# Latest solar energy technology

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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 The previous record had existed for only about five months--and it likely won"t be long before it too is obsolete.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.

In a new paper published February 26 in the journal Nature Energy, a University of Colorado Boulder researcher and his international collaborators unveiled an innovative method to manufacture the new solar cells, known as perovskite cells, an achievement critical for the commercialization of what many consider the next generation of solar technology.

Today, nearly all solar panels are made from silicon, which boast an efficiency of 22%. This means silicon

panels can only convert about one-fifth of the sun"s energy into electricity, because the material absorbs only a limited proportion of sunlight"s wavelengths. Producing silicon is also expensive and energy intensive.

"Perovskites might be a game changer," said Michael McGehee, a professor in the Department of Chemical and Biological Engineering and fellow with CU Boulder"s Renewable & Sustainable Energy Institute.

Scientists have been testing perovskite solar cells by stacking them on top of traditional silicon cells to make tandem cells. Layering the two materials, each absorbing a different part of the sun"s spectrum, can potentially increase the panels" efficiency by over 50%.

"We"re still seeing rapid electrification, with more cars running off electricity. We"re hoping to retire more coal plants and eventually get rid of natural gas plants," said McGehee. "If you believe that we"re going to have a fully renewable future, then you"re planning for the wind and solar markets to expand by at least five to ten- fold from where it is today."

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Web: https://hollanddutchtours.nl/contact-us/
Email: energystorage2000@gmail.com
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