

1 Introduction. Our world demands renewable energy more than ever and photovoltaic (PV) technologies are one of the key technologies to meet the global need of the hour for "zero emissions."

Organic solar cells have emerged as promising alternatives to traditional inorganic solar cells due to their low cost, flexibility, and tunable properties. This mini review introduces a novel perspective on recent advancements in organic solar cells, providing an overview of the latest developments in materials, device architecture, and performance optimization. In ...

This review discusses some of the most significant technological developments that were presented in the literature and helped improve photovoltaic performance, such as tandem architectures, plasmonics, and use of graphitic nanostructural materials, among others.

Organic solar cells - otherwise known as organic photovoltaic cells (OPV) - are the latest advancement in solar cell technology, and one quickly gaining the attention of industry professionals. This is mainly due to their high performance, unprecedented ability to absorb light from the sun, and the technology's amazing versatility.

The various parts of OPV cells are discussed, and their performance, efficiency, and electrical characteristics are reviewed. A detailed SWOT analysis is conducted, identifying promising ...

The development of organic semiconductors for photovoltaic devices, over the last three decades, has led to unexpected performance for an alternative choice of materials to convert sunlight to electricity.

Organic solar cells have the potential to become the cheapest form of electricity, beating even silicon photovoltaics. This article summarizes the state of the art in the field, highlighting research challenges, mainly the need for an efficiency increase as well as an improvement in long-term stability.

The historical development and representative achievements in materials, device physics, and device engineering of organic solar cells (OSCs) are summarized in this review. Abstract Organic solar cells (OSCs) have been developed for few decades since the preparation of the first photovoltaic device, and the record power conversion efficiency ...

Abstract Organic solar cells (OSCs) have been developed for few decades since the preparation of the first ... especially the breakthroughs in these disciplines. In this review, we are aiming at reviewing the history of the development of OSCs and summarizing the representative breakthroughs. References; ; .., ...

The certified power conversion efficiency (PCE) of organic photovoltaics (OPV) fabricated in laboratories has

improved dramatically to over 19% owing to the rapid development of narrow-bandgap ...

Review--Organic Solar Cells: Structural Variety, Effect of Layers, and Applications. Paritosh Chamola 1, ... In 2013, Mori et al. fabricated a photovoltaic cell using PTQ1 and N2200 which exhibited an efficiency of 4.1%. 124. Gao et al. 125 presented J51 as a donor material, by combining J51 with N2200 in the device design of ITO/PEDOT: PSS ...

Increasing demand for energy worldwide, driven largely by the developing world, coupled with the tremendous hidden costs associated with traditional energy sources necessitates an unprecedented fraction of the future global energy mix come from sustainable, renewable sources. The potential solar energy resource dwa

1 Introduction. Photovoltaics (PV) has recently become the cheapest source of electricity in history. [] Over the past 20 years, the PV market has expanded tremendously, increasing from just 252 MW installed per year in 2000 to 115 GW installed per year in 2019 [2, 3] to a total of 740 GW installed capacity. This corresponds to a steady growth of 40% per ...

This paper reviews the available life cycle analysis (LCA) literature on organic photovoltaics (OPVs). This branch of OPV research has focused on the environmental impact of single-junction bulk heterojunction polymer solar cells using a P3HT/PC60BM active layer blend processed on semi-industrial pilot lines in ambient surroundings. The environmental impact ...

Both BHJ and SD organic photovoltaic devices require two separate components blended together to form the active layer: the electron donor and acceptor. To achieve an efficient photovoltaic performance in organic materials requires both components to overcome the binding energy of the initial photogenerated exciton to create free charges.

Table 3 depicts the summary of related works on organic photovoltaic technology. The review highlights that while OPV cells have reached PCEs exceeding 19 %, the efficiency is still lower than the traditional inorganic photovoltaic (IPV) cells. ... Intrinsic degradation in organic solar cells accompanies the thermal diffusion of constituent ...

The active layer of solar cells contains the donor organic material and the acceptor organic material, used in a layer-by-layer fashion in bilayer heterojunction and are combined together in bulk heterojunction solar cells [30]. Light crosses from the transparent electrode followed by the hole transport layer to incorporate into the active layer.

"That is why organic solar cells can be very flexible and lightweight," he explains. The team uses p-conjugated polymers as the "p-type" electron-donating material in an OPV. For an ...

In the last few decades, organic solar cells (OSCs) have drawn broad interest owing to their advantages such

as being low cost, flexible, semitransparent, non-toxic, and ideal for roll-to-roll large-scale processing. Significant advances have been made in the field of OSCs containing high-performance active layer materials, electrodes, and interlayers, as well as ...

This Review highlights recent progress on single-junction and tandem NFA solar cells and research directions to achieve even higher efficiencies of 15-20% using NFA-based organic photovoltaics ...

The field of organic photovoltaics has developed rapidly over the last 2 decades, and small solar cells with power conversion efficiencies of 13% have been demonstrated. Light absorbed in the organic layers forms tightly bound excitons that are split into free electrons and holes using heterojunctions of electron donor and acceptor materials, which are then extracted ...

Clean energy plays a significant role to replace gradually exhausted non-renewable energy resources, such as fossil fuel, thus, unprecedented demand for energy harvesting technologies utilizing sustainable energy has been reported [1], [2], [3], [4]. Various solar power harvesters that convert solar energy to power have attracted dramatic attention nowadays.

The performance of organic solar cells (OSCs) has increased substantially over the past 10 years, owing to the development of various high-performance organic electron-acceptor and electron ...

This article reviews the rapid progress in the developments of inorganic and organic solar cells (SCs) such as silicon SCs, perovskite SCs, III-V SCs, quantum dot SCs, dye ...

Organic photovoltaics have attracted considerable interest in recent years as viable alternatives to conventional silicon-based solar cells. The present study addressed the increasing demand for ...

Organic solar cells are fabricated in multiple layers. Active or photovoltaic layer, electrodes, and middle layers. ... In 2020, Chen et al. have published a comprehensive review on p-conjugated small-molecule and polymeric semiconductors for organic BHJ-OSCs. The focus of the paper is on both electron-donor (hole-transporting) ...

Organic solar cells, on the other hand, are made by depositing a thin layer of photovoltaic material onto a substrate, such as ... characteristics reported in recent literature on organic solar cells, the review highlights the latest trends and advancements in the field of OPV cells. Identifying several areas for future research and develop-

Second, the excitons must diffuse to the donor-acceptor (D-A) interfaces within the diffusion length ( $L_D$ ) to prevent recombining to the ground state cause the value of  $L_D$  in organic materials is typically 10 nm, the ideal donor or acceptor domain size is less than 20 nm. This D-A interface concept is analogous--in terms of charge transport--to a P-N junction in ...

A review of photovoltaic performance of organic/inorganic solar cells for future renewable and sustainable energy technologies. Author links open overlay panel J. Ajayan a, D. Nirmal b, P. Mohankumar c, M. Saravanan a, M. Jagadesh a, L. Arivazhagan b. ... In 2013, B. Endres et al. [14] demonstrated a spin solar cell based on GaAs p-n junction ...

Organic photovoltaic cells are thin, lightweight, flexible and semi-transparent. These characteristics unlock new possibilities for applications in agriculture, architecture, ...

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