacturing.

Winners receive $500,000 in cash and a $100,000 technical support voucher to launch marketable perovskite products. This initiative is critical for bridging the 'valley of death' for startups and strengthening the U.S. clean energy supply chain.

▶ Strategic Analyst's Perspective

Strategic Analyst's Perspective: The DOE's Startup Prize is a strong policy signal and a tangible mechanism to accelerate US domestic perovskite commercialization. The funding amounts are realistic for early-stage startups but will require significant follow-on investment. The primary technical barrier for these startups will be scaling lab-proven concepts to reliable, mass-producible products. [Opportunity] for US materials & component suppliers to partner with or acquire promising startups, and for US OEMs to secure domestic supply chains. [Threat] for US companies if they fail to engage with these programs, allowing foreign competitors to outpace them in market entry. Next actions: [Business Dev] Identify and engage with potential startup prize applicants or past winners for collaboration or investment opportunities immediately. [Strategy] Develop a clear strategy for leveraging government funding and incentives for domestic perovskite manufacturing by next month.

Other Notable Articles

#01 Advancements in Lead-Free Perovskite Solar Cells: Progress and Strategic Roadmap to Overcome Stability and Efficiency Hurdles (ResearchGate)
Tech Novelty●●○○○ Proximity●○○○○ Market Impact●●●○○

A comprehensive review of lead-free perovskite progress, highlighting 15%+ efficiency but persistent stability and scalability challenges.

#03 China Advances 3GW Perovskite Factory, Korea's Flexell Launches Space-PV Tandem Production, INFICON QCM Tech Boosts Scalable Manufacturing (Perovskite-Info)
Tech Novelty●●●○○ Proximity●●●●○ Market Impact●●●●○

Asian nations are aggressively scaling perovskite production, with China building a 3GW factory and Korea targeting space PV.

#05 Perovskite Solar Cells: 30.6% Efficiency Achieved, But 10-Year Durability Remains a Key Challenge for Oxford PV's 20-Year Target by 2027 (Sunsave)
Tech Novelty●●●○○ Proximity●●●○○ Market Impact●●●●○

While efficiency is high, Oxford PV's 10-year lifespan is a critical barrier; 20-year durability by 2027 is crucial for market trust.

#08 U.S. DOE Updates Perovskite Solar Cell R&D; Program, Focusing on 27% Efficient Tandem Cells and Enhanced Stability Technologies (U.S. Department of Energy (DOE))
Tech Novelty●●●○○ Proximity●●○○○ Market Impact●●●●○

US DOE is actively funding R&D; for 27% efficient tandem cells and stability improvements, aiming to secure US leadership.

#10 EU PVSEC 2026 to Host Special Event on Sustainable Perovskite PV Commercialization: Discussing Scaling, Pilot Development, and Lessons from EU Projects (EU PVSEC)

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

EU PVSEC 2026 will focus on sustainable perovskite commercialization, scaling, and pilot line development, signaling EU strategic intent.

Recommended Actions This Week

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

Immediate (this week)

- [Strategy] Assess competitive landscape, especially Asian GW-scale manufacturing capabilities and timelines (Article #03).
- [R&D;] Review internal perovskite stability roadmaps against UNSW's 25-40 year target (Article #02) and Oxford PV's 2027 goal (Article #05).
- [Business Dev] Investigate US DOE Perovskite Startup Prize (Article #11) for potential partnership or acquisition opportunities with emerging US companies.

Short-term (1 month)

- [R&D;] Prioritize lead-free perovskite material development and interface engineering for enhanced stability and efficiency (Articles #01, #04, #09).
- [Procurement] Evaluate solvent-free vacuum deposition equipment and processes for scalable tandem cell manufacturing (Article #07) to reduce costs and environmental impact.
- [Strategy] Develop a regional manufacturing strategy to counter Asian production dominance (Article #03), leveraging US/EU government support and initiatives (Articles #08, #09, #10).

Medium-long term (quarter+)

- [Executive] Establish strategic partnerships for large-scale perovskite module production and long-term field validation to meet market durability expectations.
- [Legal/IP] Develop a robust IP portfolio around perovskite stability, advanced manufacturing processes, and lead-free alternatives to secure future market position.
- [Strategy] Diversify supply chains for critical perovskite precursors and manufacturing equipment, reducing reliance on single regions and enhancing resilience.

PerovskiteSolarCells — Selected Articles

Date: 2026-06-13

Articles: 12

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Advancements in Lead-Free Perovskite Solar Cells: Progress and Strategic Roadmap to Overcome Stability and Efficiency Hurdles

Published June 04, 2026 ResearchGate Unknown

OVERVIEW

A new review paper comprehensively analyzes the technological progress of lead-free perovskite solar cells, which offer a sustainable alternative to lead-based counterparts. While lead-free devices utilizing bismuth, germanium, or tin show theoretical efficiencies exceeding 20% and experimental efficiencies above 15%, significant challenges remain in achieving competitive efficiency, long-term stability, mitigating inherent toxicity, and ensuring scalability for commercialization. The review outlines strategic research and development directions to address these issues, paving the way for environmentally friendly photovoltaic technologies.

IN DEPTH

Recent Progress in Lead-Free Perovskite Solar Cells and Strategic Challenges

This comprehensive review article meticulously analyzes the latest research advancements in lead-free perovskite solar cells (PSCs), a critical area of development aimed at mitigating the environmental and health concerns associated with lead-containing counterparts. It highlights the potential of alternative materials such as bismuth (Bi), germanium (Ge), and tin (Sn) to deliver both high efficiency and environmental compatibility in next-generation photovoltaics.

Technical and Material Details, and Current Obstacles

- **Efficiency Milestones:** Lead-free PSCs have demonstrated theoretical efficiencies that could surpass 20%, with experimental devices achieving power conversion efficiencies (PCEs) above 15%. While these figures do not yet match the highest records of lead-based PSCs, they represent significant progress for alternative materials.
- **Alternative Materials and Architectures:** Key research areas include bismuth-based double perovskites like Cs2AgBiBr6 and tin-based perovskites such as CsSnI3. Efforts are concentrated on optimizing their bandgap, enhancing stability, and improving charge transport properties.
- **Core Technical Challenges:** Current lead-free PSCs face persistent issues including lower efficiencies compared to lead-based variants, inherent instability to moisture and oxygen, potential toxicity of some alternatives (e.g., oxidized tin), and difficulties in scaling up for mass production. Overcoming these hurdles is paramount for successful commercialization.

Background and Industry Context

Solar energy is vital for meeting global energy demands, yet conventional silicon solar cells pose challenges in manufacturing cost and flexibility. Perovskite solar cells, as a promising next-generation technology, offer high efficiency and low-cost manufacturing potential. However, the toxicity of lead, a primary component in many high-performing perovskites, raises significant environmental and health concerns. Consequently, the development of lead-free materials is crucial for ensuring the sustainability and widespread market adoption of perovskite solar cells.

