

Efficiency Boost Makes Solar Cells Cheaper

ScienceDaily (May 3, 2007) — Solar energy could become more affordable following a breakthrough by UNSW scientists, who have boosted the efficiency of solar cell technology. The advance could see the price of an installed solar system for an average house fall from around \$20,000 to \$15,000. Up to 45 percent of the cost of solar cell technology is due to the high cost of the silicon used to convert sunlight to electricity.

Silicon is the material of choice in the electronics industry because of its stability, non-toxicity and ubiquity. However, silicon is a poor absorber of light. In a bid to drive down costs, scientists have moved from using expensive thick silicon “wafers” to cheaper “thin film” cells, containing less silicon.

The disadvantage of these one-to-two micron-thick films is that they convert only eight to 10 percent of incoming sunlight into electricity, compared to the 25 percent efficiency of thicker, more expensive, silicon wafers. Scientists around the world are testing new ways to boost the efficiency of thin film technology, while keeping down costs.

Now, researchers at UNSW’s ARC Photovoltaics Centre of Excellence, led by PhD student Supriya Pillai have reported a 16-fold enhancement in light absorption in 1.25-micron thin-film cells for light with a wavelength of 1050 nm. They have also reported a seven-fold enhancement in light absorption in the more expensive wafer type cells light wavelengths of 1200 nm.

"Most thin-film solar cells are between eight and 10 percent efficient," says Dr Kylie Catchpole, a co-author of the study, "but the new technique could increase efficiency to between 13 and 15 percent."

That's an important advance, she says: "If they're below 10 percent efficient, then you can't really afford to install them, because it would take up too much of your roof area, for example, to power your house." Once the technology approaches 15 per cent efficiency, it becomes commercially viable.

An average house could have its daily power supplied by installing a solar system and panels covering 10 square metres. This system would exclude power for cooking and hot water heating.

The breakthrough, which is reported in the upcoming issue of the *Journal of Applied Physics*, could eventually see a dramatic rise in solar power’s share of the electricity market. Currently only 30,000 Australian households - out of 8 million - have installed solar panels.

The UNSW researchers have devised a way to deposit a thin film of silver (about 10 nanometres thick) onto a solar cell surface and then heat it to 200° Celsius. This breaks the film into tiny 100-nanometre “islands” of silver that boost the cell’s light trapping ability, thereby boosting its efficiency.

Adapted from materials provided by [University of New South Wales](http://www.unsw.edu.au).

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