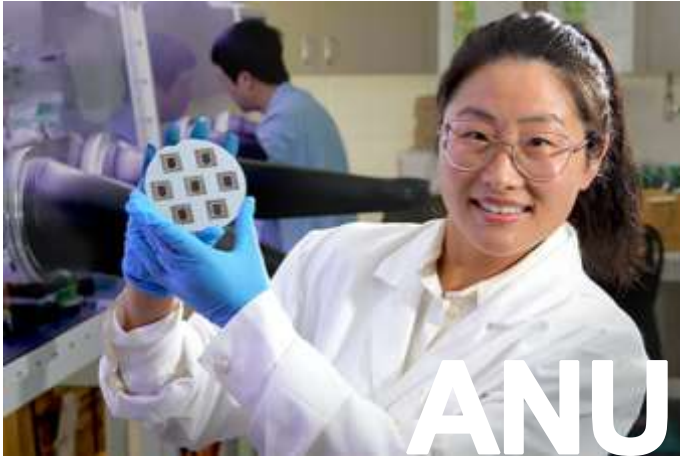


Silicon Perovskite tandem photovoltaic cell incorporating dopant-free Si cell



Silicon solar cells are fast approaching their theoretical efficiency limit of ~30%. To meet increasing demand for renewable energy, and stay competitive, the solar industry needs to adopt the next generation of photovoltaic cells. The next generation needs to meet three criteria: higher efficiency, low costs, and a long lifespan. Perovskite Silicon tandem photovoltaics offer a promising solution to this challenge. The low cost of Perovskite materials along with their ease of deposition make them a great candidate to be applied on top of Silicon cells to capture more sunlight and increase total efficiency within the same surface area

Technology (TT2020-039)

Researchers from the Australian National University are developing a Perovskite-Silicon tandem photovoltaic technology that uses dopant-free and passivating contact based Silicon solar cell as the bottom cell, and a high bandgap Perovskite solar cell on the top. The dopant-free nature of the Silicon cell reduces the cost of materials and fabrication process, allowing for simpler manufacturing setup. The technology has rapidly progressed from an efficiency of 11% in 2017 to 20% in 2022, with further increases in efficiency expected in the coming years.

Potential benefits

- > **Efficiency:** The tandems offer a potential for higher efficiency than Silicon photovoltaics.
- > **Low-cost:** The dopant free nature of the Silicon bottom cell makes the overall cost of materials and production substantially lower than technologies using doped Silicon.
- > **Ease of manufacturing:** The removal of doping steps simplifies the manufacturing process substantially, and reduces investment in manufacturing setup

Potential applications

- > Photovoltaic/Solar cells
- > Renewable Energy

Opportunity

ANU is exploring opportunities for collaborating with Silicon, Perovskite, and Perovskite-Silicon tandem photovoltaic manufacturers to co-develop and license the technology. The inventors are also keen to capitalise on opportunities to develop a spin-out/joint venture based on this technology

IP status

The IP is owned by The Australian National University and is subject to a PCT patent filing. Application number: PCTAU2022051432

Key research team

- > Heping Shen, Research Fellow, ANU School of Engineering
- > Kylie Catchpole, Professor, ANU School of Engineering
- > Leiping Duan, Research Fellow, ANU School of Engineering

Contact

Viraj Agnihotri
 Commercial Development Manager
 Commercialisation & IP
 Office of Research and Innovation Services
 The Australian National University
 T: +61 2 6125 2176 | E: viraj.agnihotri@anu.edu.au

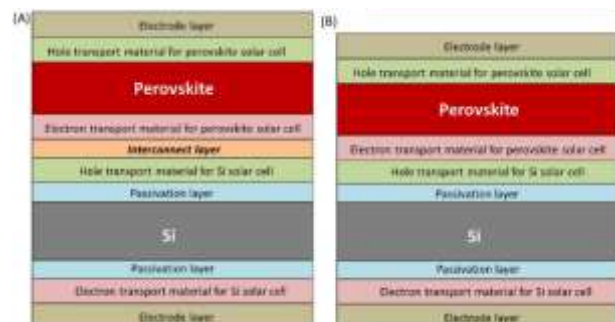


Figure 1: Si/perovskite tandem structures with dopant free Si solar cell (hole transport layer as the emitter) as bottom solar cell. The innovation also applies to the tandem structure that electron transport layer is working as emitter for Si solar cell. (A) Conventional tandem structure, (B) interconnect-free tandem structure