Switchable photovoltaic effect

What causes a field switchable photovoltaic effect?
This field-switchable photovoltaic effect can be explained by the formation of reversible p-i-n structures induced by ion driftin the perovskite layer.

What is the JSC of a switchable photovoltaic?
In contrast to switchable photovoltaics using bismuth ferrite materials,with JSC typically of the order of ~uA cm -2(refs 10,11),JSC for the OTP devices switched between 18.6 and -20.1 mA cm -2 (Fig. 1c) under one sun illumination,which is comparable to that of optimized perovskite solar cells 1,2,3,4,5,13.

What is bulk photovoltaic effect (bpve)?
The bulk photovoltaic effect (BPVE) rectifies light into the dc current in a single-phase materialand attracts the interest to design high-efficiency solar cells beyond the pn junction paradigm. Because it is a hot electron effect,the BPVE surpasses the thermodynamic Shockley-Queisser limit to generate above-band-gap photovoltage.

What is a switchable photocurrent?
The switchable photocurrent, generally observed in devices based on ferroelectric materials, reached 20.1 mA cm-2 under one sun illumination in OTP devices with a vertical architecture, which is four orders of magnitude larger than that measured in other ferroelectric photovoltaic devices10,11.

What are the characteristics of ferroelectric photovoltaics (FPV)?
The fundamentally different mechanism endows ferroelectric photovoltaics (FPV) with unique characteristics, such as switchable photovoltaic outputs (4 - 7), above-bandgap photovoltage (2, 3, 8 - 10), and light polarization dependence (3, 4, 10, 11).

Does gate voltage affect photovoltaic effect in heterojunction?
Consequently,the photovoltaic effect in the heterojunction is switchableby the gate voltage,enabling a novel self-driven optoelectronic logic element without the need of external biasing.

More importantly, the role of poling flipping on switchable photo-response was further studied through systematic measurements of the current-voltage curves for the Bi 2 WO 6 /Sb 2 Se 3 devices at various polarization states, confirming poling-controlled switchable PV effect. Our findings encourage the design and fabrication of novel ...

The effect of heavy metal cation (Bi) transmutation and ionic migration on the defects and carrier properties in a 2D layered perovskite (NH4)3(Sb(1-x) Bix)2I9 system is investigated. ... Doping and Switchable Photovoltaic Effect in Lead-Free Perovskites Enabled by Metal Cation Transmutation. Padinhare Cholakkal Harikesh,

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A substantial visible-light photovoltaic effect is observed in BiFeO3 diode structures. These results should improve understanding of charge conduction mechanisms in leaky ferroelectrics and advance the design of switchable devices combining ferroelectric, electronic, and optical functionalities. ... Switchable diode effect in ferroelectric ...

In contrast, those films in antipolar/nonpolar states show negligible photovoltaic output, which confirms that the switchable photovoltaic effect originates from the remnant polarization. Furthermore, the positive and negative polar states produce almost symmetrical outputs with opposite signs, suggesting insignificant influence from the ...

The limited sensitivity of photovoltaic-type photodiodes makes it indispensable to use pre-amplifier circuits for effectively extracting electrical signals, especially when detecting dim light.

The polycrystalline BFO thin film also exhibits a switchable photovoltaic effect with an open-circuit voltage of approximately 0.2 V and a short-circuit current of nearly 60 uA/cm 2 under illumination. This study demonstrates that the polycrystalline BFO thin film on a transparent substrate also has the ferroelectric switchable diode and ...

This field-switchable photovoltaic e?ect can be explained by the formation of reversible p-i-n structures induced by ion drift in the perovskite layer. The demonstration of switchable OTP photovoltaics and electric-field-manipulated doping paves the way for innovative solar cell designs and for the

We report the switchable photovoltaic effects in graphene/BiFeO 3 /Pt heterostructures. Pure phase polycrystalline BiFeO 3 films were deposited on Pt/TiO 2 /SiO 2 /Si substrates by pulse laser deposition. A bilayer graphene was transferred onto the BiFeO 3 film which serves as transparent conducting electrodes. The heterostructures showed switchable ...

The switchable photovoltaic (photocurrent) effect in PVSC is generally attributed to ion migration (cations/anions), the work function of the hole transporting layer, and the band ...

Ferroelectric all-inorganic halide perovskites nanocrystals with both spontaneous polarizations and visible light absorption are promising candidates for designing functional ferroelectric photovoltaic devices. Three dimensional halide perovskite nanocrystals have the potential of being ferroelectric, yet it remains a challenge to realize ferroelectric photovoltaic ...

Herein, we report the discovery of a switchable photovoltaic effect, that the sign of the open voltage and the short circuit current can be reversed by inverting the polarity of the applied field, upon electrically tailoring

the distribution of oxygen vacancies in ...

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 ...

