



## The Hot Carrier solar cell

### THE UNIVERSITY OF NEW SOUTH WALES

#### AT A GLANCE

##### Grant Recipient

The University of  
New South Wales (UNSW)

##### ASI Funding

\$0.6 million

##### Total Project Value

\$1.3 million

This project aims to demonstrate a third generation solar cell technology that will make it possible to reduce the cost of photovoltaic (PV) solar cells. Lower-cost PV cells could significantly enhance the commercial potential for the solar industry.

Solar cells and balance of system are the major components of a photovoltaic system cost. By offering high conversion efficiencies as well as low-cost fabrication techniques using cheap, non-toxic and abundant materials, the Hot Carrier (HC) solar cell can reduce both manufacturing and system costs and therefore significantly reduce the generation cost of electricity.

The HC solar cell aims to achieve high efficiency by tackling the major loss in conventional solar cells due to thermalisation (or cooling) of photo-excited carriers with energies above the conduction band-edge (“hot” carriers). In order to extract these carriers with excess energies, ways must be found to slow down the rate at which carriers lose their energy.

Preventing or slowing this process is challenging, and involves finding HC absorber materials which can prevent or minimise thermalisation of “hot” carriers so that sufficient time is available to extract them whilst they are still at

elevated energies. This allows higher voltages to be achieved from the cell. It also requires finding Energy Selective Contacts (ESCs), which extract “hot” carriers over a narrow energy range. This is necessary to prevent cold carriers in the contact from cooling the hot carriers.

Some progress has been made toward modelling of HC absorbers, ESCs and on making a more realistic model for HC cell efficiencies at UNSW. The work is now focused on further modelling and fabrication of HC absorbers, ESC, and finally integration of both for a complete HC solar cell prototype.

“The aim of this project is to demonstrate ‘proof of concept’ of the HC solar cell by developing HC absorber materials and ESCs, the two main requirements for the realisation of the HC solar cell.”

*Dr Santosh Shrestha, Project Leader.*

#### Project Contact

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