Application of electrospun nanofibers in organic photovoltaics

Application of Electrospun Nanofibers in Organic Photovoltaics Surawut Chuangchote and Takashi Sagawa Abstract This chapter highlights the introduction of organic thin-film solar ...

Organic nanofibers (ONFs) have attracted much interest as one-dimensional functional units in various research fields with their unique advantages. Among many fabrication methods for them, electrospinning has been in the spotlight recently because of its simplicity and versatility. In this paper, first we introduce the principle, advantages, and conditions of ...

PANI hollow nanofibers improved buffer layer structural properties, enhanced optical absorption, and induced a more balanced charge transfer process. Solar cell photovoltaic parameters also showed higher open-circuit voltage (+ 40.3%) and higher power conversion efficiency (+ 48.5%) than conventional architecture BHJ solar cells.

Fabrication of TiO2 nanofibers and their applications as the electron transporting layer for hybrid photovoltaic cells were studied. TiO2 nanofibers were electrospun onto an indium tin oxide (ITO ...

To improve the interfacial adhesion between the nanofiber nonwoven and dental methacrylate of BIS-GMA/TEGDMA, Deng and Yang [] induced the aligned PAN core/PMMA shell (Fig. 4.3) nanofibers into the BIS-GMA/TEGDMA resin owing to the high mechanical resistance of the PAN core and the good adhesion with the matrix (through covalent bonding) of the PMMA ...

This chapter provides an overview of photovoltaic and solar cell devices (i.e., dye sensitize solar cells, organic solar cells, and perovskite solar cells) based on nanofibers (NFs) as a key element. Details about the main types of solar cells and their working principles and how engineered NFs are used for solar cells are discussed.

Electrospinning is a versatile and viable technique for generating ultrathin fibers. Remarkable progress has been made with regard to the development of electrospinning methods and engineering of electrospun nanofibers to suit or enable various applications. We aim to provide a comprehensive overview of electrospinning, including the principle, methods, ...

Electrospun photoactive nanofibers hold significant potential for enhanced photon absorption and charge transport in organic photovoltaics. However, electrospinning conjugated polymers with fiber diameters comparable to exciton diffusion lengths for efficient dissociation, is difficult. Previously, spinning sub-100 nm poly(3-hexylthiophene) (P3HT) fibers has required ...

This chapter highlights the introduction of organic thin-film solar cells and organic-inorganic hybrid solar cells and the development of electrospun nanofibers for those applications. Organic solar cells need large interfacial surface area for efficient charge...

Application of electrospun nanofibers in organic photovoltaics

This review summarizes the recent progress in electrospun nanofibers, with an emphasis on their applications. Basic apparatus for electrospinning, typical photographic and SEM images of a nanofiber.

In particular, electrospun nanofibers have significantly enhanced the application performance of many electronic devices, such as solar cells, mechanical-to-electric energy harvesters, rechargeable batteries, supercapacitors, sensors, field-effect transistors, diodes, photodetectors, and electrochromic devices.

Research on electrospun nanofibers is a very active field in material science owing to their novel applications in diverse domains. The main focus of this review is to provide an insight into E-spin technique by understanding the working principle, influencing parameters and applications of nanofibers in different walks of life.

An improved power conversion efficiency in polymer solar cells (PSCs) was demonstrated through the incorporation of electrospun hollow core PANI nanofibers positioned between the active layer and ...

Application of Electrospun Nanofibers in Organic Photovoltaics. S. Chuangchote T. Sagawa. Materials Science, Engineering. ... and stability of the organic solar cells, and discusses the alternative approaches such as polymer/polymer solar cells and organic/inorganic hybrid solar cells. Expand. 5,729. PDF. Save. Organic/Inorganic Hybrids for ...

In recent decades, electrospinning of nanofibers has progressed very rapidly in both scientific and technological aspects, and electrospun nanofibers have shown enormous potential for various applications. In particular, electrospun nanofibers have significantly enhanced the application performance of many electronic devices, such as solar cells, mechanical-to-electric energy ...

Electrospun nanofibers have received considerable attention in the field of soft electronics owing to their promising advantages and superior properties in flexibility and/or stretchability ...

We fabricated dual functional electrospun (ES) nanofibers by a coaxial electrospinning technique for enhancing the organic photovoltaic (OPV) device efficiency. The nanofibers contained poly[2,7-(9,9-dihexylfluorene)-alt-4,7-(2,1,3-benzothiadiazole)] (PFBT) nanoparticles as the luminescent solar concentrator (LSC) and Ag nanoparticles for the ...

Conductive nanofiber mats can be used in a broad variety of applications, such as electromagnetic shielding, sensors, multifunctional textile surfaces, organic photovoltaics, or biomedicine. While nanofibers or nanofiber from pure or blended polymers can in many cases unambiguously be prepared by el ...

This chapter highlights the introduction of organic thin-film solar cells and organic-inorganic hybrid solar cells and the development of electrospun nanofibers for those applications. Organic solar cells need large

interfacial surface area for efficient charge separation of excitons, which are normally achieved by thermal annealing. However, this annealing is relatively not compatible ...

ConspectusElectrospinning is a simple and versatile technique that relies on the electrostatic repulsion between surface charges to continuously draw nanofibers from a viscoelastic fluid. It has been applied to successfully produce nanofibers, with diameters down to tens of nanometers, from a rich variety of materials, including polymers, ceramics, small ...

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Dye sensitized solar cells having electrospun CuO nanofibers as blocking layer are also reported [24]. They improved the PCE up to 0.152% by introducing this layer. TiO 2 nanofibers, prepared by ES are used in solar cell application [25]. Electrospun polymer blend is also used as an electrolyte in dye sensitized solar cells [26].

Electrospun ZnO nanofiber interlayers for enhanced performance of organic photovoltaic devices Author links open overlay panel Fatemeh Mohtaram a b, Sedigheh Borhani a, Mehrad Ahmadpour b, Peter Fojan d, Abbas Behjat c, Horst-Günter Rubahn b, ...

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In this work, flat-lying aligned ZnO nanofibers were electrospun on FTO substrates, where they were utilized as electron transport layers in organic solar cell devices. Two ...

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The synthesis of materials-based electrospun nanofibers with different parameters is as shown in Table 1. 5 Sensor Applications Based on Electrospun Nanofibers. The manipulation of an atomic or molecular level of atoms is called nanotechnology. Nanotechnology has opted significant role in many applications.

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The use of inorganic semiconductors in the form of electrospun nanofibers as electron transporting layers is a promising alternative way. Nanofiber-based transparent electrodes can ...

In the field of organic solar cells with a nanofiber structure, we introduced hollow core nanofibers as a novel and effective buffer layer of organic solar cells.

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Typical applications of electrospun nanofiber mats can be found in the areas of biotechnology and biomedicine [26,27,28,29], implant scaffolds [], micropollutant elimination [], nanoparticle delivery [], oil/water separation [33,34], air and water filtration [35,36,37,38], and electrochemical cells [].This review gives an overview of the aforementioned kinds of ...

In this work, we demonstrate high performance inverted organic photovoltaic cells from electrospun nanofiber based electron transport layers, which outperform their thin-film ...