NON-CONFIDENTIAL DISCLOSURE

Photovoltaic Technology- Laser Doping Selective Emitter

UNSW has boosted the performance of its Laser Doping Selective Emitter (LDSE) solar cell, a groundbreaking technology first developed by UNSW engineers in the mid-1990s.

LDSE Inventors: Professor Stuart Wenham and Professor Martin Green

UNSW's patented LDSE technology achieves energy-conversion efficiency of 19 percent using standard p-type or n-type commercial mono-silicon wafers (Cz monoX). This represents a 15 percent performance improvement compared to standard screen-printed solar cells using the same wafers and materials. It is highly suited to large-scale commercial production because of its simple, low cost, high-throughput characteristics.

The LDSE technology uses a laser in the presence of a phosphorus doping source to melt the silicon lying beneath the overlying antireflection coating /phosphorus source. This incorporates the phosphorus dopants into the molten silicon and removes the dielectric layer thereby exposing the silicon surface. Subsequent self-aligned metal contact formation to these exposed n-type regions is achieved with light-induced plating. This results in metal lines only 20 microns wide, with perfect alignment to the localised heavily doped regions. The antireflection coating is retained in non-metallised regions and acts as a plating mask, providing excellent surface passivation and antireflection qualities.

The rear surface uses conventional aluminium screen-printing and firing to form a rear p+ layer and metal contact. In the n-type LDSE cell, this p+ layer forms the main junction at the interface with the n-type wafer near the rear surface, with the novel firing conditions facilitating the achievement of V_{oc} values in excess of 650mV on standard commercial grade n-type CZ material.

An important benefit of the LDSE technology is its suitability for multicrystalline silicon wafers and other lower cost wafer types. UNSW has achieved pilot production energy-conversion efficiencies of 17 percent using multicrystalline silicon wafers.

Lower-cost wafers typically degrade badly when subjected to prolonged high temperature thermal processes, making them incompatible with other high efficiency technologies. LDSE technology overcomes this limitation by using a laser to locally apply the necessary heat for localised formation of heavily doped regions. This means the remainder of the wafer isn't subjected to high temperatures and avoids the problems associated with prolonged high temperature thermal processes.

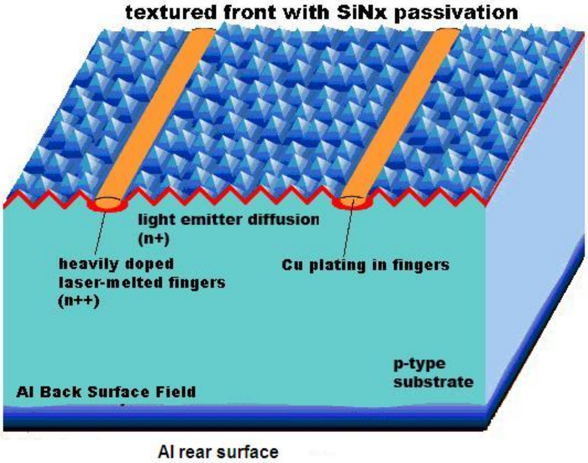

Diagram of a p-type LDSE solar cell

The next-generation LDSE technology, will be ready for commercial production within two years. By then it is expected to achieve a 20 to 25 percent increase over present performance of standard mono-silicon screen-printed solar cells.

In summary, the advantages of UNSW's patented LDSE solar cell technology are:

- Higher efficiency solar cells
- Lower production costs
- Suitable for mono- or multi-crystalline wafers
- Suitable for n-type with either front or rear junctions

To find out about licencing and partnering opportunities please contact:
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