



# Do photovoltaic perovskite cells need antimony

SI solar cell compared to the SbSI-based cell. However, this method is time-consuming because it requires multiple cycles in step 2 to obtain complete sulfoiodides.

2.1 Bi, Sb Perovskite Solar Cells. Halide perovskites based on group V metal cations are promising candidates because of their ns<sup>2</sup> electron containing orbital configuration as Pb<sup>2+</sup>.<sup>11</sup> Therefore, bismuth (Bi) and antimony (Sb) perovskites have

In theory, a huge amount. Let's forget solar cells for the moment and just consider pure sunlight. Up to 1000 watts of raw solar power hits each square meter of Earth pointing directly at the Sun (that's the theoretical power of direct midday sunlight on a cloudless day--with the solar rays firing perpendicular to Earth's surface and giving ...

1 Introduction. Perovskite solar cells (PSCs) have gained considerable attention in response to the rapid progress in solar technology, [1-8] as seen by the notable enhancement in efficiency from a modest 3.8% to 25.7% over the course of a decade. [9-13] This incredible enhancement was made likely by the halide perovskite materials" ...

In 2020, Ahmad and Mobin reported in a review article that the PCE of Sb-based perovskite solar cells varied from 0.03 to 3.34 [128]. Recently, antimony (Sb)-based perovskite-inspired solar cells ...

Abstract: Over the past decade, lead halide perovskite light absorbers have been the conventionally used perovskite light absorbers. However, there is an urgent call for alternative perovskite materials with toxicity levels and poor stability to UV radiations. Antimony-based perovskites have proven to be a material with unique ...

To date, SAMs have pushed the PCE of single-junction PSCs more than 25%<sup>13</sup>, of perovskite-CIGS tandem devices more than 24%<sup>51,52</sup>, of all-perovskite tandem solar cells more than 27%<sup>53,54</sup> and of ...

DOI: 10.1021/acsenergylett.3c02409 Corpus ID: 267479800; Air-Stable Lead-Free Antimony-Based Perovskite Inspired Solar Cells and Modules @article{Xu2024AirStableLA, title={Air-Stable Lead-Free Antimony-Based Perovskite Inspired Solar Cells and Modules}, author={Jie Xu and Luigi Angelo Castriotta and Aldo ...

In this manuscript, we report lead-free bismuth and bismuth/antimony-based perovskite materials [Cs<sub>2</sub>AgBiBr<sub>6</sub>, Cs<sub>2</sub>AgBi<sub>0.6</sub>Sb<sub>0.4</sub>Br<sub>6</sub>, and Cs<sub>2</sub>AgBi<sub>0.6</sub>Sb<sub>0.4</sub>(Br<sub>0.278</sub>I<sub>0.722</sub>)<sub>6</sub>] nanocrystals (NCs) synthesized using the hot injection method and benzoyl bromide has been used as a precursor and trimethyl-silyl iodide (TMSI) as ...



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Inverted perovskite solar cells possess great potential for single or multi-junction photovoltaics. However, energy and charge losses at the interfaces limit their performance.

1 Introduction. Fabrication of stable, efficient, and scalable photovoltaic cells for commercialization has captivated much research interest. Over the past decade, even though the power conversion efficiency (PCE) of third-generation solar cells had a great breakthrough, the first-generation solar cells still are predominant in the PV market.

A promising photovoltaic technology with great efficiency, affordable production, and promise for many uses has emerged: perovskite solar cells.

As a result, the all-inorganic perovskite solar cells (PSCs) based on 0.25% Sb <sup>3+</sup> doped CsPbI<sub>2</sub>Br light absorber and screen-printable nanocarbon counter electrode achieved a power conversion ...

An Italian research team claims a first for solar modules based on air stable lead-free and tin-free antimony-based light absorber, a perovskite-inspired material. The mini modules have a 1.2%...

materials have garnered substantial research interest worldwide. Their outstanding performance in solar cell applications and excellent efficiency at the lab scale have already been proven. However, owing to their low stability, the widespread manufacturing of perovskite solar cells (PSCs) for commercialization is still far off.

An international research group led by the National University of Singapore (NSU) has fabricated an inverted perovskite solar cell by placing p-type antimony-doped tin oxides (ATO<sub>x</sub>) combined with ...

The perovskite-inspired Cu<sub>2</sub>AgBiI<sub>6</sub> (CABI) material has been gaining increasing momentum as photovoltaic (PV) absorber due to its low toxicity, intrinsic air stability, direct bandgap, and a high absorption coefficient in the range of 10<sup>5</sup> cm<sup>-1</sup>. However, the power conversion efficiency (PCE) of existing CABI-based PVs is still ...

Here we introduce p-type antimony-doped tin oxides (ATO<sub>x</sub>) combined with a self-assembled monolayer molecule as an interlayer between the perovskite and ...

