Fact Sheet

United States-Australia Solar Energy Collaboration Foundation Project

AUSTRALIAN SOLAR INSTITUTE

Multi-junction c-Si solar cells based on virtual Ge substrates

THE UNIVERSITY OF NEW SOUTH WALES (UNSW) AND THE NATIONAL RENEWABLE ENERGY LABORATORY (NREL).

AT A GLANCE

Grant Recipient
The University of New South Wales (UNSW)

ASI Funding
$1.27 million

Total Project Value
$6.03 million

Silicon based solar cells are highly cost-effective but have reached their efficiency limit. Tandem stack III-V technology provides a significant opportunity to improve efficiency but is expensive in its usual form. This project aims to combine the technologies to produce a low-cost, highly efficient solar cell.

This project aims to produce the first silicon based solar cell with more than 30 per cent efficiency, challenging the UNSW-held world record for conventional, silicon wafer technology.

Researchers will take advantage of the affordability of silicon based products by using it as the core component, and introduce other elements such as multi junction tandem stack technology.

There are many challenges to stacking cells on silicon in this way, the most difficult being the difference in atomic spacing in the silicon compared to the III-V group semi conductors. This difference is most effectively bridged using a thin layer of germanium, a product that is more than 100 times more expensive than silicon.

Using a sophisticated approach, researchers at the UNSW have shown that a simple, low-cost way of integrating it into the design is possible.

Their approach mimics conventional, highly efficient but expensive germanium multi-junction cell technology, without the associated costs.

As part of the project, researchers will:

- Demonstrate the viability of the combined III-V, silicon approach;
- Fabricate the first silicon based cell above 30 per cent efficiency; and
- Explore new equipment options to enable high volume production of multi-junction cells to match the modern silicon production line rate.

This project brings together two world-leading research groups; the National Renewable Energy Laboratory (specialists in multi-junction technology) and the University of New South Wales (leaders in silicon technology). They are well placed to explore a combination of the technologies to produce the next generation silicon based solar cell.

"This innovative approach will ensure Australia maintains its position as a leader in silicon cell technology development and pioneer a path for more efficient and affordable systems."

Professor Martin Green, Project Manager.

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