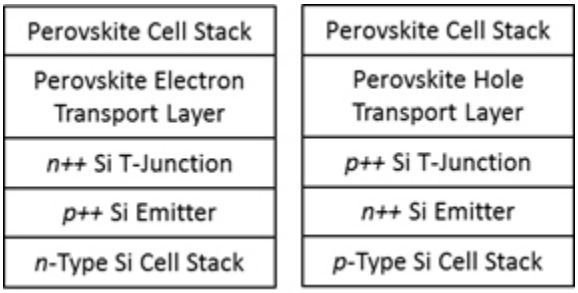
Docket #: S15-001

Multijunction Perovskite/Crystalline Silicon Solar Cell with Tunnel Junction

A team of Stanford and MIT researchers developed a perovskite/silicon multijunction solar cell designed to surpass the photovoltaic efficiency limits of silicon while utilizing existing manufacturing capabilities. By employing different solar cell layers that absorb different parts of the sun's energy, the efficiency is boosted beyond the performance of the individual layers. This design is also economical because perovskite is low cost and is deposited at low temperatures. Combined in a tandem device with c-Si, the inventors believe an optimized device can reach 29-35% efficiency, using existing c-Si manufacturing infrastructure.



Structure of n-type (left) and p-type (right)
2-terminal perovskite/silicon multijunction solar cell

Stage of Research
The MIT-Stanford team demonstrated feasibility of the structure, achieving 13.7% in the lab prototype. The team believes the tandem solar cell can reach 29% or higher through proper photon management, state of the art photovoltaic manufacturing and materials, and higher quality perovskite.

Applications

- Solar cells

Advantages

- **c-Si compatible fabrication** – utilizes commercially available production equipment
- **High efficiency** - potential for 29-35% efficiency
- **Low cost** – uses relatively inexpensive, commercially available materials

Publications

- Mailoa, Jonathan P., Colin D. Bailie, Eric C. Johlin, Eric T. Hoke, Austin J. Akey, William H. Nguyen, Michael D. McGehee, and Tonio Buonassisi. "A 2-terminal perovskite/silicon multijunction solar cell enabled by a silicon tunnel junction." Applied Physics Letters 106, no. 12 (2015): 121105.

Patents

- Issued: 10,535,791 (USA)

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