

## Easing Concerns About Pollution From Manufacture Of Solar Cells

ScienceDaily (Feb. 26, 2008) — In a finding that could help ease



*Manufacturing solar cells, which harness the energy of the sun, produces far few pollutants than conventional fossil fuel technologies, scientists say. (Credit: Courtesy of NASA)*

concerns about the potential environmental impact of manufacturing solar cells, scientists report that the manufacture of solar cells produces far fewer air pollutants than conventional fossil fuel technologies. Their report is the first comprehensive study on the pollutants produced during the manufacture of solar cells.

Solar energy has been touted for years as a safer, cleaner alternative to burning fossil fuels to meet rising energy demands. However, environmentalists and others are increasingly concerned about the potential negative impact of solar cell (photovoltaic) technology.

Manufacture of photovoltaic cells requires potentially toxic metals such as lead, mercury and cadmium and produces carbon dioxide, which contributes to global warming.

In the new study, Vasilis M. Fthenakis and colleagues gathered air pollution emissions data from 13 solar cell manufacturers in Europe and the United States from 2004-2006. The solar cells include four major commercial types: multicrystalline silicon, monocrystalline silicon, ribbon silicon, and thin-film cadmium telluride.

The researchers found that producing electricity from solar cells reduces air pollutants by about 90 percent in comparison to using conventional fossil fuel technologies.

The study "Emissions from Photovoltaic Life Cycles" is scheduled for the March 15 issue of the ACS' Environmental Science & Technology. doi./10.1021/es071763q

## Go Solar, Wind Or Geothermal If You Want Renewable Energy With Life-cycle Efficiency

ScienceDaily (Aug. 18, 2007)

— Do the overall efficiencies of renewable energy sources, such as wind, solar, and geothermal add up in terms of their complete life cycle from materials sourcing, manufacture, running, and decommissioning" Researchers in Greece have carried out a life cycle assessment to find the answer.

Increasing energy consumption and a growing world population implies shrinking reserves of fossil fuels. While the use of fossil fuels brings with it the problem of carbon dioxide emissions and climate change. Our continued dependence on fossil fuels coupled with the pressing global issue of climate change has pushed the concept of renewable energy sources to the top of the agenda.

In looking for alternative energy supplies, there is more to simply adding up the outputs, according to Christopher Koroneos and Yanni Koroneos of the Laboratory of Heat Transfer and Environmental Engineering, at the Aristotle University of Thessaloniki, Greece. They argue that a whole life cycle assessment of any environmentally friendly energy supply must be carried out to ensure its green credentials are valid.

Writing in *Inderscience's International Journal of Global Energy Issues*, the researchers point out that land use and materials employed are just two aspects of renewable energy development that can have an adverse impact on the otherwise positive environmental picture.

There are three viable renewable energy resources, say the researchers - solar energy, wind power and geothermal energy. They have applied the techniques of life cycle assessment (LCA) to each in order to determine the total environmental impact and to compare this with the effects of equivalent energy release from fossil fuels.

The LCA approach allows an assessment to be made of the flow of material and energy used in the construction, operation and ultimate decommissioning of a renewable energy supply. It also takes into account the manufacturing of components, the possible extraction and supply of fuels as well as waste generated in these processes.

The researchers demonstrate that some renewable energy systems based on wind power and geothermal energy do have valid green credentials in electricity production. The efficiency of these systems is comparable over the complete life cycle than the equivalent fossil fuel system. However, the conversion of solar energy to electricity using photovoltaic solar cells is less efficient in terms of materials production, running, and recycling than non-renewable energy. However, economies of scale come into play with solar power and a large enough area of solar cells would outstrip the fossil fuel system.

The team also points out that the life cycle pollution of solar systems is much, much lower than any conventional system although thermodynamic efficiency is lower.

"A significant advantage of the use of renewable energy systems," say the researchers, "is that they are environmentally friendly because overall they result in lower dangerous pollutant emissions, this and one other major factor, they are essentially inexhaustible."

## Nano Flakes May Revolutionize Solar Cells

ScienceDaily (Dec. 19, 2007)

— A new material, nano flakes, may revolutionise the transformation of solar energy to electricity. If so, even ordinary households can benefit from solar electricity and save money in the future.

If researcher Martin Aagesen's future solar cells meet the expectations, both your economy and the environment will benefit from the research. Less than 1 per cent of the world's electricity comes from the sun because it is difficult to transform solar energy to electricity. But Martin Aagesen's discovery may be a huge step towards boosting the exploitation of solar energy.

"We believe that the nano flakes have the potential to convert up to 30 per cent of the solar energy into electricity and that is twice the amount that we convert today," says Martin Aagesen who is a PhD from the Nano-Science Center and the Niels Bohr Institute at University of Copenhagen. During his work on his PhD thesis, Martin found a new and untried material.

"I discovered a perfect crystalline structure. That is a very rare sight. While being a perfect crystalline structure we could see that it also absorbed all light. It could become the perfect solar cell," says Martin Aagesen. The discovery of the new material has sparked a lot of attention internationally and has led to an article in Nature Nanotechnology.

