

Organic photovoltaic ☐☐





Overview

Organic solar cells are based on the absorption of light by a donor-acceptor system. The donor has a high HOMO and a low LUMO, while the acceptor has a low HOMO and a high LUMO. This leads to the formation of an exciton, which is then separated into a free electron and a hole.

The efficiency of organic solar cells is limited by several factors, including the absorption coefficient, the charge carrier mobility, and the recombination rate. The absorption coefficient is typically low, leading to a thin active layer. The charge carrier mobility is also low, leading to a high series resistance. The recombination rate is high, leading to a low open-circuit voltage.

Despite these limitations, organic solar cells have several advantages, including their low cost, flexibility, and tunability. They are also a promising technology for use in building-integrated photovoltaics (BIPV).

Organic solar cells have a theoretical maximum efficiency of ~31%, but current efficiencies are around 18-20%. This is due to the low absorption coefficient and the high recombination rate.

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ITO is a common material used for the transparent conductive layer in organic solar cells. It is a thin layer of indium tin oxide that allows light to pass through while conducting electricity.

• *Electronic Processes in Organic Crystals and Polymers*, 2 ed. by Martin Pope and Charles E. Swenberg, Wiley (1999), • Organic.

Organic solar cells are based on the absorption of light by a donor-acceptor system. The donor has a high HOMO and a low LUMO, while the acceptor has a low HOMO and a high LUMO. This leads to the formation of an exciton, which is then separated into a free electron and a hole.



performance and device stability. However, the impact of variations in the MOF side chain on perovskite characteristics and the mechanism of MOF/perovskite film formation remains unclear.

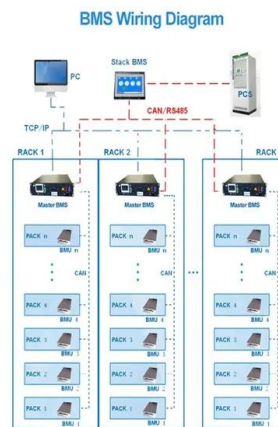


Large-area organic photovoltaic modules with 14.5% certified ...

A new certified world record efficiency for large-area organic photovoltaic (OPV) modules is demonstrated, namely 14.5% on the total module area (15.0% on active area). This achievement is enabled by finite element method (FEM) computer simulations used to optimize the coating homogeneity and the solar module layout. Barely any performance loss is observed ...

Charge-generating mid-gap trap states define the thermodynamic

The inability to accurately measure the charge-generating energy states in organic solar cells makes elucidating the photovoltaic effect in these devices difficult. Here, the authors report charge



Uncovering the out-of-plane nanomorphology of organic photovoltaic ...

Morphology of organic thin film, including the in-plane and out-of-plane directions, plays a crucial role in determining the performance of organic solar cells, yet the characterisation is



Organic photovoltaics

Organic photovoltaics Bernard Kippelen * a and Jean-Luc Brédas b a School of Electrical and Computer Engineering, Center for Organic Photonics and Electronics, Georgia Institute of Technology, Atlanta, Georgia 30332, USA.



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Physical insights into non-fullerene organic photovoltaics

Boosted by the fast development of non-fullerene acceptors, organic photovoltaics (OPVs) have achieved breakthrough power conversion efficiencies -- in excess of 20% and approaching those of state-of-the-art crystalline silicon photovoltaics. New physical





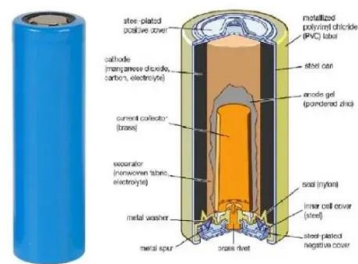
Direct observation of trap-assisted recombination in organic

The presence and relevance of trap-assisted recombination in organic photovoltaic devices is still a matter of some considerable ambiguity and debate, hindering the field as it seeks to deliver



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Organic Solar Cells: An Introduction to Organic Photovoltaics

A concise overview of organic solar cells, also known as organic photovoltaics (OPVs), a 3rd-generation solar cell technology. OPVs are advantageous due to their affordability & low ...



