Bulk heterojunction photovoltaic cells with low donor concentration

An ideal photovoltaic device should possess a consistent performance during its operational lifetime; however, organic semiconductors are often regarded as inherently unstable when they are subjected to the cyclic environmental changes [10].Undoubtedly, significant degradation pathways have been posited to occur at virtually every layer and interface of OSC ...

Organic solar cells (OSCs) have gained renewed interest with the emergence of non-fullerene acceptors (NFAs). Small molecule NFAs blended with donor polymers have rapidly advanced, reaching state-of-the-art power conversion efficiencies above 16% 1, 2 for single junctions and 17.3% for all-organic solution-processed tandem cells. 3 These NFA-based ...

We investigate the arrangement of donor molecules in vacuum-deposited bulk heterojunction (BHJ) 1,1-bis-(4-bis(4-methyl-phenyl)-amino-phenyl)-cyclohexane (TAPC):C70-based organic solar cells (OSCs). Even a low dose of donors (~10%) forms columnar structures that provide pathways for efficient hole transport in the BHJ layer; however, these structures disappear at ...

One of the improvements of organic solar cells is with DA proximity in devices by using blends of donor-like and acceptor-like molecules or polymers, which are called DA bulk-heterojunction solar cells [34-39], as shown in Fig. 17.4A.The previous organic solar cells consisted of a simple pn heterojunction. The bulk-heterojunction is a pin junction that consists of a mixture intrinsic ...

The absorber layer of an efficient state of the art bulk heterojunction solar cell is made of so-called donor and acceptor molecules. As donors usually conjugated polymers, oligomers or conjugated pigments, as acceptors frequently fullerene derivatives are applied (Fig. 2). Often these materials are classified as organic semiconductors [19].

Introduction. In general, to achieve efficient exciton dissociation in polymer or small molecular bulk heterojunction (BHJ) organic solar cells (OSCs), the donor to acceptor volume ratio should range from 4:1 to 1:4. 1-5 For instance, for a low volume of donors, below the optimum donor concentration, the hole transport is interrupted by the phase aggregation of ...

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The purpose of this review is threefold: first, to summarize the current understanding of processes that take

place during photocurrent generation in an organic solar cell; second, to link them to the morphology and chemical composition for several polymer-fullerene blends; and finally, to generalize the results to other bulk heterojunction ...

High-efficiency organic photovoltaic (OPV) cells are mostly based on a bulk heterojunction [1] (BHJ) structure, which is essentially a thin film of mixed electron donor and acceptor. With few exceptions, the acceptor component is a fullerene-based material such as C 60 [2] and PCBM, [3] whereas a large variety of materials has been found to be useful as the donor component. [4]

Organic photovoltaic (OPV) devices traditionally show low V oc relative to their optical absorption threshold (compared with that of other solar cell types).. The large V oc loss is assigned to both the need for a donor-acceptor heterojunction to split excitons and fast charge recombination.. Recently, greatly reduced V oc losses have been reported for OPV devices, ...

Most highly efficient small molecule-based bulk heterojunction (BHJ) photovoltaic cells contain a large concentration of fullerene in their blend active layers. However, the excitons generated in fullerene can seriously quench at the surface of the commonly used MoO 3 buffer layer, becoming a key limitation to the photovoltaic performance of ...

Organic solar cells have gathered much research interest in recent years because of their advantages like low-cost, flexibility and light-weight. This paper presents a first of its kind, critical review of the theoretical and experimental studies performed to determine the outcome of changing active layer thickness on the working of a bulk heterojunction organic solar cell. The ...

The exciton dissociation probability at the heterojunction is assumed to be high enough so that exciton concentration at the donor-acceptor interface is zero. ... Aresu A, Ndjawa E, Anjum DH, Beaujuge CD, Amassian PM (2014) Efficient inverted bulk-heterojunction solar cells from low-temperature processing of amorphous ZnO buffer layers ...

Semantic Scholar extracted view of "The influence of donor material on achieving high photovoltaic response for organic bulk heterojunction cells with small ratio donor component" by Fangming Jin et al. ... Bulk Heterojunction Photovoltaic Cells with Low Donor Concentration. Minlu ... provided that the donor is present in a small concentration ...

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