Chalcogenide perovskite solar cells

Currently, there is only one report available on the manufacturing of BaZrS 3 chalcogenide perovskite solar cells, achieving a power conversion efficiency (PCE) of 0.17 % [23]. On the other hand, the potential use of SrZrS 3 in PV devices has not been tested experimentally. Chawik et al."s work is the only theoretical study so far on how different HTLs (NiO x, Cu 2 O, ...

Tandem solar cells combining a wide-bandgap perovskite top cell and a low-bandgap bottom cell based on mixed tin (Sn)-lead (Pb) perovskite or a dissimilar material such as silicon (Si) or copper ...

In 2015, a class of unconventional semiconductors, Chalcogenide perovskites, remained projected as possible solar cell materials. The MAPbI3 hybrid lead iodide perovskite has been considered the best so ...

Perovskite solar cells have attracted much attention due to their rapidly increasing power conversion efficiency, however, their poor inherent long-term stability limits their commercialization. One of the reasons for the low ...

Chalcogenide perovskites (CPs), especially Barium Zirconium Sulfide (BaZrS 3), have attracted tremendous attention as a potential alternative to hybrid halide perovskites for optoelectronics due to their exceptional visible light absorption and extraordinary chemical stability. Therefore, we numerically investigated a highly efficient n-i-p CPs model solar cells ...

In 2013, the performance of a TiO2 solar cell sensitized with lead iodide perovskite (CH3NH3PbI3) was optimized further to attain an overall power conversion efficiency i=15%, which is a new ...

solar cell efficiencies have been reached,[3] the "killer" application of PV perovskites in the near term is thought to be the aug-mentation of commercial crystalline sil-icon solar cells with wide-bandgap perov-skite top cells, to create a tandem device. Si-perovskite tandem device efficiencies have reached 29%, which already exceeds

Chalcogenide perovskites have received much attention in the past few years as a potential candidate for various energy conversion applications since they are extremely resilient, abundantly accessible on Earth, and harmless. It is always worth having insight into computational data of solar cell parameters obtained from designing the chalcogenide perovskite-based ...

ef ciency of chalcogenide perovskite solar cell materials, defect energy . levels are essential [92]. The introduction of localized energy levels . within the bandgap by these defects can have a ...

Metal chalcogenide perovskites were proposed as potential solar cell material in 2015. The theoretical maximum solar cell efficiencies of some chalcogenide perovskites are ~30%, similar to CH 3 NH 3 PbI 3 ...

Examples are the chalcogenide perovskites, such as BaZrS 3. Despite the high stability and the low toxicity shown by these compounds, photovoltaic devices have not been reported yet due to the high temperature synthesis required by these compounds, which limit their applications. [19, 20] Finally, a third path is possible: a lead-free chalco-halide perovskite, such as MASbSI 2. ...

With photovoltaic performance of metal halide perovskite-based solar cells skyrocketing to approximately 26% and approaching the theoretical Shockley-Queisser limit of single junction solar cells, researchers ...

Chalcogenide perovskites are a family of compounds related to perovskite structures or compositions, which have witnessed rapid advances in recent years. They possess favorable properties such as high stability, low toxicity, direct band gaps, good carrier transport abilities, strong light absorption, and potential luminescent properties, making them stand out ...

A perovskite solar cell (PSC) is a type of solar cell that includes a perovskite-structured compound, most commonly a hybrid organic-inorganic lead or tin halide-based material as the light-harvesting active layer. [1] [2] Perovskite materials, such as methylammonium lead halides and all-inorganic cesium lead halide, are cheap to produce and simple to manufacture. Solar ...

Chalcogenide perovskites (CPs), especially Barium Zirconium Sulfide (BaZrS 3), have attracted tremendous attention as a potential alternative to hybrid halide perovskites for ...

Although the photoconversion efficiencies of solar cells based on Bi- and Sb-based halide perovskites are significantly lower than those of organic-inorganic Pb-halide perovskites, the inclusion of negatively charged chalcogen ions shifts their bandgaps for favorable optoelectronic properties and forms metal chalcogenide bonds. As a result, the overall covalence ...