Future Outlook

The review provides a strategic roadmap for future research and development in lead-free PSCs. It emphasizes the need for continued advancements in material science to fine-tune bandgaps, refine defect passivation techniques, develop novel interface materials, and optimize device architectures. Furthermore, establishing robust long-term stability evaluation methods and conducting real-world performance validation are identified as indispensable steps to accelerate practical implementation. Through these concerted efforts, lead-free perovskite solar cells hold the promise of playing a pivotal role in the future clean energy landscape.

Source: https://www.researchgate.net/publication/398944806_A_review_on_recent_progress_in_lead-free_perovskite-based_solar_cell_materials

UNSW Professor Martin Green Establishes Field-Testing Facility for Perovskite Solar, Aiming to Commercialize 35.2% Tandem Efficiency

Published June 04, 2026 UNSW Sydney Australia

OVERVIEW

Professor Martin Green of UNSW Sydney, renowned as the "father of modern photovoltaics," is establishing an independent field-testing facility for perovskite solar modules to validate their long-term durability under real-world conditions. This initiative aims to accelerate the commercialization of perovskite technology as silicon cells approach their efficiency limits. Recent international reports indicate perovskite-on-silicon tandem cells have achieved a remarkable 35.2% efficiency, but establishing 25-40 year stability, comparable to silicon, remains the primary hurdle for widespread adoption.

IN DEPTH

UNSW's Professor Green Launches Field-Testing Facility for Perovskite, Driving Commercialization of 35.2% Tandem Cells

Professor Martin Green of the University of New South Wales (UNSW), globally recognized as the "father of modern photovoltaics," has announced a new initiative to accelerate the commercialization of perovskite solar cells. This move comes as conventional silicon solar cells approach their theoretical efficiency limits. As part of this effort, an independent field-testing facility will be established to evaluate the long-term durability of perovskite solar modules under real-world environmental conditions.

Technical and Clinical Details

- **World Record Efficiency Update:** According to the latest international solar cell efficiency tables (NREL Chart), laboratory-scale perovskite-on-silicon tandem cells have recorded an extraordinary power conversion efficiency of 35.2%. This significantly surpasses the highest efficiencies for single-junction silicon cells (28.1% for large areas) and small perovskite cells (28.0%), unequivocally demonstrating the potential of tandem structures to exceed the Shockley-Queisser limit.
- **Importance of Durability Assessment:** Professor Green's research focuses on transforming this high-efficiency technology into a commercially sustainable product. While silicon solar cell modules offer long-term warranties of 25 to 40 years, current perovskite modules have yet to achieve comparable long-term stability. The new field-testing facility will meticulously analyze perovskite behavior under complex outdoor environmental factors such as temperature fluctuations, humidity, and UV radiation, providing crucial data for durability improvements.

Background and Industry Context

Solar power is a cornerstone of the global clean energy transition, but silicon technology is mature, facing physical limits for further efficiency gains. Perovskite solar cells, with their excellent light absorption properties and relatively inexpensive manufacturing processes, are anticipated as a "game-changer" to overcome these limitations. Specifically, tandem structures combining perovskites with existing silicon solar cells offer the potential for efficiencies unattainable by either technology alone, promising significant improvements in solar power's cost-effectiveness.

Future Outlook

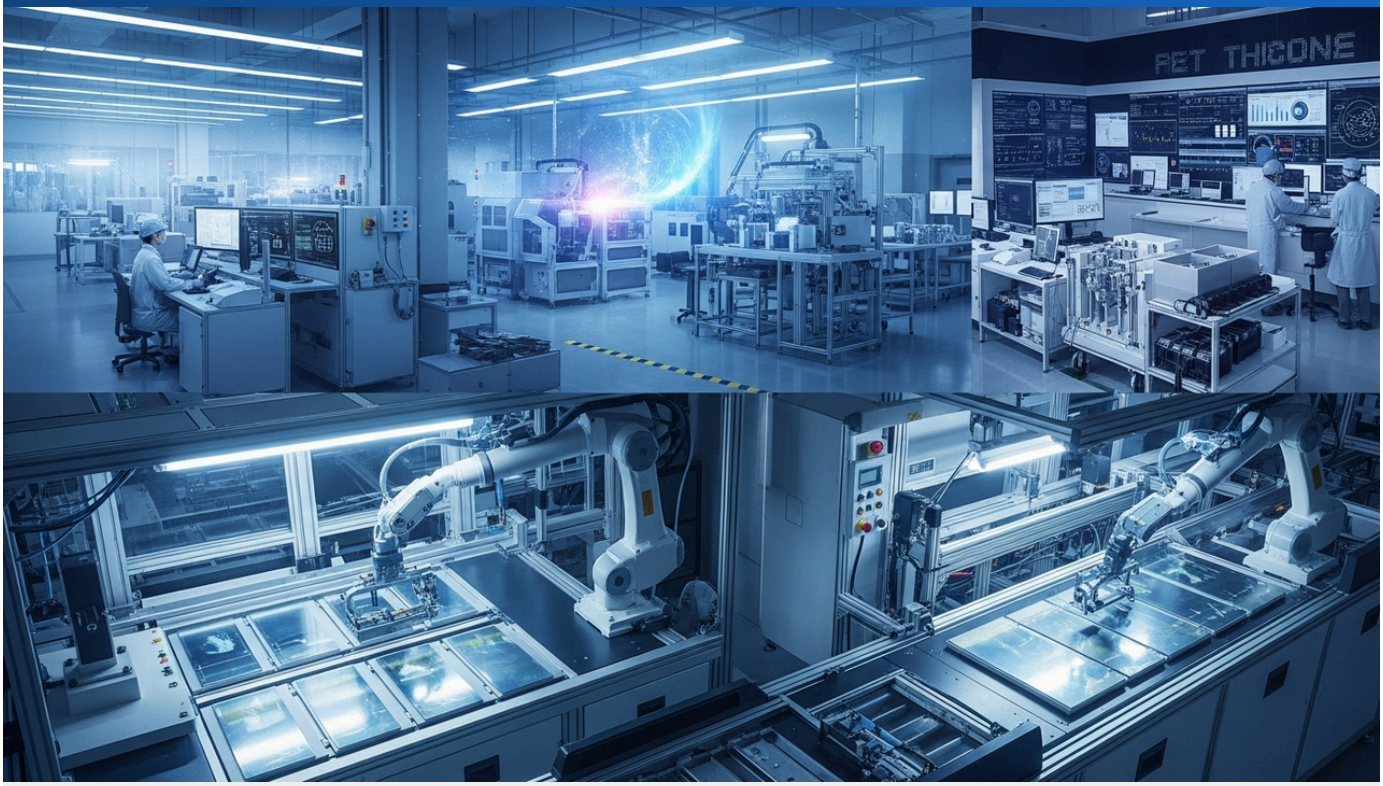
Professor Green states that the insights gained from this field-testing facility will be indispensable for resolving the long-term stability issues of perovskite solar cells and clarifying their path to commercialization. The collection and analysis of real-world performance data are expected to accelerate the optimization of material composition, refinement of device architecture, and advancement of protective layer technologies. This initiative represents a critical step for perovskite technology to play a major role in the global energy mix.