"The potential is unmistakable. We can reduce the solar cell production costs because we use less of the expensive semiconducting silicium in the process due to the use of nanotechnology. At the same time, the future solar cells will exploit the solar energy better as the distance of energy transportati on in the solar cell will be shorter and thus lessen the loss of energy," says Martin Aagesen who is also director of the company SunFlake Inc. that pursues development of the new solar cell.

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Adapted from materials provided by [University of Copenhagen](#).

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University of Copenhagen (2007, December 19). Nano Flakes May Revolutionize Solar Cells. *ScienceDaily*. Retrieved December 3, 2008, from <http://www.sciencedaily.com/releases/2007/12/071218105420.htm>

# Record High Performance With New Solar Cells

ScienceDaily (Nov. 9, 2008) — Researchers in China and Switzerland are reporting the highest efficiency ever for a promising new genre of solar cells, which many scientists think offer the best hope for making the sun a mainstay source of energy in the future. The photovoltaic cells, called dye-sensitized solar cells or Grätzel cells, could expand the use of solar energy for homes, businesses, and other practical applications, the scientists say.

The research, conducted by Peng Wang and colleagues — who include Michael Grätzel, inventor of the first dye-sensitized solar cell — involves photovoltaic cells composed of titanium dioxide and powerful light-harvesting dyes. Grätzel cells are less expensive than standard silicon-based solar cells and can be made into flexible sheets or coatings.

Although promising, Grätzel cells until now have had serious drawbacks. They have not been efficient enough at converting light into electricity. And their performance dropped after relatively short exposures to sunlight.

In the new study, researchers describe lab tests of solar cells made with a new type of ruthenium-based dye that helps boost the light-harvesting ability. The new cells showed efficiencies as high as 10 percent, a record for this type of solar cell. The new cells also showed greater stability at high temperatures than previous formulas, retaining more than 90 percent of their initial output after 1,000 hours in full sunlight.

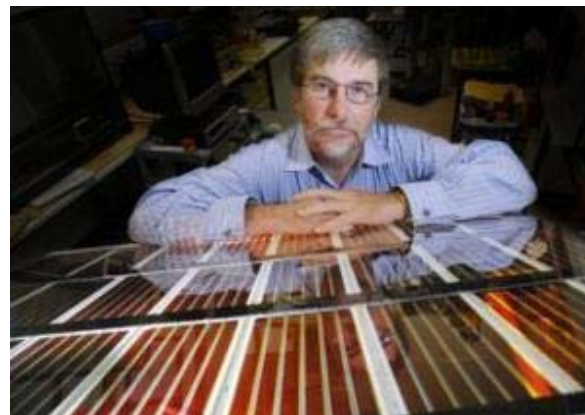
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## Journal reference:

1. Shi et al. **New Efficiency Records for Stable Dye-Sensitized Solar Cells with Low-Volatility and Ionic Liquid Electrolytes.** *Journal of Physical Chemistry C*, November 13, 2008; 112 (44): 17046 DOI: [10.1021/jp808018h](https://doi.org/10.1021/jp808018h)

## Future Of Solar-powered Houses Is Clear: New Windows Could Halve Carbon Emissions

ScienceDaily (Apr. 10, 2008) — People could live in glass



*Professor John Bell. (Credit: Image courtesy of Queensland University of Technology)*

houses and look at the world through rose-tinted windows while reducing their carbon emissions by 50%, thanks to QUT Institute of Sustainable Resources (ISR) research.

Professor John Bell said QUT had worked with a Canberra-based company Dyesol, which is developing transparent solar cells that act as both windows and energy generators in houses or commercial buildings.

He said the solar cell glass would make a significant difference to home and building owners' energy costs and could, in fact, generate excess energy that could be stored or on sold.

Professor Bell said the glass was one of a number of practical technologies that would help combat global warming which was a focus of research at the ISR.

"The transparent solar cells have a faint reddish hue but are completely see-through," Professor Bell said.

"The solar cells contain titanium dioxide coated in a dye that increases light absorption.

"The glass captures solar energy which can be used to power the house but can also reduce overheating of the house, reducing the need for cooling."

Professor Bell said it would be possible to build houses made entirely of the transparent solar cells.

"As long as a house is designed throughout for energy efficiency, with low-energy appliances it is conceivable it could be self-sustaining in its power requirements using the solar-cell glass," he said.

"Australian housing design tends to encourage high energy use because electricity is so cheap.

"But it is easy to build a house that doesn't need powered cooling or heating in Queensland."

He said the glass would be on the market in a few years.

Professor Bell said the solar cell glass was the subject of two Australian Research Council Linkage grants to QUT researchers to investigate ways to increase its energy absorption and to reduce the effects of "shadowing", where overcast skies and shadows from trees or other buildings can cause loss of collected power.

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*Adapted from materials provided by [Queensland University of Technology](#).*

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