Researchers develop inexpensive, easy process to produce solar panels

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NJIT researchers develop inexpensive, easy process to produce solar panels. Credit: New Jersey Institute of Technology

Researchers at New Jersey Institute of Technology have developed an inexpensive solar cell that can be painted or printed on flexible plastic sheets.

“The process is simple,” said lead researcher and author Somenath Mitra, PhD, professor and acting chair of NJIT’s Department of Chemistry and Environmental Sciences. “Someday homeowners will even be able to print sheets of these solar cells with inexpensive home-based inkjet printers. Consumers can then slap the finished product on a wall, roof or billboard to create their own power stations.”

"Fullerene single wall carbon nanotube complex for polymer bulk heterojunction photovoltaic cells," featured as the June 21, 2007 cover story of the *Journal of Materials Chemistry* published by the Royal Society of Chemistry, details the process.

Harvesting energy directly from abundant solar radiation using solar cells is increasingly emerging as a major component of future global energy strategy, said Mitra. Yet, when it comes to harnessing renewable energy, challenges remain. Expensive, large-scale infrastructures such as wind mills or dams are necessary to drive renewable energy sources, such as wind or hydroelectric power plants. Purified silicon, also used for making computer chips, is a core material for fabricating conventional solar cells. However, the processing of a material such as purified silicon is beyond the reach of most consumers.

"Developing organic solar cells from polymers, however, is a cheap and potentially simpler alternative," said Mitra. "We foresee a great deal of interest in our work because solar cells can be inexpensively printed or simply painted on exterior building walls and/or roof tops. Imagine some day driving in your hybrid car with a solar panel painted on the roof, which is producing electricity to drive the engine. The opportunities are endless. "

The science goes something like this. When sunlight falls on an organic solar cell, the energy generates positive and negative charges. If the charges can be separated and sent to different electrodes, then a current flows. If not, the energy is wasted. Link cells electronically and the cells form what is called a panel, like the ones currently seen on most rooftops. The size of both the cell and panels vary. Cells can range from 1 millimeter to several feet; panels have no size limits.

The solar cell developed at NJIT uses a carbon nanotubes complex, which by the way, is a molecular configuration of carbon in a cylindrical

shape. The name is derived from the tube's miniscule size. Scientists estimate nanotubes to be 50,000 times smaller than a human hair. Nevertheless, just one nanotube can conduct current better than any conventional electrical wire. "Actually, nanotubes are significantly better conductors than copper," Mitra added.

Mitra and his research team took the carbon nanotubes and combined them with tiny carbon Buckyballs (known as fullerenes) to form snake-like structures. Buckyballs trap electrons, although they can't make electrons flow. Add sunlight to excite the polymers, and the buckyballs will grab the electrons. Nanotubes, behaving like copper wires, will then be able to make the electrons or current flow.

"Using this unique combination in an organic solar cell recipe can enhance the efficiency of future painted-on solar cells," said Mitra. "Someday, I hope to see this process become an inexpensive energy alternative for households around the world."

Source: New Jersey Institute of Technology