Towards nanowire solar cells with a 65-percent efficiency

June 20 2010

Dutch researchers want to develop solar cells with an efficiency of over 65 percent by means of nanotechnology.

In Southern Europe and North Africa these new solar cells can generate a substantial portion of the European demand for electricity. The Dutch government reserves EUR 1.2 million (1.5 million U.S. dollars) for the research.

An agency of the Ministry of Economic Affairs, will grant the EUR 1.2 million to Eindhoven University of Technology researchers for their research into nanowire solar cells. It is their expectation that, when combined with mirror systems, these solar cells can generate a sizeable portion of the European electricity demand in Southern Europe and North Africa.

The current thin-film solar cells (type III/V) have an efficiency that lies around 40 percent, but they are very expensive and can only be applied as solar panels on satellites. By using mirror systems that focus one thousand times they can now also be deployed on earth in a cost-effective manner. The TU/ researchers expect that in ten years their nano-structured solar cells can attain an efficiency of more than 65 percent. Jos Haverkort: "If the Netherlands wants to timely participate in a commercial exploitation of nanowire solar cells, there is a great urgency to get on board now." The research is conducted together with Philips MiPlaza.

They think that nanotechnology, in combination with the use of concentrated sunlight through mirror systems, has the potential to lead to the world's most efficient solar cell system with a cost price lower than 50 cent per Watt peak. In comparison: for the present generation of solar cells that cost price is 1.50 euro (1.85 USD) per Watt peak.

Nanowires make it possible to stack a number of subcells (junctions). In this process each subcell converts one color of sunlight optimally to electricity. The highest yield reported until now in a nanowire solar cell is 8.4 percent. Haverkort: "We expect that a protective shell around the nanowires is the critical step towards attaining the same efficiency with nanowire solar cells as with thin-film cells." Haverkort thinks that at 5 to 10 junctions he will arrive at an efficiency of 65 percent.

In addition, the researchers expect considerable savings can be made on production costs, because nanowires grow on a cheap silicon substrate and also grow faster, which results in a lower cost of ownership of the growth equipment. What is more, the combination of the mirror systems with nanotechnology will imply an acceptable use of the scarce and hence expensive metals gallium and indium.

Provided by Eindhoven University of Technology