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New Plastic Solar Cell Breaks Efficiency Record

Date: April 20, 2007

Source: Wake Forest University

Summary: Scientists have doubled the efficiency of organic or flexible, plastic solar cells in just two years.

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The global search for a sustainable energy supply is making significant strides at Wake Forest University as researchers at the university's Center for Nanotechnology and Molecular Materials have announced that they have pushed the efficiency of plastic solar cells to more than 6 percent.

In a paper to be published in an upcoming issue of the journal Applied Physics Letters, Wake Forest researchers describe how they have achieved record efficiency for organic or flexible, plastic solar cells by creating "nano-filaments" within light absorbing plastic, similar to the veins in tree leaves. This allows for the use of thicker absorbing layers in the devices, which capture more of the sun's light.

Efficient plastic solar cells are extremely desirable because they are inexpensive and light weight, especially in comparison to traditional silicon solar panels. Traditional solar panels are heavy and bulky and convert about 12 percent of the light that hits them to useful electrical power. Researchers have worked for years to create flexible, or "conformal," organic solar cells that can be wrapped around surfaces, rolled up or even painted onto structures.

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Three percent was the highest efficiency ever achieved for plastic solar cells until 2005 when David Carroll, director of the Wake Forest nanotechnology center, and his research group announced they had come close to reaching 5 percent efficiency.

Now, a little more than a year later, Carroll said his group has surpassed the 6 percent mark.

"Within only two years we have more than doubled the 3 percent mark," Carroll said. "I fully expect to see higher numbers within the next two years, which may make plastic devices the photovoltaic of choice."

In order to be considered a viable technology for commercial use, solar cells must be able to convert about 8 percent of the energy in sunlight to electricity. Wake Forest researchers hope to reach 10 percent in the next year, said Carroll, who is also associate professor of physics at Wake Forest.

Because they are flexible and easy to work with, plastic solar cells could be used as a replacement for roof tiling or home siding products or incorporated into traditional building facades. These energy harvesting devices could also be placed on automobiles. Since plastic solar cells are much lighter than the silicon solar panels structures do not have to be reinforced to support additional weight.

A large part of Carroll's research is funded by the United States Air Force, which is interested in the potential uses of more efficient, light-weight solar cells for satellites and spacecraft. Other members of Carroll's research team include Jiwen Liu and Manoj Namboothiry, postdoctoral associates at Wake Forest's nanotechnology center, and Kyungkon Kim, a postdoctoral researcher at the center, who has moved to the Materials Science & Technology Division at the Korea Institute of Science and Technology in Seoul.

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Story Source:

Materials provided by **Wake Forest University**. *Note: Content may be edited for style and length.*

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