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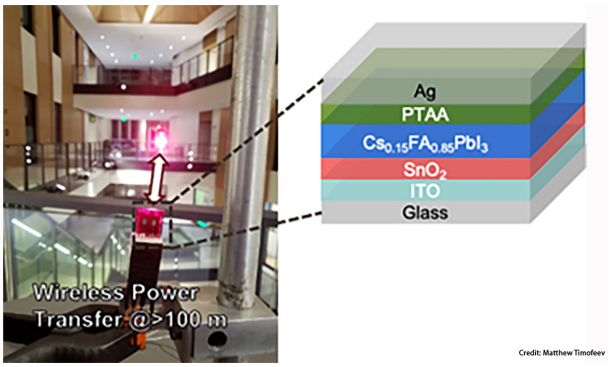
Perovskite solar cells could replace single-use batteries and erase the need for changing power sources for hard-to-reach devices.



As the Internet of Things (IoT) expands, so too does its demand for power. Currently, many devices in the IoT network rely on single-use batteries that can be difficult to replace for remote or sensitive sensors and clog up landfills.

Perovskite solar cells, best known for their use in solar panels, can also assist in photonic wireless power transmission when coupled with a monochromatic light source. Timofeev et al. demonstrated how such a setup could work, providing sufficient power by shining a laser over 100 meters away from the detector.

This undergraduate-led effort identified the potential of perovskites for this unconventional purpose.

“Perovskites have many of the necessary capabilities to help solve this problem of sustainability through an energy harvesting approach,” said author William Joseph Scheideler. “They are compatible with large area, low-cost manufacturing methods such as printing that could allow fabrication of these devices on flexible substrates. Perovskites also have tunable bandgap energies and can offer high-efficiency conversion for monochromatic light.”

The authors fabricated their perovskite cells using conventional spin-coating methods as well as high-speed printing methods. They measured the power produced from LEDs and lasers of varying wavelengths, intensities, and at varying distances. Even at distances greater than 100 meters, the authors achieved efficient energy conversion capable of powering an IoT device.

“We are targeting applications of our devices in powering wireless sensor networks, particularly those installed in the built environment in locations that make changing batteries infeasible, such as on ceilings or in cleanrooms,” said Scheideler. “These sensors could be placed in new locations and could operate for longer durations using power provided by photonic power transfer.”

Source: “Engineering perovskite solar cells for efficient wireless power transfer,” by Matthew I. Timofeev, Francesco V. Guarnieri, Julia E. Huddy, and William J. Scheideler, *APL Energy* (2023). The article can be accessed at https://doi.org/10.1063/5.0169827.