Nanotech breakthrough aids quest for viable alternative energy sources

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At a time when oil prices are reaching record highs and people are bracing for winter heating bills, researchers at Wake Forest University's Center for Nanotechnology and Molecular Materials have made significant strides in improving the efficiency of organic or flexible solar cells.

Traditional silicon solar panels are heavy and bulky and convert about 20 percent of the light that hits them to useful electrical power. For years, researchers have worked to create flexible, or "conformal," organic solar cells that can be wrapped around surfaces, rolled up or even painted onto structures, but the best scientists have been able to do is about 3 percent efficiency, until now.

Researchers at Wake Forest, with the help of researchers at New Mexico State University, have achieved an efficiency rate for organic solar cells of almost 6 percent. In order to be considered a viable technology, the solar cells must be able to convert about 10 percent of the energy in sunlight to electricity. Wake Forest researchers hope to reach 10 percent by October 2006, said David Carroll, director of the nanotechnology center at Wake Forest.

"The consumer market would be really open to having these conformal systems if you could, for instance, roll them up and put them away," said Carroll, who is also an associate professor in Wake Forest's physics department. "Imagine a group of hikers with a tent that when you unrolled the tent and put it up, it could generate its own power. Imagine

if the paint on your car that is getting hot in the sun was instead converting part of that heat to recharge your battery."

Carroll said flexible, organic solar cells also offer several possibilities for military use.

"The military would obviously want something like that because you could only put maybe tens of those big solar panels on a transport, but you could put hundreds of ultra-thin flexible ones on a transport and supply half the army," he said.

Most experts have estimated that flexible, solar cell technology for consumers was about a decade away, but Carroll said the new breakthrough at Wake Forest and NMSU means that consumers could be using this technology in the next five years.

Using a set of polymer coatings, researchers at Wake Forest constructed a nanophase within the polymer called a "mesostructure." The "mesostructure" changes the properties of the plastic and makes it better for collecting light. The researchers also removed the current from the polymer coating, Carroll said.

A test system at Wake Forest's nanotechnology center was used to simulate the sun, Carroll said, and the simulated spectrum was precisely measured and shot onto the organic solar cell, which appeared as a thin coat of paint. Devices at the center have registered almost 6 percent efficiency.

This breakthrough was announced in October at the Santa Fe Workshop on Nanoengineered Materials and Macro-Molecular Technologies, which was sponsored by Wake Forest's nanotechnology center.

Source: Wake Forest University (By Jacob McConnico)