Source: https://www.unsw.edu.au/newsroom/news/2026/06/father-of-modern-solar-approaches-the-next-frontier

Collected: June 12, 2026 | Automated Research System (Gemini API)

Global Perovskite Surge: China's 3GW Factory, Korea's Space Cells, and INFICON's Precision Drive Commercialization

Published Published June 09, 2026 Perovskite-Info China、South Korea、イタリア、Germany



OVERVIEW

Global efforts to commercialize perovskite solar cells are accelerating rapidly. China is set to complete a 3GW module manufacturing base by October 2026, while South Korea's Flexell Space has launched a pilot for high-value space-grade perovskite/CIGS tandem cells. Crucially, advancements in precision manufacturing, such as INFICON's QCM-monitored thermal evaporation, are enabling the high yield and stability essential for widespread adoption.

IN DEPTH

Background

The global push towards the commercial production of perovskite solar cells is gaining significant momentum, with substantial investments and technological advancements observed particularly in Asia and Europe. Perovskite solar cells represent a next-generation technology with numerous advantages over traditional silicon cells, including lower manufacturing costs, high power conversion efficiencies, and applicability to flexible substrates. These characteristics position them for diverse markets, ranging from utility-scale ground-mounted power plants and Building-Integrated Photovoltaics (BIPV) to portable electronics and even advanced space applications. While significant challenges to mass production remain, robust government support and inter-company collaborations are actively accelerating their commercialization.

Key Findings

China Construction Second Engineering Bureau is making rapid progress on a 3-gigawatt (GW) perovskite solar cell module manufacturing base in southwestern China. The installation of its metal roof structure is complete, with the facility slated for full completion and handover by October 2026. This project marks a critical milestone for the large-scale deployment of perovskite solar technology.

- **Flexell Space (Korea) Targets Space Applications:** South Korean company Flexell Space has inaugurated a pilot manufacturing facility in Uiwang for perovskite/CIGS tandem solar cells, specifically engineered for demanding space applications. This facility aims to produce 20 high-efficiency, lightweight tandem cells (each 20cm x 20cm) per day, strategically targeting high-value niche markets where their unique properties offer distinct advantages.
- **Italy's New Time Collaborates on Production Roadmap:** Italy's New Time has partnered with China's Huasun to outline a detailed four-phase roadmap for perovskite panel production within Italy. This comprehensive roadmap encompasses refining material formulations for improved performance and durability, ensuring robust device stabilization, obtaining crucial international certifications, and ultimately establishing full-scale industrial manufacturing capabilities.

- **INFICON's Precision Deposition Technology Enhances Scalability:** A pivotal factor in achieving scalable perovskite production is precise control over manufacturing processes. INFICON's innovative approach combines thermal evaporation with real-time quartz crystal microbalance (QCM) monitoring to achieve extremely high accuracy in perovskite solar cell deposition. QCM plays an indispensable role by providing real-time measurement of layer thickness and composition during the evaporation process. This meticulous control ensures stable device characteristics and high production yields, as even minor variations in layer thickness and composition can significantly accelerate device degradation. This precision control technology is thus crucial for achieving the long-term stability required for broad market adoption.

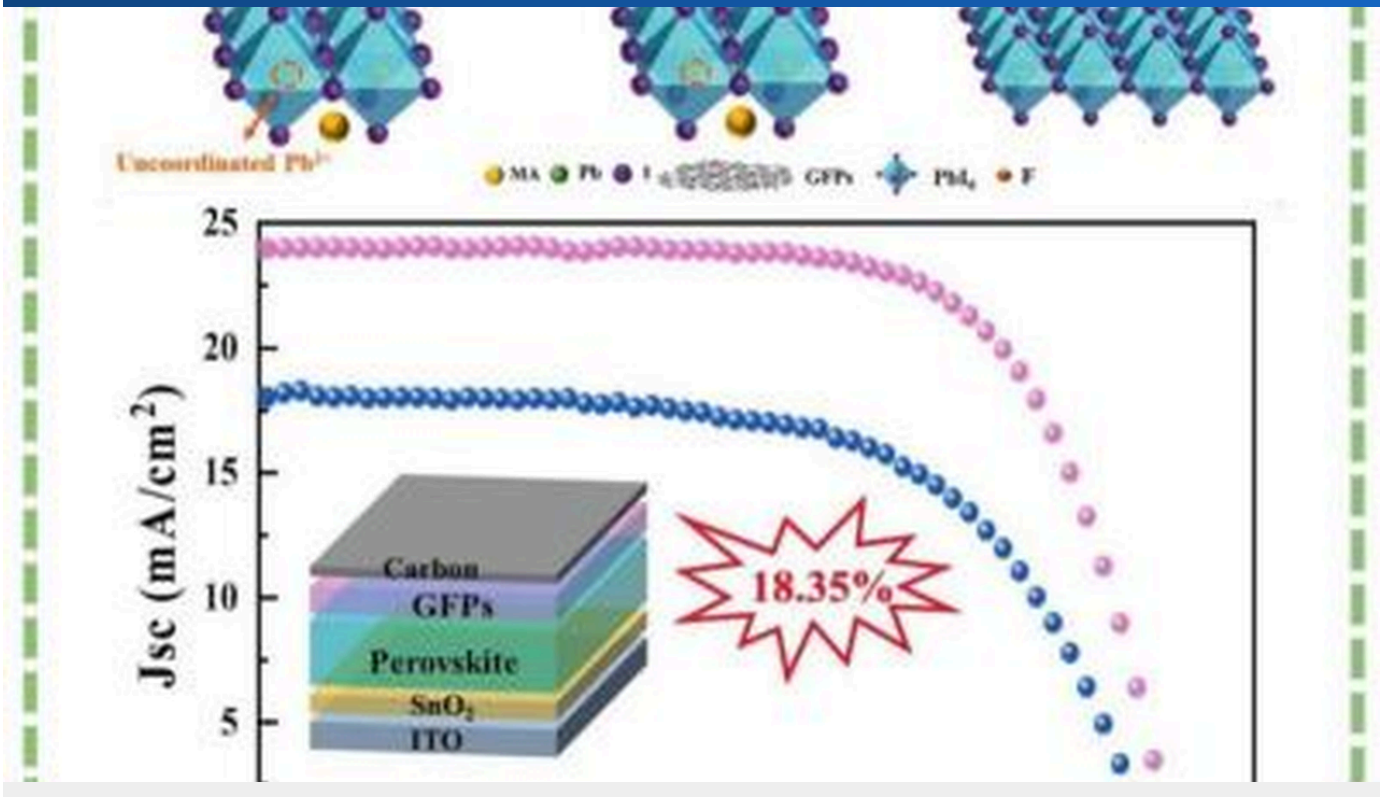
The establishment of these new manufacturing bases and pilot lines provides clear evidence that perovskite solar cell technology is transitioning from the research and development phase into mass production. The integration of such precision manufacturing process control technologies is vital for enhancing product reliability and market competitiveness, significantly broadening the potential for perovskite solar cells to become a major player in the global energy market. Furthermore, initial applications in high-value niche markets, such as space, will offer critical opportunities to rigorously demonstrate the technology's reliability and superior performance.

