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Energy, the Environment and the Bottom Line

Transparent Photovoltaic Cells Turn Windows Into Solar Panels

By **John Collins Rudolf** April 20, 2011 3:35 pm

A new class of transparent photovoltaic cells has been developed that can turn an ordinary windowpane into a solar panel without impeding the passage of visible light, scientists said Tuesday.

The cells could one day transform skyscrapers into giant solar collectors, said Richard Lunt, one of the researchers on the project.

“We think there’s a lot of potential to be able to integrate these into tall buildings,” Dr. Lunt, a postdoctoral researcher at the M.I.T. Research Laboratory of Electronics, said in an interview.

Previous attempts at transparent solar cells have either failed to achieve high efficiency or blocked too much light to be used in windows. But the new cells, based on organic molecules similar to dyes and pigments, are tailored to absorb only the near-infrared spectrum and have the potential to transform that light into electricity at relatively high efficiency.

The current efficiency of the prototype cells is only about 2 percent, but some basic modifications, like stacking the cells, could increase efficiency to around 10 percent, Dr. Lunt said.

The largest challenge in developing commercial applications for the new solar cells will be longevity. The cells could be packaged in the middle of double-paned windows, which would provide protection from the elements. But the

longevity of the cells would still need to approach the life span of the windows themselves, which would not be replaced for decades.

“To make this thing truly useful, you do need to extend the lifetime, and make sure it reaches at least 20 years, or even longer than that,” said Vladimir Bulovic, a professor of electrical engineering at M.I.T. who collaborated on the development of the cells.

Mr. Bulovic said that previous work to extend the life span of organic light-emitting diodes, or LEDs, which share properties with the organic solar cells, indicated that the problem of longevity was not an extraordinarily difficult one.

“It appears at this point that this is an engineering problem,” he said. “I would expect that within a decade those will be solved issues.”

If the cells can be made long-lasting, they could be integrated into windows relatively cheaply, as much of the cost of conventional photovoltaics is not from the solar cell itself, but the materials it is mounted on, like aluminum and glass. Coating existing structures with solar cells would eliminate some of this material cost.

If the transparent cells ultimately prove commercially viable, the power they generate could significantly offset the energy use of large buildings, said Dr. Lunt, who will begin teaching at Michigan State University this fall.

“We’re not saying we could power the whole building, but we are talking about a significant amount of energy, enough for things like lighting and powering everyday electronics,” he said.

The Center for Excitonics, an Energy Frontier Research Center financed by the Department of Energy, provided funds for the research. A paper describing the technology behind the cells will appear in the next issue of the journal *Applied Physics Letters*.