Small molecule photovoltaic cells

Are small molecule organic solar cells efficient?
Small molecule organic solar cells (OSCs) represent an alternative route for OSCs,but their efficiencies are lower than polymer-molecule blend based counterparts. Here Zhou et al. show high performance devices with 14% efficiency and feature hierarchical morphologies.

What are all-small-molecules organic solar cells (ASM-OSCs)?
A rising trend in this field is the development of all-small-molecules organic solar cells (ASM-OSCs) due to their merits of excellent batch-to-batch reproducibility, well-defined structures, and simple purification.

Are solution-processed small molecular materials suitable for organic solar cells?
A homo-tandem solar cell based on SMPV1 was constructed with a novel interlayer (or tunnel junction) consisting of bilayer conjugated polyelectrolyte,demonstrating an unprecedented PCE of 10.1%. These results strongly suggest solution-processed small molecular materials are excellent candidatesfor organic solar cells.

Are all-small-molecule organic solar cells better than polymer solar cells?
All-small-molecule organic solar cells (all-SMOSCs) have attracted tremendous attention on account of their special merits of easy purification,well-defined molecular structures,and better molecular repeatabilitycompared with polymer solar cells (PSCs).

Are liquid crystalline small molecules suitable for nonfullerene solar cells?
J. Mater. Chem. A 7, 3682-3690 (2019). Li, H. et al. Liquid-crystalline small molecules for nonfullerene solar cells with high fill factors and power conversion efficiencies. Adv. Energy Mater. 9, 1803175 (2019). Yuan, J. et al. Single-junction organic solar cell with over 15% efficiency using fused-ring acceptor with electron-deficient core.

Can small molecule organic solar cells be commercialized?
Nature Communications 15,Article number: 1946 (2024) Cite this article All-small-molecule organic solar cells with good batch-to-batch reproducibility combined with non-halogen solvent processing show great potential for commercialization.

Recently, solution-processed organic solar cells combining small-molecule donor and nonfullerene acceptor have achieved breakthrough results with the certified efficiency over 15%. These impressive progresses are driven by the concerted ...

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Among the numerous organic photovoltaic (OPV) materials, benzodithiophene (BDT)-based small molecules have come to the fore in achieving outstanding power conversion efficiency (PCE) and breaking the 17% efficiency barrier in single-junction OPV devices, indicating the significant potential of this class of materials in commercial photovoltaic ...

In the following, we will introduce the development history, molecular structures, as well as physicochemical and photovoltaic properties of organic small molecule acceptor photovoltaic materials, including fullerene derivatives, narrow bandgap SMAs, and non-fused ...

All-small-molecule organic solar cells (ASM-OSCs) have achieved exciting research progress in recent years. A brief summary from the perspective of materials, morphology, and device optimization tech...

This work demonstrates an effective strategy to optimize the active layer for sequential morphology evolution and vertical distribution. Combining layer-by-layer deposition and solid additive methoxy-substituted graphdiyne treatment, 17.18% efficiency was achieved, the highest power conversion efficiency for all-small-molecule solar cells reported to date. We ...

The small molecule 1 (asm1) with ortho-fluorinated side chain and small molecule 2 (asm2) with meta-fluorinated side chain are selected to probe the fluorination effect on optical and electronic properties.The results show that asm1 can increase open-circuit voltages and short circuit current. The asm1/Y6 system can significantly improve the charge transfer ...

A two-dimensional conjugated small molecule (SMPV1) was designed and synthesized for high performance solution-processed organic solar cells. This study explores the photovoltaic properties...

The solution-processable small molecules based on carbazole or fluorene containing rhodanine dyes at both ends were synthesized and introduced as acceptors in organic photovoltaic cells. The high energy levels of their lowest unoccupied molecular orbitals resulted in a power conversion efficiency of 3.08% an

Tetrahydrofuran-fabricated all-small-molecule organic solar cells based on BM-ClEH:BO-4Cl achieved high power conversion efficiencies of 15.0% in binary device and 16.1% in ternary device...

Small molecule organic solar cells (OSCs) represent an alternative route for OSCs, but their efficiencies are lower than polymer ...

Recently, solution-processed organic solar cells combining small-molecule donor and nonfullerene acceptor have achieved breakthrough results with the certified efficiency over 15%. These impressive progresses are driven by the concerted efforts of modifying the donor and acceptor materials and optimizing the morphology.

Organic photovoltaic (OPV) is one of the most promising technologies for powering indoor electronic devices. The high-performance indoor organic photovoltaics (IOPV) require medium bandgap materials to absorb

visible light efficiently and reduce energy loss. However, state-of-the-art A-DA"D-A type small molecule acceptors (SMAs) have absorptions ...

Zhou, Z. et al. High-efficiency small-molecule ternary solar cells with a hierarchical morphology enabled by synergizing fullerene and non-fullerene acceptors. Nat. Energy 3, 952-959 (2018).

Conformation tailorable by asymmetric central core is a powerful method to develop high-performance small molecule donors. In the past few years, compared with the ...

To broaden the absorption spectra, modify the bulk-heterojunction microstructure, and suppress morphological evolution of the host blend, we introduce an asymmetric small-molecule acceptor, L8-S9, with a narrow optical band gap and good molecular crystallinity, into the MPhS-C2:L8-BO binary system. The resulting ternary system achieved a ...

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