Source: https://www.perovskite-info.com/tags/perovskite-solar-production

Collected: June 12, 2026 | Automated Research System (Gemini API)

Yan'an University Achieves 18.35% Efficiency in Carbon-Based Perovskite Solar Cells, Fluorinated Polymer Interface Boosts Stability

Published June 06, 2026 Perovskite-Info China



OVERVIEW

Researchers at Yan'an University have achieved a 18.35% power conversion efficiency in carbon-based perovskite solar cells (C-PSCs) by implementing a novel interface engineering strategy using fluorinated graphite polymers (GFPs). This GFP layer effectively passivates defects and modulates energy levels in the perovskite film, significantly improving charge extraction and environmental stability. This breakthrough is expected to contribute substantially to the commercialization of low-cost, highly stable C-PSCs.

IN DEPTH

Yan'an University Elevates Carbon-Based Perovskite Solar Cell Efficiency to 18.35% and Enhances Stability with Fluorinated Polymer Interface Technology

Researchers at Yan'an University in China have unveiled a new interface engineering strategy that dramatically improves the performance of carbon-based perovskite solar cells (C-PSCs). By incorporating fluorinated graphite polymers (GFPs), they successfully boosted the power conversion efficiency (PCE) of C-PSCs to 18.35%. This represents a significant advancement, paving the way for the commercialization of C-PSCs.

Technical and Clinical Details

- **Multifunctionality of GFPs:** The introduced GFPs act as a functional layer on the methylammonium lead iodide (MAPbI3) perovskite thin film. This GFP layer enhances device performance through several mechanisms:
    - **Defect Passivation:** It effectively passivates trap states at the perovskite crystal surface and grain boundaries, thereby suppressing non-radiative recombination.
    - **Energy Level Modulation:** The GFPs optimize the band alignment of the device, enhancing the efficiency of charge carrier extraction.
    - **Crystallization Control:** They promote secondary grain growth within the perovskite film, leading to improved film quality and uniformity.
- **Formation of Hydrophobic Barrier:** The GFP layer also forms a hydrophobic dipole layer on the perovskite film. This significantly boosts the device's resistance to external environmental factors such as moisture and oxygen, thereby enhancing long-term stability.
- **Performance Enhancement:** These improvements collectively lead to enhanced charge extraction efficiency and reduced non-radiative recombination losses, ultimately achieving a high efficiency of 18.35% and excellent environmental stability.

Background and Industry Context

Conventional hole-transport layer (HTL)-free carbon-based perovskite solar cells, which eliminate the need for precious metal electrodes and can be manufactured at low cost, hold great promise as a future low-cost photovoltaic technology. However, their performance, especially long-term stability, has been a major challenge for commercialization. This research demonstrates the potential to overcome these challenges through a simple surface modification, expanding the applicability of C-PSCs.

Future Outlook

Yan'an University's research unequivocally demonstrates that interface engineering using fluorinated polymers is a powerful strategy for simultaneously enhancing both the efficiency and stability of C-PSCs. This technology offers a new pathway to realize high-performance, reliable perovskite solar cells while keeping manufacturing costs low. In the future, the integration of this approach into large-scale production processes is expected to significantly increase the adoption of C-PSCs in broader markets.

Source: https://www.perovskite-info.com/yanan-university-boosts-carbon-based-perovskite-solar-cell-efficiency-1835

Collected: June 12, 2026 | Automated Research System (Gemini API)

Perovskite Solar Cells: 30.6% Efficiency Achieved, But 10-Year Durability Remains a Key Challenge for Oxford PV's 20-Year Target by 2027

Published June 09, 2026 Sunsave UK

OVERVIEW

A Sunsave article examines the current state of perovskite solar cells, reporting record efficiencies of 30.6% by Trina Solar (June 2025) and 26.9% for Oxford PV's residential panels (2024). While perovskite-silicon tandem cells offer efficiencies exceeding the Shockley-Queisser limit, the current commercial lifespan of Oxford PV's panels is only 10 years. Although the company aims for 20 years by 2027, this falls significantly short of conventional silicon panels' 25-40 year warranties, highlighting a critical challenge for market adoption.

IN DEPTH

Perovskite Solar Cells: Achieving 30.6% Efficiency While Facing the 10-Year Durability Challenge, with Oxford PV Targeting 20 Years by 2027

Sunsave has published an article providing a detailed analysis of the current status and commercialization prospects of perovskite solar cells, a technology garnering significant attention as a next-generation photovoltaic solution. The article highlights the remarkable efficiency records achieved by perovskite technology while simultaneously focusing on the critical challenge of long-term durability that still needs to be overcome.

Key Achievements and Technical Challenges

- **Record-Breaking Efficiency:**
  - Trina Solar has achieved a record power conversion efficiency of 30.6% for perovskite solar cells as of June 2025.
  - Oxford PV's residential perovskite-on-silicon tandem panels recorded an efficiency of 26.9% in 2024, demonstrating tangible progress towards practical application.
- **Superiority of Tandem Cells:** Tandem solar cells, which combine perovskites with silicon, possess the potential to achieve efficiencies beyond the Shockley-Queisser limit (approximately 29%)—the theoretical maximum for single-junction silicon solar cells. This capability is considered one of the most compelling advantages of perovskite technology.
- **Durability Concerns:** The most significant challenge lies in the lifespan and stability of the panels. The expected lifespan of current commercial perovskite-silicon tandem panels from Oxford PV is only 10 years, starkly contrasting with the 25–40 year warranties offered by conventional silicon panels. While Oxford PV aims to extend this lifespan to 20 years by 2027, further improvements are essential to establish market trust and widespread adoption.

Background and Industry Context

The solar energy market is central to the global transition to sustainable energy, but with the maturation of silicon technology, there is a growing demand for more efficient and cost-effective alternatives. Perovskite solar cells have emerged as a promising candidate to meet this need due, to their excellent light absorption properties, ease of manufacturing via solution processes, and potential for low cost. However, stability issues, particularly their vulnerability to moisture, heat, and UV light, have been obstacles to large-scale commercial deployment. While recent advances in materials science and device architecture have led to significant efficiency gains, extending lifespan remains the paramount challenge.

Future Outlook

The commercial success of perovskite solar cells depends heavily not only on their efficiency but also on their long-term reliability and durability. The proactive efforts by leading companies like Oxford PV to extend product lifespan are positive indicators for the entire industry. Over the coming years, advancements in material stability, evolution of encapsulation technologies, and optimization of manufacturing processes are expected to enable perovskite solar cells to achieve a lifespan and cost-performance comparable to, or even surpassing, conventional silicon panels, thereby revolutionizing the energy market.

