Perovskite/Crystalline Silicon Multijunction Solar Cell

Technology #17501

Applications

Perovskite/crystalline silicon multijunction solar cells can be used as an alternative to conventional solar cells. Perovskite/crystalline silicon multijunction solar cells improve cell efficiency by incorporating multiple bandgaps.

Problem Addressed

Currently, solar cells have been unable to surpass the Shockley-Queisser Limit, which is determined by the material band gap. Because single junction solar cells only have one bandgap, photons with energy below or above this bandgap energy are not completely converted to electrical energy. However, this design overcomes this limit by creating a multijunction cell using organic-inorganic halide perovskite.

Technology

One of the most promising ways to surpass the efficiency limit of current solar cells is by reducing the thermalization loss of high energy photons, which can be done by building solar cells in multijunction configuration using materials with different bandgaps. In this technology, the materials are silicon and an organic-inorganic halide perovskite. Perovskite was chosen because it is capable of being an efficient solar cell material despite being deposited at low-temperature and requires low-capex. The integration of perovskite top solar cell and crystalline silicon bottom solar cell is enabled by the introduction of silicon-based tunnel junction connecting the two solar cells. Depending on the perovskite chosen, the efficiency limit can be increased up to 39%.

Advantages

- Increases solar cell efficiency
- Reduces cost per unit power of photovoltaics

Categories For This Invention:

Energy
Solar
Photovoltaics
Perovskite
Silicon PV

Intellectual Property:

2-terminal metal halide semiconductor/c-silicon multijunction solar cell with tunnel junction

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Issued US Patent
2-terminal metal halide semiconductor/c-silicon multijunction solar cell with tunnel junction
PCT
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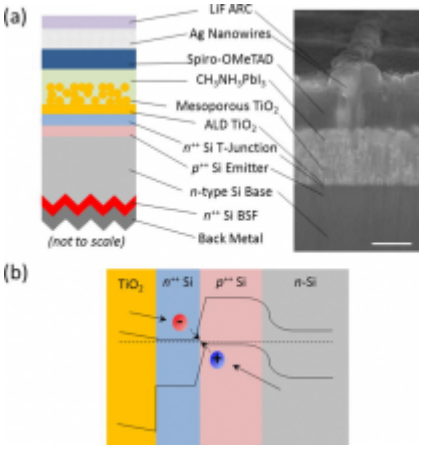
Publications:

A 2-Terminal Perovskite/Silicon Multijunction Solar Cell Enabled by a Silicon Tunnel Junction
Applied Physics Letters
2015

External Links:

Photovoltaic Research Laboratory
http://pv.mit.edu/

Image Gallery:



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