News Release

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SANYO Develops Ultra-thin HIT Solar Cell with the World's Highest-level Conversion Efficiency of 22.8%

Resource Saving and Half the Thickness of Previous Cells

Tokyo, September 18, 2009 – SANYO Electric Co., Ltd. (SANYO) is pleased to announce the realization of a 22.8% cell energy conversion efficiency, for a research-level HIT solar cell*1. This comes close to the world's best conversion efficiency of 23.0% in a practical size (100 cm^2 or more) announced in May 2009. SANYO's solar cell improvement was realized using a cell thickness of 98μm, which is less than half*2 the previous thickness.

Background

With crystalline silicon-type photovoltaic cells such as HIT solar cells, the most important issue for reducing the cost of photovoltaic systems is the achievement of both energy conversion efficiency and a thin silicon wafer, which is the energy generation layer.

Generally, reducing the thickness of the silicon wafer in order to save resources and reduce costs results in less optical absorption and causes energy conversion efficiency to drop. Now SANYO has developed technology that can greatly control the drop in performance, which has been the issue for making even thinner cells. SANYO did this by using its technology for high efficiency creation developed over many years for its HIT solar cells, which feature high energy conversion efficiency. As a result, SANYO has achieved the world's highest-level*3 conversion efficiency of 22.8%*4 at the research level in a practical size, using an ultra-thin HIT solar cell with a thickness of 98μm, which is less than half the thickness of a conventional high-efficiency solar cell. In the future, SANYO will focus on advancing applications for mass-production products with technology that offers both high conversion efficiency and a thinner cell for the newly improved HIT solar cell. At the same time, the company will pursue R&D that aims for even better high conversion efficiency, lower costs, and resource-saving designs.

*1 The Heterojunction with Intrinsic Thin-layer (HIT) solar cell is an original technology developed by SANYO, and is a hybrid model that combines a crystalline silicon substrate and an amorphous silicon thin film. It offers the world's best power generation level per unit of installation area, based on superior high energy conversion efficiency and temperature resistance.

*2 98μm, which is less than half the thickness of the world's highest efficiency HIT solar cell (thickness > 200μm; 23.0% conversion efficiency)

*3 As of September 18, 2009 (according to in-house surveys). World's highest conversion efficiency is 23.0% with the HIT solar cell (announced by SANYO on May 22, 2009)

*4 Evaluation results provided by the National Institute of Advanced Industrial Science and Technology (AIST).

Overview of the elemental technology enabling high efficiency in a thin cell

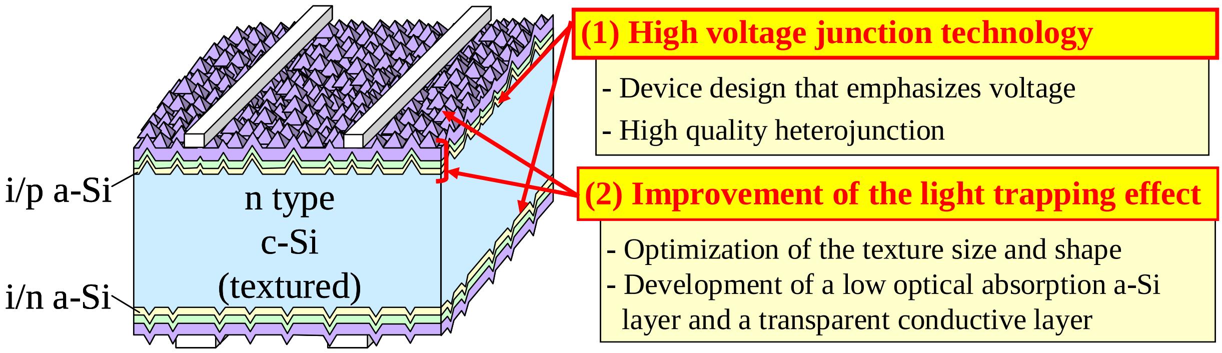
1. High voltage junction technology

The advantage of the HIT solar cell structure is being able to obtain high open-circuit voltage (Voc)*5, while reducing recombination loss*6 of the charged carriers*7, particles of electricity. This is done by depositing high quality amorphous silicon (a-Si) on a substrate surface made of single-crystalline silicon (c-Si), the energy generation layer. With SANYO's new technology, the voltage has been greatly increased from the previous 0.729 volts to 0.743 volts. This is based on successful discovery of conditions for greatly increasing Voc in a thinner cell, as a result of selecting a structure that places more emphasis on voltage at the time of device design.

2. Improved light trapping effect

In the HIT solar cell, the primary cell material, the silicon wafer, absorbs light and functions as the energy generation layer. Therefore, when trying to make a conventional solar cell thinner, the energy-generating silicon wafer also must become thinner, which decreases the amount of optical absorption, and lowers the short-circuit current (Isc)[*8]. SANYO succeeded in solving this problem by improving the light trapping effect of the Si wafer. This was achieved with better technology for reducing optical absorption loss in the transparent conductive layer and in the a-Si layer, through optimization of the Si textured surface. The result is a substantial increase for the previous Isc of 37.3 mA/cm^2 (SANYO measurement for a cell thickness of 85μm) to 38.8 mA/cm^2 in an ultra-thin HIT solar cell with a cell thickness of 98μm.

Schematic diagram of the elemental technology



*5 The open-circuit voltage (Voc) is the maximum voltage produced by the solar cell

*6 Recombination loss occurs when the negative electrons and positive holes (carriers) that are produced within the solar cell combine and disappear, causing a loss in the electrical current produced by the cell and hence a decrease in the overall output of the solar cell.

*7 A charged carrier denotes a particle carrying an electric charge, namely electrons (negative) or holes (positive). While electrons have a negative charge, holes have a positive charge, as they represent the absence of an electron at a position where one could exist.

*8 The short-circuit current (Isc) is the maximum current that can be produced by the solar cell

*9 The fill factor (FF) is the maximum output of the solar cell divided by the product of Voc and Isc (Voc x Isc)

HIT Solar Cell Features

Open-circuit voltage (Voc)	0.743 V
Short-circuit current (Isc)	3.896 A (38.8 mA/cm^2)
Fill factor (FF)[*9]	79.1%
Cell energy conversion efficiency	22.8%
Cell size	100.3 cm^2

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