

Two-sided solar cells can collect scattered light to gather more energy

January 12 2021, by Nicholas G. Demille



A bifacial perovskite/silicon tandem prototype being field-tested at King Abdullah University of Science & Technology in Saudi Arabia. The new technology is the result of a collaboration that includes U of T Engineering researchers. Credit: Michele De Bastiani

To increase the performance of solar panels, an international

collaboration—including researchers from King Abdullah University of Science & Technology (KAUST) and U of T Engineering—has created a bifacial, or two-sided, tandem solar cell, built by bringing together the best of the perovskite and silicon technologies.

Out in the field, light primarily comes directly from the sun. Conventional [tandem solar cells](#) can already convert this light into electricity more efficiently compared to traditional silicon-only solar cells by absorbing additional wavelengths of [light](#).

Now, the researchers have realized that even more energy can be gathered using a two-sided tandem configuration. Light reflected and scattered from the ground—referred to as "albedo"—can also be collected to significantly increase the current of a tandem solar cell.

The research, which was published today in the journal *Nature Energy*, outlines exactly how the team engineered the perovskite/silicon device to exceed the currently accepted performance limits for the tandem configuration.

"By exploiting the albedo, we can now generate currents higher than in conventional tandems, without increasing the manufacturing costs at all," said Dr. Michele De Bastiani, the co-lead author of this study. The study's authors include University Professor Ted Sargent (ECE) and ECE postdoctoral fellow Yi Hou.

The potential for capturing indirect sunlight has been studied in the past, but without experimental verification. In addition to U of T Engineering, KAUST researchers worked with collaborators from the Karlsruhe Institute of Technology, and the University of Bologna to solve the scientific and engineering challenges required to include indirect sunlight in the energy gathering capacity of their modules.

With this knowledge at hand, they tested the bifacial tandem solar cell in outdoor conditions, achieving efficiencies beyond any commercial silicon solar panel.

"Bifacial silicon-only solar [cells](#) are rapidly taken an increasing share in the photovoltaics market, as they can lead to a performance gain of 20% relative. Exploiting this concept in perovskite/silicon tandems now opens opportunities for ultra-high power generation at affordable cost" concluded Professor Stefaan De Wolf (KAUST).

More information: Michele De Bastiani et al. Efficient bifacial monolithic perovskite/silicon tandem solar cells via bandgap engineering, *Nature Energy* (2021). [DOI: 10.1038/s41560-020-00756-8](https://doi.org/10.1038/s41560-020-00756-8)

Provided by University of Toronto

Citation: Two-sided solar cells can collect scattered light to gather more energy (2021, January 12) retrieved 21 April 2024 from <https://techxplore.com/news/2021-01-two-sided-solar-cells-energy.html>

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