Hole transport materials for solar cells

PTAA as Efficient Hole Transport Materials in Perovskite Solar Cells: A Review Yihao Wang, Leiping Duan, Meng Zhang,* Ziv Hameiri,* Xu Liu,* Yang Bai,* and Xiaojing Hao* 1. Background The ever-growing energy demand in the world is causing severe environmental problems.[1-3] Renewable energy sources can

The dominated hole transport material (HTM) used in state-of-the-art perovskite solar cells (PSCs) is Spiro-OMeTAD, which needs to be doped to improve its conductivity and mobility. The inevitable instability induced by ...

Hole-transport materials are deposited between the photoactive layer and the anode, improving the device performance. HTLs, used in conventional polymer solar cells (PSCs), were first reported in the late 1990s after a similarly reported experimentation in organic light-emitting diodes (OLEDs) [39,40].

The molecular design and conformations of hole-transporting materials (HTM) have unravelled a strategy to enhance the performance of environmentally sustainable perovskite solar cells (PSC). Several attempts have been made and several are underway for improving the efficiency of PSCs by designing an efficient HTM, which is crucial to preventing corrosion, ...

We developed a triazatruxene-based hole transport material (HTM), 3Ka-DBT-3Ka, aiming to enhance band alignment and augment charge generation and collection in devices, as an alternative for 1,2-ethanedithiol (EDT).The PbS CQD solar cells employing 3Ka-DBT-3Ka as the HTM achieve a peak efficiency of 11.4%, surpassing devices employing the conventional PbS ...

A typical PSC device has five fundamental layers: the conducting substrate (ITO/FTO), the hole-transporting layer (HTL), the perovskite light-absorber layer, the electron transporting layer (ETL), and the metal electrode (Au/Ag) [11].The working principle of a perovskite solar cell is similar to dye-sensitized solid-state solar cells [12].When the solar ...

This review provides an overview of the recent development of organic hole-transporting materials in the efficiency and stability of IPSCs, including organic small molecules and conjugated conductive polymers. The effective strategies for the charge-transport layer and perovskite films of IPSCs are also discussed.

Perovskite solar cells (PSCs) have achieved significant progress in the past decade and a certified power conversion efficiency (PCE) of 26.0% has been achieved. The widely used organic hole transport materials ...

Hole transport materials in heterojunction solar cells (e. g. perovskite solar cells (PSCs)) play critical roles in determining charge transport dynamics, photovoltaic ...

This review presents various hole transport layers (HTLs) employed in perovskite solar cells (PSCs) in pursuing high power conversion efficiency (PCE) and functional stability. The PSCs have achieved high PCE

(over 23%, certified by NREL) and more efforts have been devoted into research for stability enhancement.

Hole transporting layers between carbon electrodes and perovskite improves the performance of perovskite solar cells. Here, four interlayer materials are assessed and ...

The prospect of enhancing stability by substituting organic transport layers with suitable inorganic compounds, particularly Cu-based inorganic hole-transport materials (HTMs), holds promise due to their high ...

Despite the high efficiencies currently achieved with perovskite solar cells (PSCs), the need to develop stable devices, particularly in humid conditions, still remains. This study presents the synthesis of a novel photo-cross-linkable fullerene-based hole transport material named FT12. For the first time, the photo-cross-linking process is applied to PSCs, resulting in the ...

1 · Self-assembled molecules (SAM) as hole transport materials play an important role in performance of inverted perovskite solar cells (PSCs). Common anchoring groups like 2-cyanoacrylic acid and phosphonic acid provide strong anchoring at the bottom interface and excellent passivation during inverted PSC fabrication.

1 Introduction. The emergence of solid-state perovskite solar cells (PSCs) 1 and subsequent advancements in their power conversion efficiencies (PCEs) exceeding 22% 2 have captured the attention of photovoltaics research society and industry. 3 Typically, PSCs are composed of transparent top electrode, electron transport material (ETM), perovskite light absorber, hole ...

