



Transparent solar cells

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New solar panel technologies are set to transform the global solar energy landscape. Some of these promising technologies are already in the advanced stages of development, and could hit the market fairly soon. With these innovations, solar is no longer going to require extensive land parcels or unsightly roof spaces. (Aesthetically appealing and highly efficient solar shingles, for example, are already creating attractive solar roofs.)

Photovoltaic glass is probably the most cutting-edge new solar panel technology that promises to be a game-changer in expanding the scope of solar. These are transparent solar panels that can literally generate electricity from windows--in offices, homes, car's sunroof, or even smartphones. Blinds are another part of a building's window that can generate electricity (we will discuss it in a later section).

Researchers at Michigan State University (MSU) originally created the first fully transparent solar concentrator in 2014. This clear solar panel could turn virtually any glass sheet or window into a PV cell. By 2020, the researchers in the U.S. and Europe have already achieved full transparency for the solar glass.

These transparent solar panels can be easily deployed in a variety of settings, ranging from skyscrapers with large windows to a mobile device such as a phone, a laptop, or an e-reader. As these solar power windows can simply replace the traditional glass windows in offices and homes, the technology holds the potential to virtually turn every building in the United States and the world into a solar producer.

A transparent solar panel is essentially a counterintuitive idea because solar cells must absorb sunlight (photons) and convert them into power (electrons). When a solar glass is transparent, the sunlight will pass through the medium and defeat the purpose of utilizing sunlight. However, this new solar panel technology is changing the way solar cells absorb light.

The cell selectively harnesses a portion of the solar spectrum that is invisible to the naked eye, while allowing the normal visible light to pass through. To achieve this technological wonder, the researchers have developed the transparent luminescent solar concentrator (TLSC) rather than trying to do the impossible by creating a transparent photovoltaic glass cell.

The TLSC is composed of organic salts that are designed to absorb specific invisible UV and infrared light wavelengths, which then glow (luminesce) as another invisible wavelength. This new wavelength is then guided to the edge of the window plastic, which thin PV solar cell strips convert it into electricity.

Once the mass production begins for transparent solar panels, researchers estimate that the TLSC should be able to deliver an efficiency of about 10%. This may not appear to be an earth-shattering number, but on a national or global scale, when almost every window in a home or office building consists of clear solar panels,

the results can be transformative.

As the transparent solar panels cost comes down with their mass production and deployment, this non-intrusive technology can be scaled right from commercial and industrial applications to handheld consumer devices, while remaining very affordable.

Just the way solar roof panels are currently produced using different technologies (Tesla's solar shingles and other technologies), solar windows are also being developed using different techniques. The two major types of transparent solar panels include partial and full transparent panels.

A German manufacturer, Heliatek Gmb, has developed this partially clear solar panel, which can absorb about 60 percent of the sunlight it receives. Compared to the conventional solar PV cells, the partially transparent solar panels have a lower efficiency at 7.2%. However, solar power generation can be increased by adjusting the balance between the sunlight that is transmitted and absorbed.

For instance, in south-facing glass buildings, it is often important to reduce the transmitted light (many such office buildings already use tinted glass). In these locations, the partially transparent solar panel can work very well.

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