Carbon nanotube photovoltaics

OverviewCarbon nanotube composites in the photoactive layerSingle wall carbon nanotubes as light harvesting mediaCarbon nanotubes as a transparent electrodeCNTs in dye-sensitized solar cellsSee alsoCombining the physical and chemical characteristics of conjugated polymers with the high conductivity along the tube axis of carbon nanotubes (CNTs) provides a great deal of incentive to disperse CNTs into the photoactive layer in order to obtain more efficient OPV devices. The interpenetrating bulk donor-acceptor heterojunction in these devices can achieve charge separation and collection because of the existence of a bicontinuous network. Along this networ...

Here, authors apply single-walled carbon nanotubes as front and back electrodes, achieving power generation density of 36% and bifaciality factor of 98%. ... Fig. 3: Photovoltaic performances of ...

This manuscript describes the use of nitrophenyl-functionalized single-walled carbon nanotubes (NP-SWNT) in organic photovoltaic cells for the first time. We mainly focus on these innovative materials to scout for the replacement or doping of the universal buckminsterfullerene PCBM acceptor in the active layer. An optimization of the functional degree was first ...

High conductive and transparent thin films based on carbon nanotube - poly(3,4-ethylene-dioxythiophene)-poly(styrene sulfonate), PEDOT-PSS blends have been used to replace the conventional indium tin oxide (ITO) as the hole collecting electrode in organic photovoltaic cells.

Carbon Nanotubes for Quantum Dot Photovoltaics with Enhanced Light Management and Charge Transport. Tazawa, Yujiro; Habisreutinger, Severin N.; Zhang, Nanlin; ... SnO 2 -Carbon Nanotubes Hybrid Electron Transport Layer for Efficient and Hysteresis-Free Planar Perovskite Solar Cells. Tang, Huijie; Cao, Qi; He, Ziwei;

We report on photovoltaic diodes based on bilayer heterojunctions between nearly monochiral, polymer wrapped (7,5) semiconducting carbon nanotube photoabsorbing films and C60. The internal quantum efficiencies (IQEs) for exciton dissociation and subsequent charge collection at the nanotubes" visible E22 and near-infrared E11 and E11 + X resonances are ...

This article considers first-principles predictive modeling of carbon nanotube photovoltaic (PV) devices, with the objective being to increase predictive capabilities to the point that systems engineering approaches can be applied. After covering some background, the state of the art in first-principles modeling is reviewed and extended to ...

The potential for carbon nanotubes in the field of photovoltaics is multifaceted and broad. This Progress Report examines their use in organic and silicon based solar cells and discusses the ...

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This work presents the 2-aminofluorene polymer matrix based on the multi-walled carbon nanotube module for an alternative energy conversion system as a photovoltaic solar cell. The properties of the MWCNT-PAF composite were taken characterized by thermogravimetric methods, differential scanning calorimetry, fourier-transform infrared spectroscopy analysis, ...

A photovoltaic (PV) device based on "high-work-function metal/single-walled carbon nanotube/low-work-function metal" hybrid junction has been studied theoretically by the self-consistent nonequilibrium Green"s function approach. The PV effect and power conversion efficiency (?) of the device under light illumination are simulated, with a monochromatic ? of ...

School of Chemistry and Physics, University of KwaZulu-Natal, Durban, South Africa; In recent years, carbon-based materials, particularly carbon nanotubes (CNTs), have gained intensive research attention in the fabrication of organic solar cells (OSCs) due to their outstanding physicochemical properties, low-cost, environmental friendliness and the natural ...

Photovoltaic devices have rapidly developed in recent years as they seek to address the ever-increasing energy requirements and environmental issues. Due to their simple structure and easy, low-temperature fabrication, heterojunctions of carbon nanotube (CNT) films and silicon (Si) have been used in solar cells, photodetectors and ...

Amid a wide-ranging search for materials that can aid the optimization of solar photovoltaic performances, propelled by the ever increasing demand for clean and renewable energy in the 21st century society, Carbon nanotubes (CNTs) offer an excellent avenue for progress. While multiple papers have reviewed and reported on their unique properties and ...