Source: https://www.sunsave.energy/solar-panels-advice/solar-technology/perovskite

Collected: June 12, 2026 | Automated Research System (Gemini API)

Australian Halocell Energy Secures AUD 606.6K Government Grant, Boosting Indoor Perovskite PV Module Production by 14-Fold

Published June 09, 2026 pv magazine Global Australia

OVERVIEW

Australian Halocell Energy has secured an AUD 606,680 (approx. USD 428,000) grant from the Australian government's Industry Growth Program. This funding will be utilized to upgrade its manufacturing facility in Wagga Wagga, New South Wales, with advanced roll-to-roll manufacturing equipment. The initiative aims to dramatically increase the annual production of indoor perovskite PV modules from 7,000 to 100,000 units, a nearly 14-fold expansion, accelerating the company's commercialization and establishing advanced solar technology in Australia.

IN DEPTH

Australian Halocell Energy Obtains AUD 606.6K Government Grant, Scaling Indoor Perovskite PV Module Production 14-Fold from 7,000 to 100,000 Units Annually

Halocell Energy, a leading Australian developer of advanced perovskite solar cells, has secured a significant grant of AUD 606,680 (approximately USD 428,000) from the Australian government's Industry Growth Program. This funding is earmarked for a substantial expansion of the company's perovskite PV manufacturing capabilities at its facility in Wagga Wagga, New South Wales.

Key Achievements and Plans

- **Dramatic Production Capacity Expansion:** The awarded grant will enable Halocell Energy to acquire advanced roll-to-roll manufacturing equipment and optimize its existing production processes. This will boost the company's annual production capacity for indoor perovskite PV modules from the current 7,000 units to a target of 100,000 units, representing an approximately 14-fold increase. This significant scale-up marks a major step towards the commercialization of perovskite solar cell technology.
- **Strategic Investment:** The funding is expected to contribute not only to enhanced manufacturing efficiency but also to strengthening quality control systems and developing products that address broader market needs. Indoor PV modules are in high demand in specific niche markets such as IoT devices and smart sensors, where high efficiency in low-light conditions is crucial.

Background and Industry Context

Perovskite solar cells are garnering attention as a next-generation power source, particularly for indoor and wearable devices, due to their lower manufacturing costs compared to traditional silicon solar cells, as well as their flexibility and high power generation efficiency in low-light environments. The Australian government's Industry Growth Program aims to support advanced manufacturing and technological innovation within the country, and the grant to Halocell Energy reflects Australia's commitment to being at the forefront of renewable energy technology.

Future Outlook

Halocell Energy's substantial increase in production capacity will enhance its competitiveness not only within Australia but also in the global indoor PV market. The adoption of scalable process technologies like roll-to-roll manufacturing is crucial for reducing costs and improving the supply stability of perovskite solar cells, which will, in turn, facilitate their adoption in a wider range of applications in the future. This success serves as a positive model for other perovskite startups, demonstrating the potential for government support and commercialization.

Source: https://now.solar/2026/06/10/halocell-energy-secures-grant-for-perovskite-pv-scale-up-pv-magazine-global/

Collected: June 12, 2026 | Automated Research System (Gemini API)

KIT and University of Valencia Pioneer Scalable Tandem Solar Cells with High-Throughput, Solvent-Free Vacuum Processing and Tunable Bandgaps

Published Published June 08, 2026 Photonics Spectra Germany、スペイン

OVERVIEW

Researchers at the Karlsruhe Institute of Technology (KIT) and the University of Valencia have engineered a high-throughput, solvent-free vacuum process for fabricating both single-junction and perovskite-silicon tandem solar cells. This novel technique ensures highly uniform perovskite layer deposition on textured silicon and offers precise bandgap control through mixed-halide organic source adjustments. The innovation marks a crucial step towards scalable manufacturing and optimized performance for next-generation, high-efficiency photovoltaics.

IN DEPTH

Background

Perovskite-silicon tandem solar cells represent a leading candidate for next-generation photovoltaics, promising ultra-high efficiencies that can surpass the theoretical limits of conventional single-junction solar cells. However, their widespread commercialization has been significantly impeded by critical challenges in manufacturing scalability, cost-effectiveness, and device reproducibility, particularly concerning the mass production of complex tandem structures at an economically viable cost. Addressing these bottlenecks, a collaborative research team from the Karlsruhe Institute of Technology (KIT) and the University of Valencia has achieved a major breakthrough. They have developed an innovative high-throughput, solvent-free vacuum process applicable to both single-junction perovskite solar cells and two-terminal perovskite-silicon tandem configurations. This new technology is poised to dramatically accelerate manufacturing speed and enhance scalability, offering a compelling alternative to traditional solvent-based processes.

Key Findings

- **High-Throughput, Solvent-Free Vacuum Deposition:** The developed process marks a significant departure from conventional solution-based methods by eliminating the use of hazardous solvents. This not only reduces environmental impact and streamlines manufacturing costs but also leverages vacuum conditions to achieve superior layer uniformity and purity. The result is enhanced device performance reproducibility, a critical factor for industrial deployment.
- **Uniform Perovskite Layers on Textured Silicon Subcells:** A key innovation lies in the process's ability to deposit exceptionally uniform perovskite layers directly onto textured silicon subcells. While textured silicon is crucial for maximizing light trapping in tandem devices, achieving homogeneous thin-film deposition on its inherently uneven surface has historically presented a formidable technical hurdle. This breakthrough overcomes that challenge, offering greater design flexibility and paving the way for even higher efficiency tandem architectures.

- **Precise and Tunable Bandgap Control:** The research demonstrates precise control over the perovskite absorber layer's bandgap. By meticulously adjusting the ratio of mixed-halide organic sources, such as methylammonium iodide and methylammonium bromide, researchers can fine-tune the material's light absorption properties. This capability is vital for designing tandem devices that efficiently absorb different portions of the solar spectrum, thereby maximizing overall power conversion efficiency.

Collectively, these advancements represent a major leap towards the commercialization of perovskite-silicon tandem solar cells. By simultaneously reducing manufacturing costs, significantly boosting production throughput, and enhancing both device performance reproducibility and reliability, this technology lays the groundwork for large-scale industrial deployment. This approach is anticipated to substantially improve the cost-performance ratio of solar power generation, playing a pivotal role in accelerating the global adoption of renewable energy.

