



Sliver® Cells

Sliver® cells address the major issue relating to the uptake of solar electric systems – the cost. Sliver® cells use up to 90% less silicon compared with mono crystalline cells of equivalent output resulting in lower module costs.

Sliver® cells were invented and developed by the Centre for Sustainable Energy Systems (CSES). Origin Energy, an Australian energy company, has committed \$35 million to a manufacturing plant in Adelaide, and modules made of Sliver® cells

will be commercially available from 2005.

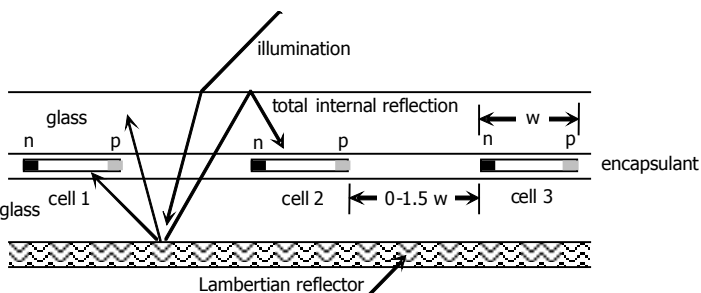
Fabrication

Sliver® solar cells are fabricated using 1 – 2 mm thick silicon wafers. The key step in Sliver® cell processing is to form deep narrow grooves all the way through the wafer. Several processes can be used including laser scribing, a dicing saw or an anisotropic etching process.

The result is a wafer cut into a series of slivers, with each sliver approximately 50-100mm long, 1-2mm wide and 40-60µm thick.

Note that after creating the grooves the slivers are still attached to the wafer. This allows the slivers to undergo further steps in the fabrication process before they are removed and assembled into modules.

Cells can be laid out with no gap between or with any spacing between slivers up to about 1.5 times the width of each cell. With a scattering reflector attached to the rear of each module, most of the light incident in the space between the cells can still be captured. Sliver® cells are truly bifacial as they respond equally well to light on either surface.

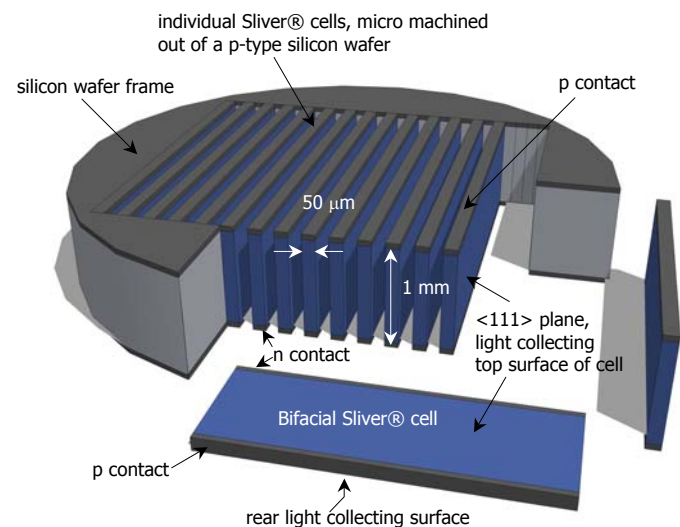


Advantages

More bang for your buck!

This means less silicon per unit area, greater area covered per unit mass of silicon, lower \$/W, lower overall system costs or greater efficiency if more expensive materials and processes are used. These are all different ways of saying that Sliver® cells use approximately one tenth the amount of expensive silicon compared with conventional cells.

A wafer (assume 150mm diameter) configured as a conventional solar cell has an area of 177cm². However, the same wafer, when processed to produce Sliver® cells, can be used to cover up to 5,000 cm² of module area, which is 30 times better than for conventional technology.



The open circuit voltage of Sliver® cells is in the range 650-700mV at 25°C.

Sliver cells can be connected in any series and parallel configuration to deliver the output voltage required for any application.



The output of 72 conventional cells is the same as that from 2 wafers when the wafers are manufactured into Sliver® cells.

Transparent Modules



Building-integrated Sliver® modules take advantage of the fact that any degree of module transparency can be easily achieved by adjusting the Sliver® cell spacing.

Flexibility

Flexible modules can be created by suitable encapsulation of the Sliver® cells (which are flexible due to their thinness).

High Voltage

Many Sliver® cells in series still take up very little area, so high voltages can be obtained in very small modules. This makes Sliver® cells ideal for powering small consumer items.

Bifacial Response

The perfect bifacial response of a Sliver® cell means that Sliver modules respond equally well to light falling on either surface. This allows for novel applications of Sliver® modules. For example, highway round barriers can utilise Sliver® modules that are mounted vertically facing east-west.

Higher Efficiencies



Due to the silicon savings, better quality silicon can be used to maintain higher efficiency. Because fewer wafers need to be processed per unit area of finished module, more sophisticated processing can be used to ensure the highest cell performance.

Slightly Lower Operating Temperatures

Sliver® modules operate at slightly lower temperatures than comparable conventional modules, and so lose less performance on hot days.

Energy Payback

The energy payback time of a Sliver® module is short because the quantity of energy-intensive silicon is sharply reduced. The energy payback time is 1.5 years, two thirds of which is due to standard module components (glass Al frame etc.) compared with 4 years for a conventional module.

Use as Concentrator Cells

Sliver® cells have important potential applications as concentrator cells in the range 10-80 suns. Reasons for this include the fact that the concentrator cells can come from large production runs, high cell efficiency and high voltage capability.



Contacting CSES

See <http://solar@anu.edu.au> for further details, a list of current projects, media releases and papers presented at national and international conferences.

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