

Transparent Conductors for Silicon Solar Cells

Business Opportunity

This invention provides a novel top surface design for screen-printed silicon solar cells that overcomes the dependence on uniformly heavily diffused emitters, thereby avoiding the corresponding poor performance to short wavelengths of light.

NewSouth Innovations are looking for a collaborative research partner to work with the UNSW to develop the new technology with the view to possible commercialisation through a licensing agreement or trade sale.

Novelty

Researchers are endeavouring to develop improved screen-printing techniques that facilitate the achievement of narrower screen-printed metal lines (fingers) that can therefore be spaced more closely without excessive metal shading losses, while still allowing the use of emitter sheet resistivities approaching 100 ohms per square. One approach is to improve the lateral conductivity of the 100 ohms per square emitter, by coating it with a transparent conducting oxide such as zinc oxide or indium tin oxide. This approach gets used in some solar cell technologies such as amorphous silicon solar cells where the lateral conductivity is not high enough for the metal finger spacing being used. Such layers however tend to be expensive to produce reliably in production while simultaneously lowering the durability of the resulting product due to degradation in the electrical properties of such layers over long periods of time, particularly in the presence of moisture.

This invention provides an alternative approach to using the transparent conducting oxides. It uses heavily doped transparent conductors within the silicon itself in parallel with a lightly diffused emitter with the latter having a sheet resistivity in the range of 50 to 5,000 ohms per square. These heavily doped transparent conductors within the silicon run parallel to each other as shown in figures 1 and carry current to the metal fingers which usually run perpendicularly to the heavily doped transparent conductors and make electrical contact to them where they intersect. These heavily doped transparent conductors within the silicon therefore alleviate the need for sheet resistivities below 100 ohms per square in the remainder of the emitter, therefore facilitating greatly improved response to short wavelength light compared to conventional screen printed solar cells of figure 2.

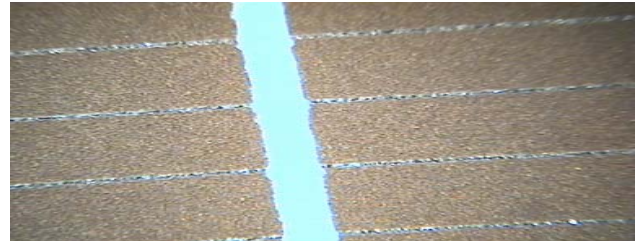


Figure 1- Laser Doped Transparent Conductors

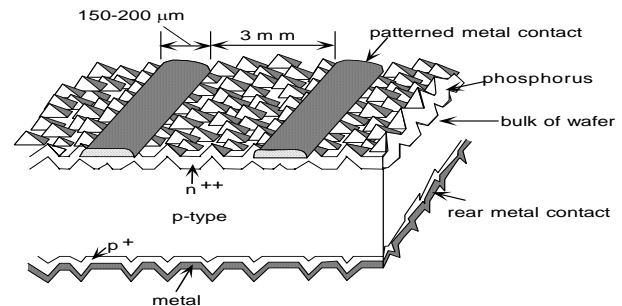


Figure 2 - Conventional Screen Printing

The Technology

High performance cells need to avoid heavily diffused surfaces where the light enters. Conventional screen-printed solar cells cannot satisfy this requirement due to the need for the metal fingers to be spaced well apart and due to the need for heavy doping in the silicon to achieve good ohmic contact between the silicon and the metal.

This invention overcomes these limitations through the use of transparent heavily doped silicon conductors within the silicon wafer that carry current to the metal fingers which in general run perpendicularly to the transparent conductors as shown in figure 1. Provided such conductors are spaced less than about 1.2mm apart, the remainder of the emitter can be doped to sheet resistivities above 100 ohms per square as desired for good performance to short wavelength light.

Patent Position

NewSouth Innovations is working with inventors from UNSW to establish a strong patent position covering the use of Transparent Conductors technology

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