Tandem solar cells based on hybrid organic-inorganic metal halide perovskites have reached efficiencies up to 28%, but major concerns for long-term stability and the presence of Pb have raised interest in searching for fully earth-abundant, intrinsic chemically stable, and nontoxic alternatives. With a direct band gap around 1.8 eV and stability in air up to at least ...

Perovskite chalcogenides have been acknowledged as a potential candidate for solar cell applications. We have investigated new chalcogenide perovskite AInX3 (A = Sc, Y and X = S, Se) materials in the present study. The WIEN2k packages are used based on the framework of DFT. AInX3 (A = Sc, Y and X = S, Se) are crystallized in the orthorhombic phase. ...

In this study, a chalcogenide perovskite solar cell having the structure FTO/TiO 2 /BaZrSe 3 /Spiro-OMeTAD/Au was simulated with the help of SCAPS-1D. In the simulation, each device parameter has been modified separately (while keeping the other values constant) to observe how it influences the V oc, J sc, efficiency, and FF of the device. A conclusion that has ...

Chalcogenide perovskite solar cells

Enhancing the inherent stability of perovskite solar cells through chalcogenide-halide combinations. Cheng Wang a, Riming Nie * ab, Yiming Dai a, Huanyu Tai a, Bingjian Zhu a, Luyao Zhao a, Yong Wu a, Wanlin Guo * a and Sang Il Seok * b a State Key Laboratory of Mechanics and Control of Mechanical Structures, Key Laboratory for Intelligent ...

F PV > 1 is a requirement for high-performance solar cells. We find that F PV ? 10 for both BaZrS 3 and Ba 3 Zr 2 S 7, placing these chalcogenide perovskites among the very best candidates for thin-film solar cells. It remains to be seen whether these results, measured on microscopic single-crystals, bear out in thin films and in solar cell ...

BaZrS3 chalcogenide perovskites have emerged as a promising absorber due to their exceptional properties. However, there are no experimental reports on the applicability of BaZrS3 in photovoltaics. Thus, theoretical knowledge of device structure engineering is essential for its successful fabrication. In this regard, we have proposed various BaZrS3 device ...

Chalcogenide semiconductors offer excellent optoelectronic properties for their use in solar cells, exemplified by the commercialization of Cu(In,Ga)Se2- and CdTe-based photovoltaic technologies. Recently, several other chalcogenides have emerged as promising photoabsorbers for energy harvesting through the conversion of solar energy to electricity and ...

The integration of perovskite solar cells into diverse applications, beyond conventional energy harvesting, signifies the expanding role of these materials in various technological domains. In summary, the reviewed literature showcases the diverse and evolving landscape of perovskite solar cell research. From efficiency enhancements and stability ...

4 · Tin-based perovskite solar cells have garnered attention for their biocompatibility, narrow bandgap, and long thermal carrier lifetime. However, nip-type tin-based perovskite ...

In perovskite solar cells, p-type inorganic semiconductors are good choices for hole transport to measure hole conductivity. These materials stand out for having a variety of valence energy levels, high mobility, outstanding chemical stability, and remarkable visibility.(Rajeswari et al., 2017; H. Wang et al., 2017) However, Spiro-OMeTAD can be replaced with an alternate ...

Organic-inorganic halide perovskite solar cells (PSCs) have experienced rapid growth in power conversion efficiencies (PCEs), however, their commercialization is limited by their inherent poor long-term stability. Mixed halide and chalcogenide is a good pathway to fabricate highly efficient and stable solar cells. Here, we constructed halide-chalcogenide ...

The perovskite solar cells have garnered much attention of the scientific community owing to their superior optoelectronic and mechanical ... Comprehensive investigation of Pb-free MASnI 3 perovskite as light harvester in solar cell with distinct novel chalcogenide based ETLs and Cu 2 O as efficient HTL is made for

the first time along with optimization of ...

Perovskites dominate the photovoltaic research community over the last two decades due to its very high absorption coefficient, electron and hole mobility. However, most of the reported solar cells constitute organic perovskites which offer very high efficiency but are highly unstable. Chalcogenide perovskites like BaZrS₃, CaZrS₃, etc. promise to be ...

Research findings on the structure and composition of chalcogenide perovskite (CP) solar cells has shown their ability to deliver high energy conversion efficiencies due to well-engineered ...