Source: https://www.photonics.com/Articles/High-Throughput-Process-Enables-Scalable/a72303

Collected: June 12, 2026 | Automated Research System (Gemini API)

U.S. DOE Updates Perovskite Solar Cell R&D Program, Focusing on 27% Efficient Tandem Cells and Enhanced Stability Technologies

Published June 04, 2026 U.S. Department of Energy (DOE) USA

OVERVIEW

On June 4, 2026, the U.S. Department of Energy (DOE)'s Solar Energy Technologies Office (SETO) updated the progress of its FY2020 Perovskite Funding Program, emphasizing breakthroughs in efficiency and stability. Supported projects include developing manufacturing processes for 27% efficient two-terminal perovskite-silicon tandem cells and improving interfacial mechanical adhesion using self-assembled monolayers (SAMs). These initiatives aim to enhance perovskite solar cell reliability and reduce barriers to commercial deployment.

IN DEPTH

U.S. DOE Updates Perovskite Solar Cell R&D Program on June 4, 2026, Focusing on 27% Efficient Tandem Cells and Advanced Stability Technologies

The U.S. Department of Energy (DOE)'s Solar Energy Technologies Office (SETO) has provided an updated status report on its Fiscal Year 2020 Perovskite Solar Cell Research and Development Funding Program. This program aims to support breakthroughs across various aspects of perovskite technology, including efficiency, stability, manufacturing methods, and performance validation. The latest update emphasizes the critical importance of achieving high efficiency and reliability for practical deployment.

Key Achievements and Supported Initiatives

- **Development of High-Efficiency Tandem Cells:** One of the supported projects focuses on developing a manufacturing process for 2-terminal perovskite-silicon tandem cells that boast a high power conversion efficiency of 27%. This tandem architecture holds the potential to surpass the efficiency limits of conventional silicon solar cells, promising a significant improvement in the cost-performance ratio of photovoltaics.
- **Stability Enhancement Technologies:** The program also prioritizes improving the long-term stability, which remains one of the greatest challenges for perovskite solar cells. Specifically, efforts are supported for enhancing interfacial mechanical adhesion using self-assembled monolayers (SAMs). This approach aims to boost device durability, identify degradation pathways, and establish a clear path towards extended operational lifetimes.
- **Mitigating Reliability Concerns:** These technological developments are crucial for alleviating reliability concerns surrounding perovskite solar cells, thereby accelerating their introduction into commercial markets. The program seeks to bridge the gap between laboratory achievements and real-world market applications.

Background and Industry Context

Perovskite solar cells are widely regarded as the next frontier in the photovoltaic industry due to their exceptional performance potential and low-cost manufacturing capabilities. However, a primary barrier to their widespread commercialization has been the lack of long-term stability and reliability, especially under prolonged outdoor environmental exposure. Strategic investments by SETO within the U.S. DOE are critical for overcoming these technical hurdles and maintaining U.S. leadership in clean energy technologies.

Future Outlook

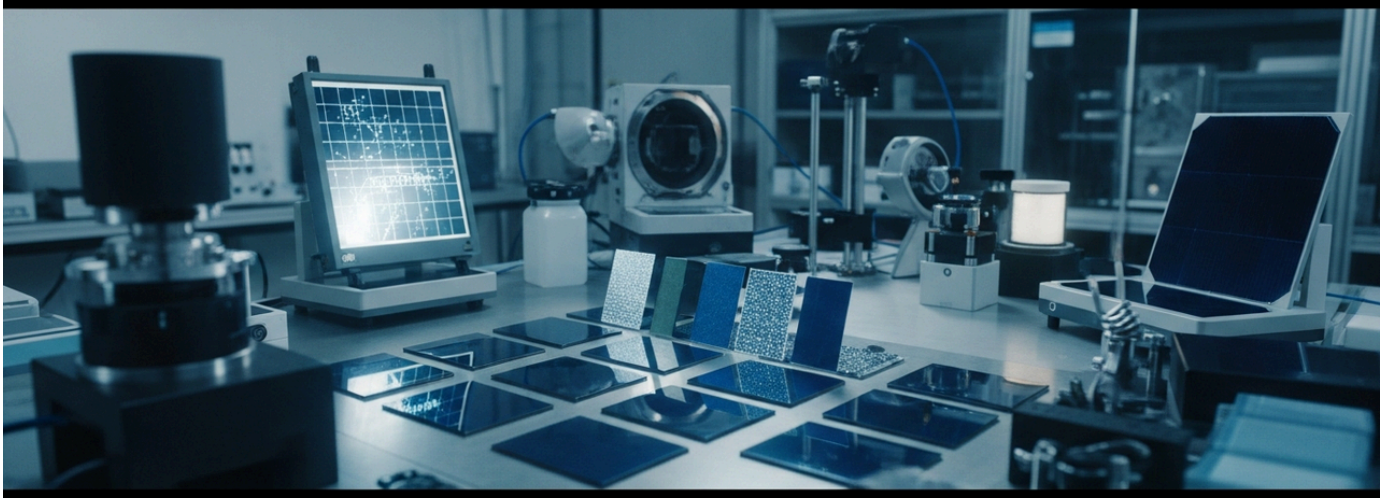
Continued support through SETO's funding program is indispensable for the transition of perovskite solar cell technology from research to practical deployment. High-efficiency tandem cell and stability enhancement technologies development will further drive down the cost of solar power and accelerate its adoption. These advancements are expected to strengthen U.S. energy security and contribute significantly to climate change mitigation efforts.

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

Collected: June 12, 2026 | Automated Research System (Gemini API)

U.S. DOE Continues Investing in Next-Gen PV: Driving Perovskite Efficiency Beyond 25%, Lead-Free Solutions, and Enhanced Stability

Published June 04, 2026 U.S. Department of Energy (DOE) USA



OVERVIEW

The U.S. Department of Energy (DOE) has renewed its funding for next-generation photovoltaics (PV) projects, with a strong focus on perovskite solar cell research. Key areas include developing high-efficiency single-junction and tandem perovskite cells (targeting over 25% efficiency), exploring lead-alternative materials, and improving material and device stability against moisture, air, and temperature. These initiatives aim to boost PV efficiency, cut costs, enhance reliability, and build a more sustainable supply chain.

IN DEPTH

U.S. DOE Continues Investment in Next-Generation PV Projects: Advancing Perovskite to Over 25% Efficiency, Lead-Free Solutions, and Enhanced Stability

The U.S. Department of Energy (DOE) has reaffirmed its commitment to accelerating the development of next-generation photovoltaic (PV) technologies by continuing its funding for relevant projects and updating its key focus areas. A cornerstone of this program is the research and development of perovskite solar cells, with particular emphasis on improving performance, sustainability, and reliability.

Key Objectives and Research Areas

- **High-Efficiency Cell Development:** The program targets the development of high-efficiency single-junction perovskite cells and tandem cells (combining perovskites with other materials like silicon) with power conversion efficiencies exceeding 25%. This objective aims to break through the limits of existing solar cell technologies and generate more electricity from smaller areas.
- **Exploration of Lead-Alternative Materials:** Driven by environmental concerns, the program actively seeks alternative materials to lead, a primary component in many perovskite solar cells. This initiative promotes the development of less toxic, more sustainable solar cells and enhances compliance with environmental regulations.
- **Enhanced Stability:** Improving the long-term stability of perovskite materials and devices against environmental factors such as moisture, air, and high temperatures is one of the most critical challenges for commercialization. The program aims to address this stability issue through innovations in material design, device architecture, and encapsulation technologies.

