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Solar cells so thin

New process also makes them transparent enough to tint windows

CHICAGO: American researchers have found a way to make efficient silicon-based solar cells that are flexible enough to be rolled around a pencil and transparent enough to be used to tint windows on buildings or cars.

The finding, reported on Sunday in the journal Nature Materials, offers a new way to process the efficient but bulky conventional solar cells by slicing the brittle wafers into ultra-thin bits and carefully transferring them onto a flexible surface.

'We can make it thin enough that we can put it on plastic to make a rollable system. You can make it grey in the form of a film that could be added to architectural glass,' said professor of materials science and engineering John Rogers of the University of Illinois at Urbana-Champaign, who led the research.

'It opens up spaces on the fronts of buildings as opportunities for solar energy,' he said in a telephone interview.

For instance, the tiny solar cells if incorporated into window tinting might be used to power a car's air-conditioner and Global Positioning System.

Solar cells, which convert solar energy into electricity, are in high demand because of higher oil prices and concerns over climate change.

While conventional solar cells are bulky and rigid, building lightweight, flexible cells has come with trade-offs in efficiency and robustness.

Many companies, including Japanese consumer electronics maker Sharp Corp and Germany's Q-Cells, are making thin-film solar cells, but they typically are less efficient at converting solar energy into electricity than conventional cells.

The new technology uses the robust and highly efficient conventional single crystal silicon, said Prof Rogers. His team uses a combination of transfer printing and a special etching method that slices chips off the surface of a bulk silicon wafer.

The sliced chips are 10 to 100 times thinner than the wafer, or one-tenth its thickness, and the size can be adapted to the application.

Once sliced, a device made of a soft polymer picks up the bits of silicon chips 'like a rubber stamp' and transfers them to a new surface material, which may be a glass or flexible plastic, Prof Rogers said. The final step is to electrically connect these cells to get power out of them, he said.

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Besides being as efficient as conventional solar panels, these ultra-thin cells may be cheaper to manufacture as they use far less silicon. Solar cell technology traditionally uses costly silicon as the base material for converting sunlight into electrical energy.

'This is a nice start at using silicon wafers more efficiently,' said Dr Howard Branz, principal scientist in the silicon materials and devices group at the National Renewable Energy Laboratory, in Golden, Colorado, in the Technology Review magazine.

With their approach, said Dr Branz, Prof Rogers and his team have for the first time demonstrated how such thin cells could be manufactured on large areas.

If the technology proves to be cheaper and easier to transport and install than conventional cells, it could remove some of the barriers to more widespread use of solar power, said Technology Review.

Prof Rogers said the technology has been licensed to a start-up company called Semprius Inc in Durham, North Carolina.

REUTERS

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