The use of carbon nanotubes (CNTs) in photovoltaics could have significant ramifications on the commercial solar cell market. Three interrelated research directions within the field are crucial to the ultimate success of this endeavor; 1) separation, purification, and enrichment of CNTs followed by 2) their integration into organic solar cells as a photosensitive ...

Vertically aligned periodic arrays of carbon nanotubes (CNTs) are used to create topographically enhanced light-trapping photovoltaic cells. The CNTs form the back contact of the device and serve as a scaffold to support the photoactive heterojunction. Molecular beam epitaxy is used to deposit CdTe and CdS as the p/n-type materials and ion-assisted deposition is used ...

In article number 2002880 Jianhui Chen, Benjamin S. Flavel and co-workers discuss the breakthroughs in growth, processing and separation of carbon nanotubes that have enabled their use in new forms of organic and silicon-based photovoltaics. Recent and rapid advancements in the efficiency and area of these solar cells suggest that carbon nanotube ...

Carbon nanotube photovoltaics

The use of photovoltaic technology has provided a sustainable solution for a more renewable source of energy. However, introducing carbon nanotubes to this field could be revolutionary. This article provides an overview of research into carbon nanotube use within photovoltaics and how this may affec

As a consequence, the photovoltaic performance of both p-single-walled carbon nanotube (SWNT)/n-Si and n-SWNT/p-Si heterojunction solar cells using MoOx and ZnO layers is improved, resulting in ...

In silicon photovoltaics, carbon nanotubes are used as hole selective contacts and have also been utilized in a CNT:Nafion ink that can reduce the complexity of fabrication of n-type solar cells ...

Transparent conducting (TC) films of single-walled carbon nanotubes (SWNTs) have the potential to replace conventional TC oxides in a wide variety of optoelectronic devices. [1-5] TC-SWNT films are particularly attractive for photovoltaics (PV) due to their high transparency over much of the solar spectrum, excellent electrical conductivity, and the ...

Carbon Nanotubes as an Alternative to ITO. CNTs have exceptional electrical and physical characteristics besides conductivity of 1 to 3 × 10 6 (S/m) as well as electron mobility of 100,000 cm 2 /V.s. (Novoselov et al. 2004; Avouris et al. 2010).CNTs are regarded as excellent transparent conducting electrodes (TCEs) in photovoltaic devices applications considering ...

However, there are issues with polymer-based photovoltaic systems and one significant effort to improve these systems has involved the use of carbon nanotubes (CNTs). This review will focus on those efforts.

O ver the past decade, photovoltaic devices using nanoscale materials, such as semiconductor quantum dots1-3, nanowires4-6 and so on7, have been extensively studied. Carbon nanotubes with ...

Here we present photocurrent measurements on a single suspended carbon nanotube p-n junction. The p-n junction was induced by electrostatic doping by local gates, and the E11 and E22 resonances in the nanotube could be probed using photocurrent spectroscopy. Current-voltage characteristics were recorded, revealing an enhanced optoelectronic response ...

Recently, carbon nanotubes (CNTs) have been used in many types of solar cells with high photovoltaic performance [1,2,3,4,5,6,7] itially, the CNTs were incorporated into solar cells as electron acceptors in organic photovoltaic (OPV) devices.

Carbon nanotubes are essential in photovoltaic solar cells, because they are both transparent and conductive, allowing sunlight to reach the perovskite light absorbers with little energy loss. This study mainly aimed to investigate SWCNTs (single-walled carbon nanotubes) and their characteristics.

Carbon nanomaterials generally exhibit both sp 2 and sp 3 hybridization. Such hybridization allows them to produce some different allotropic forms such as carbon dots, fullerenes, single and multicarbon nanotubes, or

graphene [].The specific properties of these structures induced by their atomic structure and surface chemistry [] allow them to be used in ...

Carbon nanotubes (CNTs) are direct-bandgap materials with a broad spectral response and a large absorption coefficient, which is most desired for building high-performance PV devices. Main progresses on CNT PVs in ...

There is significant interest in using semiconducting single-walled carbon nanotubes (s-SWCNTs) as the photoabsorbing layer of photovoltaic (PV) cells 1-5 and photodetectors. 6 The strong exciton binding energy in SWCNTs can be overcome by employing a bilayer s-SWCNT/acceptor heterojunction with band offsets. 7 Promisingly, the internal ...

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