Background and Industry Context

Solar energy plays an increasingly vital role in the global energy mix, but further widespread adoption necessitates improvements in efficiency, cost reduction, and long-term reliability. Perovskite solar cells are emerging as a technology with the potential to meet these requirements, and the DOE's funding bridges the gap for this technology to transition from the lab to the market. Crucially, building sustainable materials and supply chains is paramount for future energy security and environmental protection.

Future Outlook

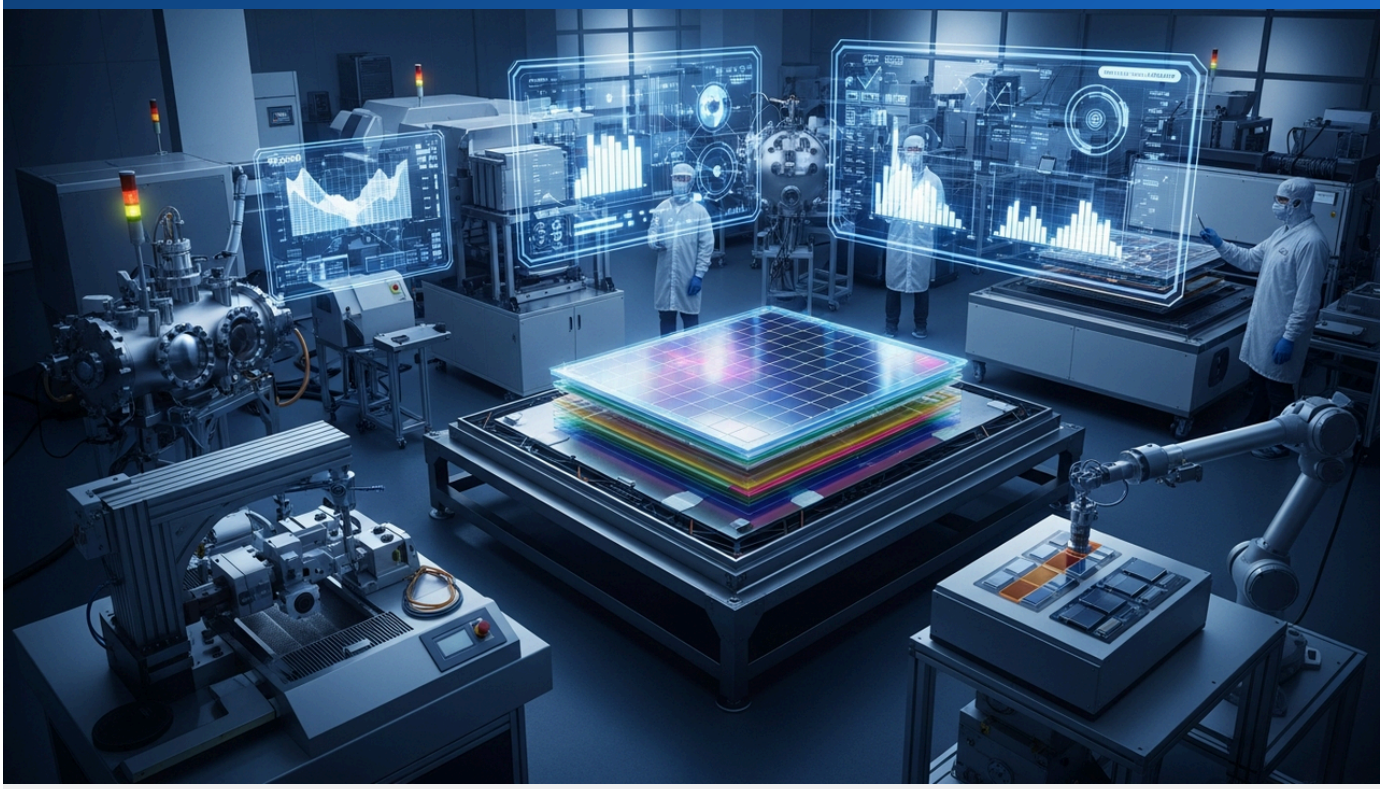
These ongoing investments by the DOE significantly enhance the potential for perovskite solar cells to offer innovative solutions in the photovoltaic market. The development of high-efficiency, lead-free, and highly stable perovskite devices will further reduce the cost of renewable energy and contribute to improved energy access. This represents a crucial step in the development of the U.S. clean energy economy and in global efforts to combat climate change.

Source: https://www.energy.gov/cmei/systems/next-generation-photovoltaics-3

Collected: June 12, 2026 | Automated Research System (Gemini API)

Accelerating Perovskite PV: EU PVSEC 2026 Focuses on Sustainable Scaling and Market Entry

Published Published June 04, 2026　EU PVSEC　ヨーロッパ



OVERVIEW

Europe's premier photovoltaic conference, EU PVSEC 2026, will host a pivotal parallel event: 'Opportunities for Sustainable Perovskite PV Commercialisation.' This dedicated session in Rotterdam will address critical market entry requirements, including technology scaling, pilot line development, manufacturing constraints, and insights from ongoing EU projects. A central focus will be the establishment of sustainable and circular value chains for this promising photovoltaic technology.

IN DEPTH

Background

Europe's largest and most influential photovoltaic conference, EU PVSEC 2026, is scheduled to convene from September 14-18, 2026, in Rotterdam, Netherlands. On June 4, 2026, organizers announced the addition of a significant parallel event to its program: "Opportunities for Sustainable Perovskite PV Commercialisation." This dedicated forum is specifically designed to tackle the pivotal challenges and pathways for bringing perovskite solar cell technology to market.

Key Themes for Discussion

- **Technology Scaling and Pilot Line Development:** Discussions will delve into the technical and economic imperatives for transitioning perovskite solar cell production from laboratory-scale research to industrial-scale manufacturing. Critical points of debate will encompass advanced process control, rigorous quality assurance protocols, and yield optimization strategies essential for high-volume production.
- **Manufacturing Constraints and Requirements:** The event will feature an in-depth examination of existing manufacturing bottlenecks, including material supply chain vulnerabilities, high equipment capital expenditure, and limitations in production throughput. It will also explore the critical resource inputs (human capital, energy, and raw materials) and specialized equipment necessary for establishing efficient and environmentally sound manufacturing lines.
- **Lessons from Ongoing EU Projects:** A core component will be the dissemination of critical insights and best practices gleaned from a diverse portfolio of European Union (EU)-funded perovskite solar cell initiatives. These shared learnings are intended to inform future research and development trajectories and refine commercialization roadmaps.
- **Sustainable and Circular Value Chains:** A crucial agenda item will be the engineering of sustainable and circular value chains for perovskite photovoltaics. This includes strategies for minimizing environmental footprint and maximizing resource efficiency across the entire product lifecycle, covering topics such as the adoption of lead-free materials, advanced recycling technologies, and optimizing energy consumption in manufacturing processes.

