

By fabricating devices with nonfullerene acceptors BTA3 and BTP-eC9, it is shown that the devices exhibit a high power conversion efficiency (PCE) of 18.0% under air mass 1.5G illumination conditions and an outstanding PCE of 28.5% for a 1 cm² device and 26.0% for a 10 cm² device under illumination from a 1000 lux light-emitting diode. In ...

1. Introduction. Organic photovoltaic (OPV) devices have been attracting much attention because of their advantageous properties, including light weight, mechanical flexibility, low material and fabrication cost, and short energy payback times [1 - 4]. Apart from traditional solar panels, possible applications of OPV devices also include power generators for wearable ...

Composites of carbon nanotubes and conjugated polymers for photovoltaic devices. *Adv Mater*, 1999, 11: 1281-1285. CAS Google Scholar Geng J, Zeng T. Influence of single-walled carbon nanotubes induced crystallinity enhancement and morphology change on polymer photovoltaic devices. *J Am Chem Soc*, 2006, 128: 16827-16833

Conjugated polymer or small molecule is most widely used as donor, similarly polymer, small molecule, perylene diimide, and fullerene derivatives are used as an acceptor material . The first successful organic photovoltaic device was reported by the research group of Dr. Ching Tang in Kodak Research Laboratories in 1986 . A power conversion ...

Polymers 2024, 16, 1407 4 of 30 Figure 3. Photovoltaic effect and devices working principle depicted according to the descriptions in the specific publications [5,6]: (a) principle of photo-induced charge separation; (b) photo-in-duced conductivity of solutions; (c) photo-induced conductivity of solid selenium devices; and (d)

For conjugated polymers used in PSC devices, bandgap and molecular energy levels are of crucial importance for device performance. The mismatch between absorption spectra of ... Additionally, a family of conjugated polymer photovoltaic materials was designed, synthesized, and characterized systematically. Furthermore, the photovoltaic ...

Although a number of simple and effective methods have been developed for the realization of highly desired black-to-transmissive electrochromism in conjugated polymer-based materials and devices, there are still several key issues that to be considered and addressed for promoting commercial applications of black-to-transmissive switching ECPs ...

Bulk heterojunction (BHJ) polymer solar cells (PSCs) sandwich a blend layer of conjugated polymer donor

and fullerene derivative acceptor between a transparent ITO positive electrode and a low work function metal negative electrode. In comparison with traditional inorganic semiconductor solar cells, PSCs offer a simpler device structure, easier fabrication, ...

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In this review paper, we present a comprehensive summary of the different organic solar cell (OSC) families. Pure and doped conjugated polymers are described. The band structure, electronic properties, and charge separation process in conjugated polymers are briefly described. Various techniques for the preparation of conjugated polymers are presented in ...

Abstract Conjugated polymers (CPs) are electronic materials which always attract the joint attention of synthetic chemistry, physics, and engineering. ... as well as allowing for the generation of improved organic photovoltaic (OPV) devices. OPV devices built from PCPDTBT/PCBM have been the first with power conversion efficiencies (PCEs ...

2,1,3-Benzothiadiazole, thiophene, thieno[3,4-b]pyrazine, quinoxaline, and silole have emerged as useful heterocycles for constructing a variety of conjugated polymers for photovoltaic applications. Solar cells are one attractive method for harnessing inexhaustible clean energy from the sun. Organic photovoltaic technology is emerging as a potential competitor to ...

Polymer solar cells (PSCs) have attracted great attention in recent years because of their advantages of easy fabrication, low cost, light weight, and potential for flexible devices. However, the power conversion efficiency (PCE) of the PSCs needs to be improved for future commercial applications. Factors limiting the PCE of the PSCs include the low exploitation of ...

In recent years, conjugated polymers have attracted great attention in the application as photovoltaic donor materials in polymer solar cells (PSCs). Broad absorption, lower-energy bandgap, higher hole mobility, relatively lower HOMO energy levels, and higher solubility are important for the conjugated polymer donor materials to achieve high ...

Factors limiting the PCE of the PSCs include the low exploitation of sunlight due to the narrow absorption band of conjugated polymers, and the low charge-transport efficiency in the devices due to the lower charge-carrier mobility of the polymer photovoltaic materials.

Organic conjugated polymers and oligomers are key electronic materials for applications such as transistors, photovoltaics, and light emitting devices due to their potential for solution processability, mechanical

Conjugated polymer photovoltaic devices and materials

flexibility, and precise structure-based tuning compared to inorganic materials.

Abstract. Organic photovoltaics (OPVs) are a promising cost-effective alternative to silicon-based solar cells, and possess low-cost, light-weight, and flexibility advantages. Recently, great advances have been achieved in the development of novel photovoltaic materials and device structures, and the power conversion efficiencies can now reach 7.7%.

In order to understand how the optoelectronic properties of the conjugated polymer in organic photovoltaic devices are modulated, molecular orbital theory (MO) is essential to explain the bond formation and delocalized electrons over the conjugated chains. Generally, the conjugated polymers have s- and p-bonds over the main chains, and s ...

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