Double-layer solar energy absorption device structure

Do lead-free solar cells have a double absorption layer?
A novel lead-free solar cell with a double absorption layer, based entirely on germanium, is proposed. Using the SCAPS-1D simulator, the CsGeI 3 and MAGeI 3 materials are well-matched. In this study, we focus on optimizing the structure of perovskite solar cells (PSCs) comprising a single absorption layer of FTO/n-CsGeI 3 /MAGeI 3 /p-CsGeI 3 /Pt.

What is the performance of a double absorption layer PSC?
Herein, we modelled and analyzed the performance of PSCs using the SCAPS-1D simulator. Through simulation of the double absorption layer PSCs, we achieve optimal device configurations, yielding a PCE of 26.85 %, a Jsc of 23.39 mA/cm 2, a FF of 88.19 %, and a Voc of 1.30V. 1. Introduction

Do perovskite solar cells have a single absorption layer?
In this study,we focus on optimizing the structure of perovskite solar cells (PSCs) comprising a single absorption layerof FTO/n-CsGeI 3 /MAGeI 3 /p-CsGeI 3 /Pt. Subsequently,a novel double absorption layer structure based on FTO/n-CsGeI 3 /MAGeI 3 /CsGeI 3 /p-CsGeI 3 /Pt PSCs is proposed.

Which material is used as a solar cell absorber layer?
In present work,fluorine-doped tin oxide (FTO) is employed as transparent electrode,tungsten disulfide (WS 2) is used as ETL,cuprous oxide (Cu 2 O) as HTL and La 2 NiMnO 6material is utilized as an absorber layer using the simulation program Solar Cell Capacitance Simulator-One Dimensional (SCAPS-1D).

Are double perovskite materials effective absorbers in tandem photovoltaic systems?
The results reported here demonstrate that lead-free and stable double perovskite materials can act as an important absorberin subcells for highly efficient,commercially viable,nontoxic and eco-friendly tandem photovoltaic technologies.

Are magei 3-csgei 3 double absorber layer PSCs N-I-P planar?
Conclusion In this work,organic-inorganic hybrid Pb-free MAGeI 3 -CsGeI 3 double absorber layer PSCs with an n-i-p planar structure have been simulated. The thickness of HTL and ETL are discussed,and the thickness and defects of the absorber layer are optimised.

We simulated tandem solar cells using methyl ammonium germanium iodide (MAGeI3) as the top subcell absorber layer due to its wide band gap of 1.9 eV. Further, FA0.75MA0.25Sn0.25Ge0.5I3 =...

This research paper presents a comprehensive numerical investigation aimed at enhancing the absorption parameters of silicon-based metamaterial inspired solar cells with anti-reflection layer integrated. This work employs the robust Finite Element Method (FEM) and introduces an Anti-Reflection Layer (ARC) into the

solar cell device structure. The focal point ...

We present a double-layer structure for high efficiency, leveraging double absorber layers in perovskite solar cells expands spectral absorption and reduces thermalization losses,...

Download scientific diagram | | Structures of CdTe solar-cell devices. a, A typical CdTe device structure with a glass/TCO (thin conducting oxide) substrate, ~100 nm CdS layer, ~4 um poly-CdTe ...

We present a double-layer structure for high efficiency, leveraging double absorber layers in perovskite solar cells expands spectral absorption and reduces thermalization losses, thereby enhancing power conversion efficiency and stability.

In this study, a double absorber solar device using an inorganic perovskite called NaZn 0. 7 Cu 0. 3 Br 3 as the top absorber layer and MASnI 3 as the bottom absorber layer is analyzed utilizing the SCAPS-1D simulation tool. The primary goal of this study is to look for a device architecture with a higher efficiency level. Here ...

In recent years, perovskite solar cells (PSCs) continue to be a popular issue due to their high-power conversion efficiency (PCE%) and cost-effective production process.The CsPbI 3 absorber layer used to produce PSCs limits the efficiency of the structure because it can absorb low-energy photons. Therefore, in this study, for the first time, CsPbI 3 and CsPbI 3 ...

This research numerically simulated a novel double absorber solar cell structure employing CsPbI 3 and CZTSSe absorbers in the active layer in SCAPS-1D. The current study analyses the effects of various electron and hole transport materials, back contact material"s work functions, working temperatures, variations in defect ...

Several solar cell device structures have been analyzed for their numerical simulation with sulphide ETLs such as ZnS, WS2, CdS, CdZnS and oxide ETLs such as TiO2, ZnO, WO3, IGZO. To progress towards eco-friendly PSCs, alternatives to sulphide, several transparent oxide alternatives (TiO2, ZnO, WO3, IGZO) have been considered as ETLs. ...

Although the double layer structure shows high evaporation efficiency [21], there is still a lot of energy losses mainly through the bottom layer of the system into the bulk water, which can take about 57% of the total energy losses [22]. Thus, methods to further reduce the heat dissipated from the bottom layer into the bulk water is still desirable. In this work, we ...

Traditional infrared devices use the inherent properties of natural materials to achieve the regulation of electromagnetic waves, but the limited ability of such devices to regulate electromagnetic waves can"t well meet our needs. In this paper, we reported a metamaterial absorber of Cr-Si 3 N 4-Cr-Si 3 N 4-Ti based on double-layer metal-insulator-metal (MIM). It is ...

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In this study, we focus on optimizing the structure of perovskite solar cells (PSCs) comprising a single absorption layer of FTO/n-CsGeI 3 /MAGeI 3 /p-CsGeI 3 /Pt. Subsequently, a novel double absorption layer structure based on FTO/n-CsGeI 3 /MAGeI 3 /CsGeI 3 ...

Lead-free Cs 2 BiAgI 6 has garnered a lot of research interest recently due to its suitability as a potential absorber layer in the solar cell (SC) architecture owing to its low cost, good stability, and high efficiency.

In the tandem structure, each subcell comprises an electron transport layer (ETL), a double perovskite absorber layer, and a hole transport layer (HTL). A two-terminal tandem device is achieved by connecting these subcells in series.

This study focuses on simulating and optimizing a double absorber layer heterojunction solar cell to enhance the efficiency of perovskite solar cells. Effectively absorbing the solar spectrum with a multi absorber layer structure will allow for maximum utilization of the spectrum, enhancing the efficiency of PSCs.

Notably, the configuration of the proposed device is FTO/WS 2 /La 2 NiMnO 6 /Cu 2 O/Au which demonstrates power conversion efficiency (PCE) of 11.41%.

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