UCLA engineers pioneer affordable alternative energy-solar energy cells made of everyday plastic

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With oil and gas prices in the United States hovering at an all-time high, interest in renewable energy alternatives is again heating up. Researchers at the UCLA Henry Samueli School of Engineering and Applied Science hope to meet the growing demand with a new and more affordable way to harness the sun's rays: using solar cell panels made out of everyday plastics.

In research published today in Nature Materials magazine, UCLA engineering professor Yang Yang, postdoctoral researcher Gang Li and graduate student Vishal Shrotriya showcase their work on an innovative new plastic (or polymer) solar cell they hope eventually can be produced at a mere 10 percent to 20 percent of the current cost of traditional cells, making the technology more widely available.

"Solar energy is a clean alternative energy source. It's clear, given the current energy crisis, that we need to embrace new sources of renewable energy that are good for our planet. I believe very strongly in using technology to provide affordable options that all consumers can put into practice," Yang said.

The price for quality traditional solar modules typically is around three to four times more expensive than fossil fuel. While prices have dropped since the early 1980s, the solar module itself still represents nearly half of the total installed cost of a traditional solar energy system.

Currently, nearly 90 percent of solar cells in the world are made from a refined, highly purified form of silicon -- the same material used in manufacturing integrated circuits and computer chips. High demand from the computer industry has sharply reduced the availability of quality silicon, resulting in prohibitively high costs that rule out solar energy as an option for the average consumer.

Made of a single layer of plastic sandwiched between two conductive electrodes, UCLA's solar cell is easy to mass-produce and costs much less to make -- roughly one-third of the cost of traditional silicon solar technology. The polymers used in its construction are commercially available in such large quantities that Yang hopes cost-conscious consumers worldwide will quickly adopt the technology.

Independent tests on the UCLA solar cell already have received high marks. The nation's only authoritative certification organization for solar technology, the National Renewable Energy Laboratory (NREL), located in Golden, Colo., has helped the UCLA team ensure the accuracy of their efficiency numbers. The efficiency of the cell is the percentage of energy the solar cell gathers from the total amount of energy, or sunshine, that actually hits it.

According to Yang, the 4.4 percent efficiency achieved by UCLA is the highest number yet published for plastic solar cells.

"As in any research, achieving precise efficiency benchmarks is a critical step," Yang said. "Particularly in this kind of research, where reported efficiency numbers can vary so widely, we're grateful to the NREL for assisting us in confirming the accuracy of our work."

Given the strides the team already has made with the technology, Yang calculates he will be able to double the efficiency percentage in a very short period of time. The target for polymer solar cell performance is

ultimately about 15 percent to 20 percent efficiency, with a 15–20 year lifespan. Large-sized silicon modules with the same lifespan typically have a 14 percent to 18 percent efficiency rating.

The plastic solar cell is still a few years away from being available to consumers, but the UCLA team is working diligently to get it to market.

"We hope that ultimately solar energy can be extensively used in the commercial sector as well as the private sector. Imagine solar cells installed in cars to absorb solar energy to replace the traditional use of diesel and gas. People will vie to park their cars on the top level of parking garages so their cars can be charged under sunlight. Using the same principle, cell phones can also be charged by solar energy," Yang said. "There are such a wide variety of applications."

Source: UCLA