Industry Context and Strategic Imperative

Despite their compelling attributes—high efficiency, inherent flexibility, and projected low cost—perovskite solar cells continue to confront substantial commercialization hurdles, primarily related to long-term stability and the scalability of production processes. Recognizing the strategic importance of this technology for achieving ambitious renewable energy targets, the European Union is significantly augmenting political and financial support to expedite its transition from research and development to industrial deployment. This parallel event is conceived as a crucial nexus for public, private, and academic stakeholders to converge, fostering critical collaborations essential for overcoming these existing barriers.

Future Outlook and Impact

The deliberations and expert insights emerging from this event are anticipated to profoundly shape the technological roadmap and market entry strategies for perovskite solar cells. Cultivating indigenous technology development and manufacturing capacities within the EU is paramount for bolstering energy independence and achieving the ambitious objectives of the European Green Deal. The intense focus on scalable solutions and integrated sustainability will lay the groundwork for perovskite technology to play a vital and transformative role in future energy systems.

Source: https://www.eupvsec.org/index.php/programme/pe-programme

Collected: June 12, 2026 | Automated Research System (Gemini API)

U.S. DOE Updates Perovskite Startup Prize, Accelerating Lab-to-Market Transition for U.S. Companies with $3M in Funding

Published June 04, 2026 U.S. Department of Energy (DOE) Solar Energy Technologies Office (SETO) USA

OVERVIEW

The U.S. Department of Energy (DOE)'s Solar Energy Technologies Office (SETO) has updated its $3 million "American-Made Challenges: Perovskite Startup Prize." This two-stage competition aims to transition perovskite solar cell research from laboratories to new U.S. businesses, thereby accelerating development and manufacturing. Winners receive $500,000 in cash and a $100,000 technical support voucher to launch a solar manufacturing company introducing marketable perovskite products in the U.S.

IN DEPTH

U.S. DOE Updates Perovskite Startup Prize, Accelerating Lab-to-Market Transition for U.S. Companies with $3M in Funding

The U.S. Department of Energy (DOE)'s Solar Energy Technologies Office (SETO) has announced updates to its "American-Made Challenges: Perovskite Startup Prize" competition, designed to foster innovation and commercialization of perovskite solar cell technology within the United States. This competition offers a total of $3 million in prizes, aiming to support the launch of new U.S. companies that can translate fundamental perovskite solar cell research into viable, market-ready products.

Key Program Details and Support

- **Two-Stage Competition Structure:** The prize is structured in two stages, requiring participants at each phase to develop plans and prototypes that advance perovskite technology from a laboratory environment towards commercialization. This staged approach encourages progressive maturation and market fit of the technology.
- **Substantial Prize Money and Support:** The ultimate winner of the competition will be awarded $500,000 in cash. Additionally, they will receive a $100,000 technical support voucher, intended to assist in launching a solar manufacturing company that can introduce marketable perovskite products in the U.S. This voucher can be utilized for access to expert knowledge, testing facilities, and other commercialization support services.
- **Objective:** The primary objective of this initiative is to accelerate perovskite solar cell research, development, and manufacturing in the United States. This effort aims to strengthen the domestic clean energy supply chain, create jobs, and contribute to increased U.S. energy independence.

Background and Industry Context

Perovskite solar cells are expected to be the next generation of photovoltaic technology, possessing high efficiency and low-cost manufacturing potential. However, bridging the "valley of death" from laboratory breakthroughs to commercial scale requires substantial funding, specialized expertise, and robust government support. Through challenge programs like this, the U.S. seeks to empower domestic companies to rapidly bring this innovative technology to market, securing its leadership in the global clean energy race.

Future Outlook

The "Perovskite Startup Prize" will serve as a crucial catalyst for the creation of new technology-driven businesses and the acceleration of perovskite solar cell commercialization. Startups supported by this program are expected to deliver efficient and reliable perovskite products to the market, further strengthening U.S. technological innovation and manufacturing capabilities in the renewable energy sector. In the long term, this is anticipated to further reduce the cost of solar power, contributing to a broader energy transition.

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

Collected: June 12, 2026 | Automated Research System (Gemini API)

Perovskite Solar Cells: Stability and Scalability Dominate Discussion at NIPHO26

Published Published June 08, 2026 nanoGe Conferences イタリア

OVERVIEW

The nanoGe International Perovskite Thin Film Solar Cells and Perovskite Photonics & Optoelectronics Conference (NIPHO26) recently convened in Pavia, Italy, bringing together global experts. The event focused on the latest advancements in hybrid perovskite solar cells, with extensive discussions centered on overcoming critical stability and manufacturing scale-up challenges crucial for their widespread commercial deployment.

IN DEPTH

Background

The nanoGe International Perovskite Thin Film Solar Cells and Perovskite Photonics & Optoelectronics Conference (NIPHO26), an international academic gathering, was held from June 8-9, 2026, at the University of Pavia, Italy. This conference focused on the latest advancements in hybrid perovskite-based solar cells, specifically addressing crucial challenges related to stability and manufacturing scale-up, which are essential for their large-scale commercial deployment.

Perovskite solar cells hold immense potential as a next-generation technology to replace or complement traditional silicon solar cells. However, their commercialization necessitates not only maintaining high efficiency but also ensuring long-term stability, manufacturing reproducibility, and adaptability to large-scale production. International conferences like NIPHO26 provide a vital platform for global researchers and engineers to share the latest knowledge and establish collaborations to overcome these technical bottlenecks.

Key Findings

- **Stability and Durability:** Long-term stability and durability against environmental stressors like moisture, heat, and UV radiation were paramount. Researchers presented novel encapsulation techniques, self-healing materials, and optimized device architectures designed to enhance the longevity of perovskite solar cells.
- **Interface Engineering and Efficiency Limits:** Discussions delved into optimizing charge transport efficiency at device interfaces, critical for pushing power conversion efficiency limits. Key areas included the development of novel interface layer materials, advanced defect passivation strategies, and exploring the fundamental physical and chemical mechanisms governing efficiency ceilings.
- **Scale-Up and Lead-Free Solutions:** The path from laboratory-scale high efficiencies to industrial production, including techniques like roll-to-roll manufacturing and large-area deposition, was a significant focus. Furthermore, in response to environmental regulations and sustainability goals, significant attention was given to the development and performance enhancement of lead-free perovskite materials.

The insights and collaborations fostered at NIPHO26 are expected to profoundly shape the future trajectory of perovskite solar cell R&D. Concerted efforts in stability and scalable manufacturing will underpin this innovative technology's increasingly central and sustainable role in the global energy transition. Advances in lead-free solutions, in particular, mark a vital step towards truly environmentally friendly solar power generation.

Source: https://www.nanoge.org/events/nipho26

Collected: June 12, 2026 | Automated Research System (Gemini API)