

New efficiency record for solar cells

May 14 2008

Physicist Bram Hoex and colleagues at Eindhoven University of Technology, together with the Fraunhofer Institute in Germany, have improved the efficiency of an important type of solar cell from 21.9 to 23.2 percent (a relative improvement of 6 per cent). This new world record is being presented on Wednesday May 14 at a major solar energy conference in San Diego.

The efficiency improvement is achieved by the use of an ultra-thin aluminum oxide layer at the front of the cell, and it brings a breakthrough in the use of solar energy a step closer.

An improvement of more than 1 per cent (in absolute terms) may at first glance appear modest, but it can enable solar cell manufacturers to greatly increase the performance of their products. This is because higher efficiency is a very effective way of reducing the cost price of solar energy. The costs of applying the thin layer of aluminum oxide are expected to be relatively low. This will mean a significant reduction in the cost of producing solar electricity.

Hoex was able to achieve the increase in efficiency by depositing an ultra-thin layer (approximately 30 nanometer) of aluminum oxide on the front of a crystalline silicon solar cell. This layer has an unprecedented high level of built-in negative charges, through which the – normally significant – energy losses at the surface are almost entirely eliminated. Of all sunlight falling on these cells, 23.2 per cent is now converted into electrical energy. This was formerly 21.9 per cent, which means a 6 per cent improvement in relative terms.

Hoex gained his PhD last week at the Applied Physics department of the TU/e with this research project. He was supported in the Plasma & Materials Processing (PMP) research group by professor Richard van de Sanden and associate professor Erwin Kessels. This group specializes in plasma deposition of extremely thin layers. The Dutch company OTB Solar has been a licensee of one of these processes since 2001, which it is using in its solar cell production lines. Numerous solar cell manufacturers around the world use equipment supplied by OTB Solar.

The ultra-thin aluminum oxide layer developed in the PMP group may lead to a technology innovation in the solar cell world. A number of major solar cell manufacturers have already shown interest.

Solar cells have for years looked like a highly promising way to partly solve the energy problem. The sun rises day after day, and solar cells can conveniently be installed on surfaces with no other useful purpose. Solar energy also offers opportunities for use in developing countries, many of which have high levels of sunshine.

Within ten to fifteen years the price of electricity generated by solar cells is expected to be comparable to that of 'conventional' electricity from fossil fuels. This technology breakthrough now brings the industrial application of this type of high-efficiency solar cell closer.

Source: Eindhoven University of Technology

Citation: New efficiency record for solar cells (2008, May 14) retrieved 27 April 2024 from <https://phys.org/news/2008-05-efficiency-solar-cells.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is

provided for information purposes only.