

Perovskite solar cells tested for real-world performance—in the lab

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Perovskite solar cells in the lab. Credit: Wolfgang Tress (EPFL)

It was only ten years ago that metal-halide perovskites were discovered to be photovoltaic materials. Today, perovskite solar cells are almost as efficient as the best conventional silicon ones, and there is much hope

that they will become a highly efficient and low-cost alternative, as they can be manufactured by rather simple and fast methods like printing.

The major obstacle for commercialization is the stability of perovskite devices. Operational stability is commonly assessed either by continuous illumination in the lab or by outdoor testing. The first approach has the disadvantage of not accounting for real-world operational variations in irradiance and temperature because of day-night and season changes. These are especially important for perovskite solar cells because of their slow response times.

On the other hand, outdoor tests require that the devices are encapsulated to protect them against exposure to harsh weather conditions. But encapsulation mainly addresses parasitic failure mechanisms that are not necessarily related to the perovskite material itself.

To escape this dilemma, Wolfgang Tress, a scientist with the lab of Anders Hagfeldt at EPFL, working with colleagues at the lab of Michael Grätzel, brought the real-world conditions into the controlled environment of the lab. Using data from a [weather station](#) near Lausanne they reproduced the real-world temperature and irradiance profiles from specific days during the course of the year. With this approach, the scientists were able to quantify the energy yield of the devices under realistic conditions. "This is what ultimately counts for the real-world application of solar cells," says Tress.

The study found that temperature and irradiance variations does not affect the performance of [perovskite solar cells](#) in any dramatic way, and although the efficiency of the [cells](#) decreases slightly during the course of a day, it recovers during the night.

"The study provides a further step towards the assessment of the

performance and reliability of [perovskite solar cells](#) under realistic operation conditions," says Tress.

More information: Wolfgang Tress et al, Performance of perovskite solar cells under simulated temperature-illumination real-world operating conditions, *Nature Energy* (2019). [DOI: 10.1038/s41560-019-0400-8](https://doi.org/10.1038/s41560-019-0400-8)

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