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Benzo[1,2-b:4,5-b']dithiophene-Based Conjugated Polymers for ...

In the past several years, power conversion efficiencies (PCEs) of bulk heterojunction (BHJ) single-junction organic photovoltaic (OPV) cells have increased rapidly because of the innovation of photovoltaic materials, including polymer donors and nonfullerene



The Harvard organic photovoltaic dataset.,Scientific Data

The Harvard Organic Photovoltaic Dataset (HOPV15) presented in this work is a collation of experimental photovoltaic data from the literature, and corresponding quantum-chemical calculations performed over a range of conformers, each with quantum chemical

Progress of organic photovoltaics towards 20% efficiency

Organic photovoltaic (OPV) technology is flexible, lightweight, semitransparent and ecofriendly, but it has historically suffered from low power conversion efficiency (PCE). However, since 2015,





Organic Photovoltaic Efficiency Predictor: Data-Driven ...

The models presented in this paper, referred to as Organic Photovoltaic Efficiency Predictor (OPEP) models, have shown significantly lower errors than previous models, with OPEP/B3LYP yielding errors of 1.53% and OPEP/sTD-DFT of 1.55%.



Self-powered ultra-flexible electronics via nano-grating

We integrated organic electrochemical transistors used as sensors with organic photovoltaic power sources on a one-micrometre-thick ultra-flexible substrate. A high-throughput room-temperature



Molecular Design of Benzodithiophene-Based Organic ...

Advances in the design and application of highly efficient conjugated polymers and small molecules over the past years have enabled the rapid progress in the development of organic photovoltaic (OPV) technology as ...



Physical insights into non-fullerene organic photovoltaics

Non-fullerene acceptors have boosted the development of organic photovoltaics. This Review highlights the photophysics and device physics of non-fullerene organic photovoltaics, including exciton





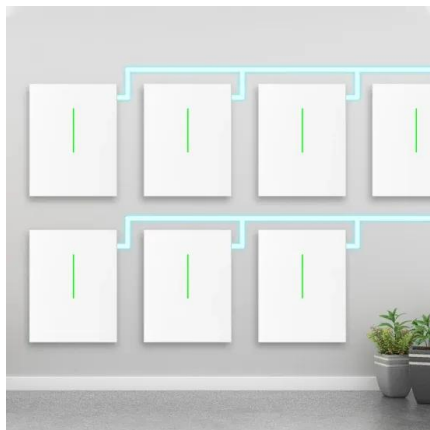
Machine learning property prediction for organic photovoltaic ...

Organic photovoltaic (OPV) materials are promising candidates for cheap, printable solar cells. However, there are a very large number of potential donors and acceptors, making selection of the



Physical insights into non-fullerene organic photovoltaics

DOI: 10.1038/s42254-024-00719-y Corpus ID: 269165634 Physical insights into non-fullerene organic photovoltaics @article{Wang2024Physicalll, title={Physical insights into non-fullerene organic photovoltaics}, author={Jiayu Wang and Yuan Xie and Kai Chen and



Increase in the efficiency and stability of large-area flexible organic

Large-area flexible organic photovoltaic modules suffer from electrical shunt and poor electrical contact between adjacent subcells, causing efficiency and stability losses. Here we improve the

photovoltaic????_photovoltaic???_photovol taic??

Two-layer organic photovoltaic cell Plasmonics for improved photovoltaic devices Plasmonics for improved photovoltaic devices. Comparison of Photovoltaic Array Maximum Power Point Tracking Techniques Solar energy conversion by dye-sensitized photovoltaic





Organic Photovoltaics' New Renaissance: Advances Toward ...

Non-fullerene acceptors (NFAs) have recently breathed new life into organic photovoltaic (OPVs), achieving breakthrough photovoltaic conversion efficiencies. Unlike conventional fullerene acceptors, they offer strong levels of tunability and solution-processibility that allow them to be easily exploited in the roll-to-roll (R2R) fabrication process.



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