Advanced Silicon Solar Cells by DESIJN (Deposited Silicon Junctions)

Project results and lessons learnt

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Contact name:	Daniel Macdonald		
Title:	Professor		
Email:	daniel.macdonald@anu.edu.au	**Phone:**	(02) 6125 2973
Website:			

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Executive Summary

This project is developing new silicon solar cell technology with our project partner, Jinko Solar, the world's largest manufacturer of photovoltaics modules. The technology being developed in this project is based on thin poly-silicon films, which provide an alternative method to allow electrical contact to the solar cells. This new type of contacting method has excellent electrical properties and can be achieved with simple fabrication processes. Potentially, these poly-silicon contacts can increase the efficiency of industrial solar cells from approximately 22% to 23% without adding to the cost of production.

Project Overview

Project summary

This project is developing new solar cell technologies based on poly-silicon layers, which simplify the solar cell design and fabrication process, whilst enabling higher efficiencies to be achieved in production. The poly-silicon layers provide two functions simultaneously – they allow electrical contact to be made to the solar cell with low resistive losses, and they also block charge carriers within the solar cell from reaching the defective surfaces, where they could otherwise be lost. We are working with Jinko Solar to develop cost effective and industrially compatible ways to make solar cells with this new type of poly-silicon contact.

Project scope

The project aims to develop industrial silicon solar cells with higher efficiency, without increasing production costs. By working in close collaboration with our project partner Jinko Solar, we are developing and transferring methods to create high quality poly-silicon contacts to solar cells that can potentially increase the efficiency by 1 % point. The project involves initial proof-of-concept and technology development at ANU, followed by transfer to the pilot lines at Jinko Solar.

Outcomes

To date, the project has successfully developed a range of suitable methods for creating poly-silicon contacts, for both p-type and n-type solar cells. A highlight has been the fabrication at ANU of 23 % efficient p-type cells that incorporate a heavily boron-doped poly-silicon layer on the rear surface, using a low-cost sputtering method with *in-situ* doping. This approach has distinct cost and safety advantages over the standard methods for creating poly-silicon contacts. Other potentially low-cost approaches to depositing the poly-silicon contacts are also being explored.

Conclusion and next steps

The project is now at the halfway point, and has made excellent progress in testing and developing new low-cost approaches to create poly-silicon contacts. A key focus for the remainder of the project will be the successful transfer of the most promising of these technologies to the pilot lines at Jinko Solar.