The use of a new hole transport material called spiro-Naph allows the realization of efficient large-area perovskite solar cells. ... New generation hole transporting materials for perovskite ...

The prospect of enhancing stability by substituting organic transport layers with suitable inorganic compounds, particularly Cu-based inorganic hole-transport materials (HTMs), holds promise due to their high valence band maximum (VBM) aligning with ...

The p-conjugated system and the steric configuration of hole transport materials (HTMs) could greatly affect their various properties and the corresponding perovskite solar cells" efficiencies. Here, a molecular engineering strategy of incorporating different amounts of p-methoxyaniline-substituted dibenzofurans as p bridge into HTMs was proposed to develop ...

Key role of inorganic-hole transport materials (HTMs) in high-performance perovskite cells are evaluated. Desired physical and optoelectronic features are highlighted. ...

High-efficiency n-i-p perovskite solar cells generally incorporate organic hole-transport layer materials such as spiro-OMeTAD or PTAA, which have intrinsically low charge carrier mobility and therefore require doping

to improve ...

Hole-transporting layers (HTLs) are an essential component in inverted, p-i-n perovskite solar cells (PSCs) where they play a decisive role in extraction and transport of holes, surface passivation, perovskite crystallization, device stability, and cost.

One approach for improving the power conversion efficiencies (PCEs) of inverted perovskite solar cells (PSCs) has been to use self-assembled monolayers (SAMs), such as [2-(9H-carbazol-9-yl)ethyl]phosphonic acid (2PACz) and its derivatives, as hole transport materials (HTMs) (1, 2).The main reasons why SAMs enhance PCEs compared with ...

Indeed, many studies have shown that hole transport materials improve the long-term stability of the solar cell, thanks to their good material durability and chemical compatibility with perovskite. Table 1 presents some results of stability tests of PSCs with various organic and inorganic HTLs.

The efficiency of perovskite solar cells is limited by the performance of the hole-transport material, which extracts charges from the active layer. Here, a molecularly engineered hole transporter ...

One of the main components is the organic hole transport materials (HTMs) as a p-type semiconductor that has the advantages over inorganic materials of being biodegradable, low cost, and easily processed. ... Dibenzo heterocyclic-terminated spiro-type hole transporting materials for perovskite solar cells. 2022, Journal of Materials Chemistry C.

Charge transport materials constitute a relatively large portion of the cost in the production of perovskite solar cells (PSCs). Therefore, developing cheap and efficient charge transport materials is of great significance for the commercialization of PSCs. ... In this study, three low-cost hole transport materials (HTMs), specifically 4,4"-(3 ...

We developed a triazatruxene-based hole transport material (HTM), 3Ka-DBT-3Ka, aiming to enhance band alignment and augment charge generation and collection in devices, as an alternative for 1,2-ethanedithiol (EDT).The PbS ...

The power conversion efficiency of modern perovskite solar cells has surpassed that of commercial photovoltaic technology, showing great potential for commercial applications. However, the current high-performance ...

The use of a hole transport material (HTM) remains indispensable in perovskite solar cells. Perovskites can conduct holes, but they are present at low levels, and for efficient charge extraction a HTM layer is a ...

Carbon-based hole transport material (HTM)-free perovskite solar cells have exhibited a promising commercialization prospect, attributed to their outstanding stability and low manufacturing cost.

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PTAA is one of the most promising hole transport materials for PSCs, which has shown great compatibility for both n-i-p- and p-i-n-structured devices. The application of PTAA has been further extended to flexible, ...

In the last decade, perovskite solar cells have witnessed great progress with a certified photoelectric conversion efficiency of 25.7%, which is comparable to single-crystal silicon solar cells, but the stability issue still restricts commercialization.

Since 2009, perovskite solar cells (PSCs) have witnessed dramatic developments with the record power conversion efficiency (PCE) exceeding 25% within a single decade. One bottleneck for the commercialization of PSCs is the lack of stability due to the commonly used hole transport materials (HTMs) with dopant