

How do solar cell windows work?

Incident light on the front face of the window is diffused and scattered at the front or rear surfaces of the window and guided to the solar cell arrays through the waveguide glass plates. Then, the solar cell arrays absorb the guided light to generate electric power.

How is a solar window constructed?

The waveguide plates consist of a diffuser and patterned glass, which scatters and guides the incident light to GaAs cell arrays at the window frame edges. These were designed and evaluated using the ray-tracing simulation method. We constructed and assembled the solar window using 3D printing.

How do luminescent solar concentrators work?

Luminescent solar concentrators absorb high-energy photons of shorter wavelengths in luminescent materials in a waveguide structure and radiate low-energy photons in all directions; among the re-emitted light, only the light emitted within a total internal reflection angle is guided into the cells at the edge of the waveguide, .

Can a white-light solar window be used for building-integrated photovoltaic (BIPV) applications?

A high-efficiency white-light solar window is proposed for building-integrated photovoltaic (BIPV) applications. In the solar window, incident light is scattered at a waveguide plate and guided into GaAs cell arrays at the edges of the window frame.

Can 3D printing be used to build a solar window?

We constructed and assembled the solar window using 3D printing. The spectral and spatial characteristics of the solar window were investigated and measured with an integrating sphere and 2D scanning image system. The solar window exhibited a module η of 6.368%, a very high value for transparent solar cells and modules.

What is the transmittance of a solar window?

The solar window exhibits an almost constant transmittance, with an average of about 21.6% in the visible range of 400-800nm and a color rendering index of about 97.8 for sunlight, which is a neutral color that does not distort the colors of indoor objects under sunlight through the window.

Concentration and guiding of light on the nanometer scale can be engineered with the help of surface and particle polaritons. Plasmonic structures exhibit large extinction cross sections ...

1. Introduction As an emerging material, lead halide perovskite has attracted tremendous attention in recent years due to its excellent optoelectronic properties with long carrier diffusion ...

The method is fast and flexible. Because no optical coupling and no solar cells with varying properties are involved, accuracy and reproducibility are higher. The method gives an area average of the light guiding

efficiency, rather than the value for the point of excitation as does the EQE measurement.

Silicon solar cells comprising this encapsulation architecture show greater total external quantum efficiencies and enhanced wide-angle light capture and conversion. This is a rapid, straightforward, and scalable approach to process light-collecting structures, whereby significant increases in cell performance may be achieved.

A solar panel using a light guiding component for receiving external light includes at least one solar cell, a transparent back plate, a transparent cover plate, a light guiding component and a packaging material. The transparent back plate is located on a first side of the solar cell. The transparent cover plate is located on a second side of the solar cell for passing and projecting ...

Silicon solar cells comprising this encapsulation architecture show greater total external quantum efficiencies and enhanced wide-angle light capture and conversion. This is a ...

The invention relates to a light-guiding solar cell panel, which comprises a light-guiding plate, a bracket, a light source direction detector, a converging port and an optical waveguide,...

Over the years different approaches have been investigated for monofacial solar cells. For example, the light guiding effect of structured front sheets made of polycarbonate (PC) or polymethyl methacrylate (PMMA), which replace the front glass, has been tested [[1], [2], [3]]. However, none of these approaches have been adopted by the PV ...

Biria et al. demonstrated a silicon solar cell encapsulant embedded with light-guiding architectures fabricated via SPPW method (Fig. 8a).

We investigated the light coupling to waveguide modes in nanophotonic thin-film solar cells exhibiting a tailored disordered grating texture by rigorous optical simulations. ...

With this filter an increase of 20% in light guiding efficiency was predicted and an increase of 19% in solar cell efficiency was measured, corresponding to almost 19% of the escape cone losses ...

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