Enhanced photovoltaic effects are demonstrated in an In 2 O 3-SnO 2 /BiFe 0.6 Sc 0.4 O 3 /LaNiO 3 (ITO/BFSO/LNO) ferroelectric thin film heterostructure. The Sc-substitution greatly improves the bulk conductivity of BiFeO 3 (BFO) and modifies the energy band alignment in the ITO/BFSO/LNO capacitor structure, where a tunable Schottky-to-Ohmic contact at the ...

9 - Switchable photovoltaic effect in solar cells: Architecture, features, and future scope. Author links open overlay panel M.S. Jyothi a b, R. Shwetharani a, Sabarish Radoor c, R. Geetha Balakrishna a. ... The evolution of photovoltaic devices, developments with open challenges, and future opportunities are analyzed and elaborated along with ...

A new class of FPVs towards high-efficiency solar cell and optoelectronic applications is presented by demonstrating switchable ferroelectric photovoltaic effects and narrow band-gap properties using hexagonal ferrite (h-RFeO3) thin films, where R denotes rare-earth ions. Ferroelectric photovoltaics (FPVs) have drawn much attention owing to their high ...

A better control over processes responsible for the photocurrent generation in semiconductors and nanocomposites is essential in the fabrication of photovoltaic devices, efficient photocatalysts ...

A switchable PV effect is detected at RT with a clear dominant ferroelectric origin over defects migration and interface effects. At low temperatures, above band-gap V oc value of -4.5 V is observed strongly supporting the bulk non-centrosymmetric PV effect.

This diode effect switches its direction when the electric polarization is flipped by an external voltage. A substantial visible-light photovoltaic effect is observed in BiFeO 3 diode structures. These results should improve understanding of charge conduction mechanisms in leaky ferroelectrics and advance the design of switchable devices combining

The photovoltaic effect in epitaxial BFO thin films is studied and an open-circuit voltage Voc of 0.3 V is obtained, demonstrating that photocurrent direction can be switched by the polarization direction of the BFO film and that the ferroelectric polarization is the main driving force of the observed photov Holtaic effect.

More interestingly, a prominent net photocurrent and switchable photovoltaic effect with a sustainable photoresponse were observed in the current polycrystalline HPMO. This Letter provides an exceptional ${d}^{3}$ material system which shows unusually large octahedral distortion and displacement-type

ferroelectricity violating the ``${d}^{0 ...

The demonstration of switchable OTP photovoltaics and electric-field-manipulated doping paves the way for innovative solar cell designs and for the exploitation of OTP materials in electrically...

A magnetic photogalvanic effect (MPGE) that introduces the magnetism as a key ingredient and induces a giant BPVE is proposed that paves a pathway to search for magnetic photovoltaic materials and to design switchable devices combining magnetic, electronic, and optical functionalities. The bulk photovoltaic effect (BPVE) rectifies light into the dc current in a ...

which confirms that the switchable photovoltaic effect originates from theremnant polarization. Furthermore, the positive and negative polar states produce almost symmetrical outputs with opposite signs, sug-gesting insignificant influence from the asymmetric top and bottom electrical contacts. As summarized in Fig. 2D, both V

This field-switchable photovoltaic effect can be explained by the formation of reversible p-i-n structures induced by ion drift in the perovskite layer. Furthermore, the demonstration of switchable OTP photovoltaics and electric-field-manipulated doping paves the way for innovative solar cell designs and for the exploitation of OTP ...

Mechanism of the Switchable Photovoltaic Effect in Ferroelectric BiFeO 3. H. T. Yi, H. T. Yi. Rutgers Center for Emergent Materials, Dept. Physics and Astronomy, Rutgers University, Piscataway, NJ 08854, USA ... This switchable photocurrent and diode effect results from the combination of polarization flipping and electromigration of oxygen ...

Hybrid organic-inorganic molecular ferroelectrics (HOIMFs) have garnered significant attention for their potential applications in nonvolatile memory and spintronic devices. However, few efforts have been devoted to the photoelectric properties of lead halide molecular ferroelectrics, despite the fact that robust ferroelectricity and flexibility are desirable for thin-film ...

reversibly switchable photovoltaic effect by changing the polarization direction with the aid of a bias electric field [8-11]. Until recently, the FPV effect has remained as an academic interest rather than having practical applications owing to extremely low photocurrent densities of FPVs in the order of nA?cm-2 ~ uA?cm-2 [9-13]. The ...

This field-switchable photovoltaic e?ect can be explained by the formation of reversible p-i-n structures induced by ion drift in the perovskite layer. The demonstration of switchable

In contrast, those films in antipolar/nonpolar states show negligible photovoltaic output, which confirms that the switchable photovoltaic effect originates from the remnant polarization. Furthermore, the positive and ...

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This optoelectronic logic device shows promising characteristics of output dark current <1 pA, on/off current ratio >10 5, switching time <10 µs, broadband operation in the ...

The switchable diode in the dark resulted in a giant switchable photovoltaic effect under illumination. In contrast to switchable photovoltaics using bismuth ferrite materials, with JSC typically of the order of ~µA cm-2 (refs 10,11), JSC for the OTP devices switched between 18.6 and -20.1 mA cm-2 (Fig. 1c) under one sun illumination ...

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