Latest solar cell

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In November 2023, a buzzy solar technology broke yet another world record for efficiency. The previous record had existed for only about five months--and it likely won"t be long before it too is obsolete. This astonishing acceleration in efficiency gains comes from a special breed of next--generation solar technology: perovskite tandem solar cells. These cells layer the traditional silicon with materials that share a unique crystal structure.

In the decade that scientists have been toying with perovskite solar technology, it has continued to best its own efficiency records, which measure how much of the sunlight that hits the cell is converted into electricity. Perovskites absorb different wavelengths of light from those absorbed by silicon cells, which account for 95% of the solar market today. When silicon and perovskites work together in tandem solar cells, they can utilize more of the solar spectrum, producing more electricity per cell.

Technical efficiency levels for silicon--based cells top out below 30%, while perovskite-only cells have reached experimental efficiencies of around 26%. But perovskite tandem cells have already exceeded 33% efficiency in the lab. That is the technology"s tantalizing promise: if deployed on a significant scale, perovskite tandem cells could produce more electricity than the legacy solar cells at a lower cost.

But perovskites have stumbled when it comes to actual deployment. Silicon solar cells can last for decades. Few perovskite tandem panels have even been tested outside.

The electrochemical makeup of perovskites means they"re sensitive to sucking up water and degrading in heat, though researchers have been working to create better barriers around panels and shifting to more stable perovskite compounds.

In May, UK-based Oxford PV said it had reached an efficiency of 28.6% for a commercial-size perovskite tandem cell, which is significantly larger than those used to test the materials in the lab, and it plans to deliver its first panels and ramp up manufacturing in 2024. Other companies could unveil products later this decade.

Researchers, farmers, and global agricultural institutions are embracing long-neglected crops that promise better nutrition and more resilience to the changing climate.

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Pure $CuInSe_2$ solar cells suffer from strong interfacial carrier recombination. Here, the authors introduce a wide U-shaped double Ga grading with a minimum bandgap of 1.01 eV and achieve certified device efficiency of 20.26%, making it highly suitable for tandem solar cell applications.

The use of harmful solvents to fabricate stable devices hampers the commercialization of perovskite solar cells. Here, the authors introduce a biorenewable solvent system and precursor-phase engineering to realize stable formamidinium lead triiodide-based solar cells.

Thermoanaerobacter kivui-drived CO2 reductase (TkHDCR) requires hydrogen as substrate, which can lead to safety issue. Here, the authors engineered TkHDCR into an electro-responsive carbon dioxide reductase to harvest electrons from either an external mediator or a polarized electroactive surface.

The sustainable fabrication of perovskite solar cells is critical. Duan et al. present a more environmentally friendly solvent system to process wide-bandgap perovskite films that can also be used for industrial-scale manufacturing in ambient air.

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