

UCLA's new transparent solar film could be game-changer

August 21 2012, by Dean Kuipers

One of the holy grails of solar cell technology may have been found, with researchers at UCLA announcing they have created a new organic polymer that produces electricity, is nearly transparent and is more durable and malleable than silicon.

The applications are mind-boggling. Windows that produce [electricity](#). Buildings wrapped in transparent [solar cells](#). Laptops and phones ?- or even cars or planes ?- whose outer coverings act as chargers. It might even be sprayed on as a liquid. The promise of cheap and easy-to-apply site-generated [solar electricity](#) might now be a lot closer to reality.

Of course, the idea of solar films and solar plastics is not new. The breakthrough to making a transparent film, however, came with isolating only one band of light in the spectrum.

"(A solar film) harvests light and turns it into electricity. In our case, we harvest only the infrared part," says Professor Yang Yang at UCLA's California [Nanosystems](#) Institute, who has headed up the research on the new photovoltaic polymer. Absorbing only the [infrared light](#), he explains, means the material doesn't have to be dark or black or blue, like most silicon photovoltaic panels. It can be clear. "We have developed a material that absorbs infrared and is all transparent to the visible light."

"And then we also invented a new electrode, a metal, that is also transparent. So we created a new solar cell," Yang adds.

Well, the metal is actually not transparent, Yang points out; it's just so small that you can't see it. The new polymer incorporates silver [nanowires](#) about 0.1 microns thick, about one-thousandth the width of a human hair, and [titanium dioxide](#) nanoparticles as an electrode. When in liquid form, it is as clear as a glass of water, and when applied to a hard, [flat surface](#) as a film it is meant to be invisible to the eye.

Thin-film PV currently exists that can be applied to windows, but only on windows that can be tinted. Many buildings use tinted windows as a way to cut down infrared radiation and thus keep out excess heat. Because this new [transparent film](#) is meant specifically to absorb in the infrared spectrum, it may be able to cut air conditioning bills and generate electricity at the same time, while leaving windows clear. Technically, however, the entire building could be covered with the thin film and not affect colors.

Isolating the infrared spectrum is currently a less-efficient way to make electricity, and Yang says his group's technology converts about 6 percent of the sun's energy into electricity, as opposed to 11 percent or 12 percent from commercial PV. But, he says, that can change.

"We have to work hard in the lab to expand the coverage of the infrared," says Yang. "Because infrared is huge, huge energy there, and we only harvest right now less than one-third of the infrared. Our efficiency could double or almost triple in the future. There are some limitations, but we should be able to go to 10 percent in the next 3 to 5 years."

Coincidentally, the company that has launched the most high-profile effort to mass-manufacture photovoltaic polymers, Konarka Technologies, involved Yang's PhD adviser, the late Sukant Tripathy. That company's colored plastics use full-spectrum light to create low-cost PV that Tripathy hoped would bring cheap electricity to his home

country of India. The company made big news earlier this year when it filed for Chapter 7 bankruptcy.

Yang says that he will have to carry on his former professor's dream to bring low-cost electricity to places like India and China, a pursuit that will necessitate a new way of looking at electricity.

"I think that solar has to take a different attitude," says Yang. "Whenever people think about solar, they think about the big silicon panels that they put on their roof, or the big solar farms that SoCal Edison builds out in the desert. But for the future of energy use, we must think about how to harvest energy whenever and wherever it is possible. If we can change the concept that energy has to come from one source, which is the power company, that the supply should not be subject to the limitations of the power grid, a lot of new things can happen."

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