

Ferroelectric photovoltaic review

Silicon-based photovoltaic (PV) technology has dominated the solar cell industry over the past many years and continues to foster to date. ... such as ferroelectrics and is called the ferroelectric photovoltaic effect (FEPV), which differs from the conventional junction-based interfacial PV effect in semiconductors, such as p-n junction or ...

Ferroelectric materials exhibiting anomalous photovoltaic properties are one of the foci of photovoltaic research. We review the foundations and recent progress in ferroelectric materials for ...

Researchers have shown that the photogenerated current of ferroelectric photovoltaic devices can be significantly improved by cation doping and heterostructure construction, reigniting the enthusiasm for the investigation of ferroelectric photovoltaics. ... This paper reviews a variety of ferroelectric photovoltaic materials, the mechanism of ...

Ferroelectric systems are gaining importance in the perspective of capitalizing on their potential in energy applications. In particular, the ferroelectric photovoltaic effect is one of the ...

Ferroelectric materials have been a focus of much research over the last few decades for their unique piezoelectric and optoelectronic properties. Conventional solar cells have been devised based on the photovoltaic effect of semiconductor p-n junctions, with their photogenerated voltage being influenced by the bandgap of the semiconductors, limiting their further ...

The anomalous photovoltaic effect and resistive switching behaviors in ferroelectric materials attract much attention in recent years. Dozens of researches revealed that the two effects coexist and affect each other in electrode/ferroelectric/electrode structures. Therefore, the conductive mechanisms and research progresses of the two effects were discussed in this ...

Achieving high power conversion efficiencies (PCEs) in ferroelectric photovoltaics (PVs) is a longstanding challenge. Although recently ferroelectric thick films, composite films, ...

2 days ago· A notable ferroelectric photovoltaic (PV) effect has been revealed in [C8N2H22]1.5[Bi2I9]-based photoelectric device with an open-circuit voltage (Voc) of 0.39 V ...

Abstract The photovoltaic devices based on ferroelectrics have drawn plenty of attention for providing a promising solar energy harvesting technology and efficient photodetectors. In this review, m... Ferroelectric Materials for Solar Energy Scavenging and Photodetectors - Zhao - 2022 - Advanced Optical Materials - Wiley Online Library

Traditional ferroelectric perovskite oxides are often limited by their wide band gaps, which restrict their efficient use of visible light. Pna2 1-LaWN 3, an innovative perovskite nitride featuring a polar structure, has

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been investigated for its electronic structure, ferroelectric properties, and photovoltaic performance through Density Functional Theory (DFT) analysis.

Ever since the first observation of a photovoltaic effect in ferroelectric BaTiO₃, studies have been devoted to analyze this effect, but only a few attempted to engineer an enhancement conjunction, the steep progress in thin-film fabrication has opened up a plethora of previously unexplored avenues to tune and enhance material properties via growth in the form of ...

The theoretically predicted ferroelectric ZnSnS₃ film was successfully grown for the first time using spray pyrolysis technique. The trigonal structure of the films with x-ray diffraction peaks corresponding to (110), (211), (01-1), and (210) planes of ZnSnS₃ were observed. The direct energy band gap (~ 2.62 eV) and an indirect gap (~ 1.63 eV) ...

Hybrid ferroelectrics have attracted much attention recently due to their low processing cost and superior piezoelectric responses. However, their photovoltaic properties are less explored. For better performance, ferroelectric semiconductors with small band gaps are desired. Here, we report on an organic-inorganic hybrid material (MV) $\{SbI\}_5$...

In this review, we refer to the solar cells based on both ferroelectric and photovoltaic effects of photoferroelectric perovskites as the photoferroelectric perovskite solar cells (PPSCs), and summarize the recent advances in the state-of-the-art technologies for developing PPSCs. The outline of this paper is as follows: (1) The structure and ...

Ferroelectric materials for photovoltaics have sparked great interest because of their switchable photoelectric responses and above-bandgap photovoltages that violate conventional photovoltaic theory.

Ferroelectric materials for photovoltaics have sparked great interest because of their switchable photoelectric responses and above-bandgap photovoltages that violate conventional photovoltaic theory. However, their relatively low photocurrent and power conversion efficiency limit their potential application in solar cells.

