High dielectric constant conjugated materials for organic photovoltaics

The majority of organic semiconductors have a low relative dielectric constant (er 6) has attracted a very limited attention. Moreover, high performance OSCs based on high dielectric constant photovoltaic materials are still in their infancy. Herein, we report an oligoethylene oxide side chain-containing non-fullerene acceptor (ITIC-OE) with a high relative dielectric constant ...

Recently, to achieve high-performance OSCs, an emerging molecular design strategy of applying flexible alkyl units as linkers to construct non-fully conjugated acceptors has been developed and addressed great attention. This review highlights the non-fully conjugated photovoltaic materials with Y-series backbone that enable high-performance OSCs.

The dielectric properties of three pairs of organic semiconductors that contain increasing numbers of cyclopentadithiophene-co-benzothiadiazole moieties (monomer, dimer and polymer) were studied and compared. The materials in each pair differed in the nature of the "solubilizing groups", which are either alkyl- or glycol-based. At low frequencies (<MHz), ...

The photovoltaic and electrical properties of organic semiconductors are characterized by their low dielectric constant, which leads to the formation of polarons and Frenkel excitons.

This Feature Article discusses synthetic methods for a particular group of hyperbranched polymers, detailed optical and electronic characterization of this group, and the design criteria for achieving a good combination of high dielectric constant and minimum loss in such materials. Hyperbranched and dendritic architectures have been targeted for various ...

High dielectric constant materials show lower exciton binding energies and hence recombination can be reduced, improving the charge carrier extraction efficiency. Despite these promising prospects, limited research has been devoted to the development and OPV integration of high-dielectric organic semiconductors.

Increasing the dielectric constant of organic photovoltaic materials to reduce recombination rates has long been pursued, however, material modification often results in the modification of ...

This is due to a high dielectric constant -- meaning there is significant screening between the electron and hole, reducing the attraction between them. The ease in separating the electron and hole allows easy exciton dissociation. In contrast, OSCs have low dielectric constants, giving large E b values in the range of 0.3-0.5 eV (Brabec ...

1. Introduction Organic photovoltaics (OPVs) prepared from earth abundant and environmentally benign elements possess light weight, flexibility, and simplicity in terms of ...

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Traditional organic photovoltaic materials exhibit low dielectric constants (er) of 3 to 4, restricting the further enhancement of power conversion efficiencies (PCEs) of organic solar...

Dielectric constant of non-fullerene acceptors plays a critical role in organic solar cells in terms of exciton dissociation and charge recombination. Current acceptors feature a ...

Provided by the Springer Nature SharedIt content-sharing initiative Dielectric constant of non-fullerene acceptors plays a critical role in organic solar cells in terms of exciton dissociation and charge recombination. Current acceptors feature a dielectric constant of 3-4, correlating to relatively high recombination loss.

DOI: 10.1016/J.PROGPOLYMSCI.2017.03.003 Corpus ID: 136310472; Recent advances in high performance donor-acceptor polymers for organic photovoltaics @article{Holliday2017RecentAI, title={Recent advances in high performance donor-acceptor polymers for organic photovoltaics}, author={Sarah Holliday and Yilin Li and Christine K. ...

Over the past 20 years, significant progress has been made in organic photovoltaics (OPVs) due to its advantages of being cost-effective, being lightweight, and having flexible manufacturability.

Although much promising synthetic progress in conjugated polymer-based organic solar cells (OSCs) has resulted in significant improvement in power conversion efficiencies (PCEs) of from over 15 to >19.0% in the last five years, the sophisticated and complex reactions from at least two families" monomers with remarkably different electron push-pull effects could ...

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 ...

semiconductors. A high dielectric constant (e) is a key factor for lowering the exciton binding energy of semiconductors and if sufficiently high can lead to free charge carriers on photoexcitation in a homojunction device. To overcome the inherently low dielectric constant of organic materials, ethylene glycol-based

Current organic materials for organic photovoltaics have low dielectric constants in the range of 2 to 4. This imposes an efficiency limiting factor in changing light into free charge carriers making them not competitive to their high dielectric inorganic counterparts, like Si which has a dielectric constant of ~12.

High Dielectric Constant Conjugated Materials for Organic Photo-voltaics. J. Mater. Chem. ... Organic photovoltaics show high promise as a technology for sustainable energy conversion. A prominent ...

In this study, we introduce a facile method of selenium substitution to reduce the Urbach energy of organic

photovoltaic materials to 20.4 meV (Y6Se), which is the lowest value reported for high ...

High dielectric constant organic semiconductors, often obtained by the use of ethylene glycol (EG) side chains, have gained attention in recent years in the efforts of improving the device ...

DOI: 10.1039/C7TA06808E Corpus ID: 139516806; High dielectric constant conjugated materials for organic photovoltaics @article{Brebels2017HighDC, title={High dielectric constant conjugated materials for organic photovoltaics}, author={J Jeroen Brebels and Jean V. Manca and Laurence Lutsen and Dirk Vanderzande and Wouter Maes}, journal={Journal of Materials Chemistry}, ...

High dielectric constant conjugated materials for organic photovoltaics. View/ open. 36394.pdf (1.390Mb) Metadata Show full item record. ... 2050-7488. Issue 46. Journal Journal of ...

Here, we show that the high optical frequency dielectric constant of Y6 leads to majority free charge generation upon optical excitation within neat films.

The fill factor (FF) of organic solar cells (OSCs), a critically important photovoltaic parameter, is still sub-optimal, often less than 0.8. To further reduce the FF gaps with regard ...

The fill factor (FF) of organic solar cells (OSCs), a critically important photovoltaic parameter, is still sub-optimal, often less than 0.8. To further reduce the FF gaps with regard to the Shockley-Queisser upper limit, we present a study unveiling the impacts of dielectric properties on obtaining high FFs and photovoltaic efficiencies in OSCs.

After the photoexcitation of a donor or acceptor molecule to form an exciton, the exciton must first diffuse to the donor/acceptor interface. There, the exciton can dissociate to form a charge transfer (CT) state via electron or hole transfer. Due to the typically low dielectric constants of organic materials, the exciton has a high binding energy.

Related References Zhang, S.; Zhang, Z.; Liu, J.; Wang, L. 2016: Fullerene Adducts Bearing Cyano Moiety for Both High Dielectric Constant and Good Active Layer Morphology of Organic Photovoltaics Advanced Functional Materials 26(33): 6107-6113

As many conjugated polymer-based organic photovoltaic (OPV) materials provide substantial solar power conversion efficiencies (as high as 13%), it is important to develop a deeper understanding of ...

low dielectric constant of organic semiconductors. The dielectric constant is a parameter that describes the permittivity of a material, or the response of a medium to an electric field. A material with a high dielectric constant will resist the electric field better than a ...

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