

Current status of research on light-controlled solar energy

What is solar energy research?

It examines the current state of solar power and related academic solar energy research in different countries, aiming to provide valuable guidance for researchers, designers, and policymakers interested in incorporating solar energy into their nation's electricity generation.

Which country is a leading researcher in solar energy research?

China is at the forefront of research in solar energy and has maintained a leading position. Although the United States indirectly. Even the Atomic Energy Commission (AEC) has laboratories where the sun is studied [18,19]. The most considerable government assistance is provided through NASA (National Aeronautics Administration).

Are PSCs the future of solar energy?

PSCs have gained prominence as the focus of research in the solar energy sector. Nevertheless, numerous challenges still persist, encompassing the need for continued efficiency enhancement, bolstered stability, and the establishment of scalable PSC production methods.

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Is solar energy a future energy resource?

The utilization of renewable energy as a future energy resource is drawing significant attention worldwide. The contribution of solar energy (including concentrating solar power (CSP) and solar photovoltaic (PV) power) to global electricity production, as one form of renewable energy sources, is generally still low, at 3.6%.

Are photovoltaic technologies the future of energy?

Critical challenges, prospects and research priority pathways are highlighted. Photovoltaic (PV) technologies have achieved commercial acceptance, technological maturity and foresee a leading role in the current energy transition to combat the adverse environmental issues posed by fossil fuel-based power generation.

Integrating solar PV with water splitting units for producing hydrogen is one of the areas that are demonstrating an intensive research interest [26]. Fig. 1 demonstrates different photovoltaic water splitting configurations. The integration of water electrolysis with solar PVs has multiple advantages, where the excess electrical energy produced can be stored in hydrogen ...

This vision paper aims at shedding light on the current knowledge and emerging pathways for solar energy utilisation. Specifically, after a general introduction and a brief overview of the current knowledge, open issues are discussed regarding photovoltaic/thermal (PV/T) collectors, building integrated photovoltaic/thermal (BIPV/T) systems ...

research efforts directed at fabrication, rational design, characterization of material components, technologies, and processes for efficient solar energy utilization are continuously in progress. During solar harvesting using a photovoltaic device, an electron-hole pair is ...

Dye-sensitized solar cells (DSSCs) are among the most attractive third-generation photovoltaic technologies due to their low toxicity, versatility, roll-to-roll compatibility,...

The studies found on photovoltaic solar energy are all technical, thus creating the need for future research related to the economic viability, chain supply...

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In this study, a comparative assessment of DSSCs, OSCs, and PSCs is conducted and the current state of the art of these promising technologies is investigated. Advanced techniques and research trends are examined from the perspective of novel materials, device modelling, and innovative device structures.

A schematic diagram of a basic hybrid system is shown in Fig. 1. The PV array and wind turbine work together to satisfy the load demand. When the energy sources (solar and wind energy) are abundant, the generated power, after satisfying the load demand, will be supplied to feed the battery until it's fully charged. On the contrary, when ...

Through a systematic literature survey, this review study summarizes the world solar energy status (including concentrating solar power and solar PV power) along with the published solar energy potential assessment articles for 235 countries and territories as the first step toward developing solar energy in these regions. A

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Luminescent solar concentrators (LSCs) represent a promising frontier in solar energy capture, leveraging technologies to concentrate and reshape light for enhanced photovoltaic performance. In this study, we compared various LSC technologies, including solar windows, within simulated real-world conditions. Our findings reveal that silicon ...

Solar-powered LED-based lighting facilities: An overview on recent technologies and embedded IoT devices to obtain wireless control, energy savings and quick maintenance

One of the most talked-about sources of sustainable energy is solar energy. The current chapter gives a general summary of the world's solar energy capacity, its classification, and advantages ...

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