The bulk photovoltaic (BPVE) effect in crystals lacking inversion symmetry offers great potential for optoelectronic applications due to its unique properties, such as above-band-gap photovoltage and switchable photocurrent. Because of their large spontaneous polarizations, ferroelectric materials are ideal platforms for studying the BPVE. However, identifying the ...

The ferroelectric photovoltaic effect has been studied extensively because of the unique possibilities it can offer, including an above-bandgap open-circuit photovoltage, a switchable ...

We elucidate the mechanism of a newly observed photovoltaic effect which occurs in ferroelectrics with periodic domain structures. Under sufficiently strong illumination, domain walls function as nanoscale generators of the photovoltaic current. The steps in the electrostatic potential function to accumulate electrons

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and holes on opposite sides of the walls while ...

The photovoltaic (PV) effect is a process by which materials or interfaces under light illumination generate voltages and electric currents. Because of the growing demand for sustainable energy supply and light communication, the importance of PV technologies is continuously increasing. 1) While semiconductor pn junctions are the most familiar devices ...

Ever since the first observation of a photovoltaic effect in ferroelectric BaTiO₃, studies have been devoted to analyze this effect, but only a few attempted to engineer an enhancement conjunction, the steep progress in thin-film ...

Ferroelectrics and multiferroics for next generation photovoltaics Bulk photovoltaic effect at visible wavelength in epitaxial ferroelectric BiFeO₃ thin films Carrier-selectivity-dependent charge recombination dynamics in organic photovoltaic cells with a ferroelectric blend interlayer Ferroelectric-based catalysis: Switchable surface chemistry

In this review, the recent progress of ferroelectric system of perovskite-type hybrids with different dimensions is summarized. Primarily, a brief description of crystallographic symmetry breaking which is a fundamental criterion to creating ferroelectricity, is illuminated. ... as well as the ferroelectric photovoltaic effect. 3.1.3 (3 ...

Ferroelectric all-inorganic halide perovskite nanocrystals with both spontaneous polarization and visible light absorption are promising candidates for designing ferroelectric photovoltaic applications. It remains a challenge to realize ferroelectric photovoltaic devices with all-inorganic halide perovskites that can be operated in the absence of an external electric ...

The photovoltaic devices based on ferroelectrics have drawn plenty of attention for providing a promising solar energy harvesting technology and efficient photodetectors. In this review, ...

The voltage generated in a noncentrosymmetric crystal due to the bulk photovoltaic effect (BPE) can greatly exceed the energy gap, however, the light energy conversion efficiency is extremely low. Here we show that the BPE is remarkably enhanced in the case of thin films. The measurements of the BPE in heteroepitaxial single domain ferroelectric ...

In this Review, we consider the experimentally verified vdW ferroelectric systems by discussing their unique characteristics, such as quadruple-well potentials, metallic ferroelectricity and ...

Ferroelastic twin walls in nonpolar materials can give rise to a spontaneous polarization due to symmetry breaking. Nevertheless, the bistable polarity of twin walls and its reversal have not yet been demonstrated. Here, we report that the polarity of SrTiO_3 twin walls can be switched by an ultralow strain gradient. Using first-principles-based machine ...

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The photovoltaic (PV) effect is a process by which materials or interfaces under light illumination generate voltages and electric currents. Because of the growing demand for sustainable energy supply and light ...

Developing ferroelectric materials with low bandgaps, engineering electrodes to optimize charge extraction, and advancing FePv device architectures are the next steps needed to reach the full potential of ferroelectric photovoltaics. The authors declare no competing financial interest.

This paper reviews a variety of ferroelectric photovoltaic materials, the mechanism of ferroelectric photovoltaics, approaches for improving ferroelectric photovoltaic performance, and the applications and future ...

We also review the dominant families of ferroelectric materials that have been most extensively investigated and have provided the best photovoltaic performance. ... the photocurrent direction is reversed showing the switchable ferroelectric photovoltaic response. Download: [Download high-res image \(274KB\)](#) [Download full-size image](#); Fig ...

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