Solar container of high dielectric constant materials

Why do organic solar cells have a low dielectric constant?
The majority of organic semiconductors have a low relative dielectric constant (?r < 6), which is an important limitation for organic solar cells (OSCs). A high dielectric constant would reduce the exciton binding energy, reduce charge carrier recombination losses, and thereby enhance the overall device performance of OSCs.

Are high performance OSCs based on high dielectric constant photovoltaic materials still infancy?
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 of ?r ? 9.4,which is two times larger than that of its alkyl chain-containing counterpart ITIC.

What is the dielectric constant of non-fullerene acceptors?
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.

Do dielectric properties affect photovoltaic efficiencies in organic solar cells?
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.

Do high dielectric constants play a significant role in OSCs?
The less phase-separated morphology in blend films due to the reduced crystallinity of ITIC-OE and the too good miscibility between PBDB-T and ITIC-OE are responsible for the lower device performance. This work suggests additional prerequisites to make high dielectric constants play a significant role in OSCs.

How can dielectric constants be increased?
The dielectric constant can be increased by incorporating nanomaterials with high dielectric constants into the nanocomposite,such as the two high dielectric permittivity graphite particles and CNTs added to PDMS and PVDF by Song et al. .

Here, we report three previously unexplored materials with very high dielectric constants (69 < ? < 101) and large band gaps (2.9 < Eg (eV) < 5.5) obtained by screening materials...

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Abstract Polymers are essential components of modern-day materials and are widely used in various fields. The dielectric constant, a key ...

A novel isotropic fullerene-hybridized fused-ring electron acceptor, C 60 -Y, featuring a high dielectric constant and isotropic molecular ...

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 ...

Semantic Scholar extracted view of "Organic Solar Cells Based on High Dielectric Constant Materials: An Approach to Increase Efficiency" by Khalil J. Hamam

A high dielectric constant non-fullerene acceptor for efficient bulk-heterojunction organic solar cells+ The majority of organic semiconductors have a low relative ...

Benchmarking density functional perturbation theory to enable high-throughput screening of materials for dielectric constant and refractive index. Ioannis ...

A non-fullerene acceptor with enhanced dielectric constant is developed by replacing alkyl chains with branched oligoethylene oxide chains, ...

This work is based on a rapid framework that has ability to design novel polymers for organic solar cells. Dielectric constant is predicted using machine learning (ML) models. In organic solar cells, the ...

These materials will be designed and tested on the basis of the following "application postulate": Adding solutions containing ions (e.g., acid solutions) to highly porous insulating materials creates a high ...

A higher dielectric constant can enhance exciton dissociation and improve the overall power conversion efficiency of the solar cell. 10,000 new polymers were generated, and their ...

High dielectric constant refers to the ability of materials to hold and accumulate more electric charge under mechanical stress, enhancing the triboelectric effect and improving energy harvesting ...

The dielectric materials with high-dielectric properties predicted in this work open up further experimental research opportunities.

Abstract The low dielectric constant of organic semiconductors has been a limiting factor in the organic photovoltaics. Non-Fullerene Acceptor Bulk Heterojunction (NFA-BHJ) organic solar cells with high ...

In the semiconductor industry, the term high-? dielectric refers to a material with a high dielectric constant (?,

kappa), as compared to silicon dioxide. High-? dielectrics are used in semiconductor ...

Here, efficient as-cast OSCs are constructed via introducing a new polymer acceptor PY-TPT with a high dielectric constant into the D18:L8-BO ...

Dielectrics having a value of dielectric constant k × 8.854 F/cm more than that of silicon nitride (k > 7) are classified as high dielectric constant materials, while those with a value of k less ...

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, ...

Here, efficient as-cast OSCs are constructed via introducing a new polymer acceptor PY-TPT with a high dielectric constant into the D18:L8-BO blend to form a double-fibril network morphology. Besides, the ...

The high dielectric constant ZrO2, as one of the most promising gate dielectric materials for next generation semiconductor device, is expected to ...

In particular, substantial plasmon absorption and backscattering remain major challenges to achieving enhancements in high-efficiency multi-junction solar cells. In this study, we abstracted the dielectric ...

Herein, we report an oligoethylene oxide side chain-containing non-fullerene acceptor (ITIC-OE) with a high relative dielectric constant of ?r ? ...

Abstract The majority of organic semiconductors have a low relative dielectric constant (? r < 6), which is an important limitation for organic solar cells (OSCs). A high dielectric constant would reduce the ...

It also discusses the impact of thermal conductivity on dielectric behavior, the challenges of controlling porosity, moisture reduction implications, and the significance of haze in low ...

Dielectric constant of non-fullerene acceptors plays a critical role in organic solar cells in terms of exciton dissociation and charge recombination. Here, authors report selenium substitution on ...

Many metal halides that contain cations with the ns2 electronic configuration have recently been discovered as high-performance optoelectronic materials. In particular, solar cells based on lead ...

Here, authors report selenium substitution on central core of acceptors to improve dielectric constant, realizing devices with efficiency of 19.0%.

The majority of organic semiconductors have a low relative dielectric constant (?r < 6), which is an important limitation for organic solar cells (OSCs). A high dielectric constant would reduce the exciton ...

Solar container of high dielectric constant materials

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

Herein, we present a comprehensive strategy to overcome the challenge by engineering the dielectric properties of nonfullerene acceptors ...

The efficiency of organic solar cells still lags behind inorganic solar cells due to their low dielectric constant which results in a weakly screened columbic attraction between the photogenerated electron ...

High fill factor organic solar cells with increased dielectric constant and molecular packing density To further reduce the FF gaps with regard to the Shockley-Queisser upper limit, we present a study ...

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