Herein, we propose an efficient strategy to introduce antimony (Sb<sup>3+</sup>) into the crystalline lattices of CsPbI<sub>2</sub>Br perovskite, which can effectively regulate the growth of perovskite crystals to obtain a more stable perovskite phase. ... Y. Y.; Duan, J. L.; Wang, Y. D.; Yang, X. Y.; Tang, Q. W. All-inorganic CsPbBr<sub>3</sub> perovskite solar cell with ...

The primary focus of this work is on the numerical modeling of lead-free methyl ammonium antimony iodide (MA<sub>3</sub>Sb<sub>2</sub>I<sub>9</sub>) based on perovskite solar cells (PSCs) by deploying solar cell capacitance ...



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Organic-inorganic hybrid lead (Pb) perovskites have been recognized as promising light-harvesting materials and attracted tremendous research attention in the photovoltaic field. The power conversion efficiency (PCE) of perovskite solar cells has exceeded 25%. However, the high toxicity and poor environmental Journal of Materials Chemistry C ...

The very fast evolution in certified efficiency of lead-halide organic-inorganic perovskite solar cells to 24.2%, on par and even surpassing the record for polycrystalline silicon solar cells (22. ...

Researchers in Singapore have built an inverted perovskite PV device with a p-type antimony-doped tin oxides (ATOx) interlayer that reportedly reduces the efficiency disparity between small...

The emergence of inorganic antimony (Sb)-based perovskite-inspired solar cells simultaneously overcomes the poor stability and toxicity of lead (Pb)-based perovskite solar cells. However, in ...

The perovskite solar cell performance of the device is calculated utilizing several ETLs (CdS, TiO<sub>2</sub>, WS<sub>2</sub>, ZnO, and SnO<sub>2</sub>) with the solar cell structure FTO/ETL/MASnBr<sub>3</sub>/NiO/Au using optimal NiO (HTL) with doping concentration (10<sup>20</sup> cm<sup>-3</sup>). The photogenerated electrons from the perovskite are collected and delivered to ...

Despite their comparable performance to commercial solar systems, lead-based perovskite (Pb-perovskite) solar cells exhibit limitations including Pb toxicity and instability for industrial applications. To address these issues, two types of Pb-free materials have been proposed as alternatives to Pb-perovskite: perovskite-based and non ...

All-inorganic perovskites, adopting cesium (Cs<sup>+</sup>) cation to completely replace the organic component of A-sites of hybrid organic-inorganic halide perovskites, have attracted much attention owing to the excellent thermal stability. However, all-inorganic iodine-based perovskites generally exhibit poor phase stability in ambient conditions. ...

The discovery of hybrid organic-inorganic lead-halide materials" photovoltaic activity has led to a significant new area of research: Perovskite Solar Cells (PSC) [1]. This term is used for solar cell absorber materials that possess the perovskite crystal structure, originally based on CaTiO<sub>3</sub> [2]. During their research journey, ...

In this paper, we have shown that Sb has been doped into the light-absorbing methylammonium lead iodide (CH<sub>3</sub>NH<sub>3</sub>PbI<sub>3</sub>) perovskite. We had anticipated that the introduction of antimony (Sb<sup>3+</sup>) as a dopant in perovskite would result in improved light-absorbing properties for use in photovoltaic cells, including longer carrier lifetimes ...

The presence of lead in novel hybrid perovskite-based solar cells remains a significant issue regarding commercial applications. Therefore, antimony-based perovskite-like A<sub>3</sub>M<sub>2</sub>X<sub>9</sub> structures are promising



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new candidates for low toxicity photovoltaic applications. So far,  $\text{MA}_3\text{Sb}_2\text{I}_9$  was reported to only crystallize in the "zero-dimensional" (0D) dimer ...

The emergence of all-inorganic antimony (Sb)-based perovskite-inspired solar cells (PISCs) has attracted much attention due to their good stability and non-toxicity compared with lead (Pb)-based ...

In the past decade, lead halide perovskites experienced impressive progress in photovoltaics with the certified device conversion efficiency over 25%, owing to their outstanding optoelectronic properties. However, the ...

In this work, an additive engineering strategy using antimony acetate ( $\text{Sb}(\text{Ac})_3$ ) is employed to enhance the photovoltaic ...

First, we introduced two cations in the precursor mixture, which improved power conversion efficiencies ( $\text{PCE} = 1.5\%$ ) of antimony (Sb)-based  $\text{MA}_{1.5}\text{Cs}_{1.5}\text{Sb}_2\text{I}_3\text{Cl}_6$  solar cells by 81% compared to ...

Scientists in China built for the first time a four-terminal tandem perovskite cell with a 17.88%-efficient top perovskite device and a 7.85%-efficient bottom antimony selenide bottom...

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