Ferroelectric photovoltaics alexe

The anomalous photovoltaic (APV) effect has witnessed great progress from classical ferroelectric photovoltaics to flexo-photovoltaics. Both call for an extension of the spectral response range. Here, we present a comprehensive study on the ferroelectric, photoelectric, ...

Recently, ferroelectric perovskite oxides have drawn much attention due to potential applications in the field of solar energy conversion. However, the power conversion efficiency of ferroelectric ...

The ferroelectric photovoltaic (PV) effect has gained widespread attention in the past decade 1,2,3,4,5 because of its promising applications in solar energy harvesting 6,7,8, self-powered ...

Ferroelectric oxides are an intriguing class of photovoltaic materials, known to produce a very high photovoltage, up to orders of magnitude larger than the bandgap, but ...

Including ferroelectric effects in solar cells introduces a number of significant effects, as the ferroelectric polarization strongly affects the processes that regulate photovoltaic operation. The electrical current and voltage generated in ferroelectric solar cells have in fact two origins (Ruppel et al., 1982).

On the other hand, bulk photocurrent can be induced by high-energy light illumination even in good insulators; and directional photocurrent without external bias [that is, a photovoltaic (PV) effect] has been studied in ferroelectrics (5-13).When a ferroelectric in an open circuit is illuminated by ultraviolet light, for example, a high photovoltage, much larger than the band ...

Here we report the bulk photovoltaic effect in two-dimensional ferroelectric CuInP 2 S 6 with enhanced photocurrent density by two orders of magnitude higher than conventional bulk ferroelectric perovskite oxides. The bulk photovoltaic effect is inherently associated to the room-temperature polar ordering in two-dimensional CuInP 2 S 6. We also ...

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This chapter provides some basic understanding about ferroelectric photovoltaics (PVs) and the related processes. It intends to provide the information on the instrumental work that has been done to understand and unravel the origin of PV effect. The underlying mechanism behind the PV effect in semiconductors involves the use of a pn-junction.

Ferroelectric photovoltaic effect (FE-PV) was originally investigated in several ferroelectric perovskite oxides, such as in BaTiO 3, PbTiO 3, Pb ... Yang et al., 2009c; Alexe and Hesse 2011). The origin of the photocurrent enhancement is related to more photogenerated charges and their fast transportation between the electrodes. Most of the ...

1 day ago· In this work, we explore materials with an intrinsic inverse relation between band gap and polarization in a single ferroelectric phase. Ferroelectrics with an inverse band gap versus ...

A novel nanostructured ferroelectric photovoltaic material, consisting of the ferroelectric lead zirconate titanate (PZT) film and Ag(2) ... L. Pintilie I. Vrejoiu G. Rhun M. Alexe. Physics, Materials Science. 2007; Photovoltaic properties of the metal-ferroelectric-metal structures, having SrRuO3 metal oxide electrodes and Pb(Zr,Ti)O3 ...

We propose a device model that elucidates the role of domain walls in the photovoltaic effect in multi-domain ferroelectric perovskites. The model accounts for the intricate interplay between ferroelectric polarization, space charges, photo ...

We report large photovoltaic enhancement by A-site substitutions in a model ferroelectric photovoltaic material, BiFeO 3. As revealed by optical measurements and supported by theoretical calculations, the enhancement is ...

Physical aspects of ferroelectric semiconductors for photovoltaic solar energy conversion Pilar Lopez-Varo,1 Luca Bertoluzzi,2 Juan Bisquert,*2,3 Marin Alexe,4 Mariona Coll5, Jinsong Huang,6 Juan Antonio Jimenez-Tejada,1 Thomas Kirchartz,7,8 Riad Nechache,9 Federico Rosei,9 Yongbo Yuan6 1Departamento de Electrónica y Tecnología de Computadores, CITIC-UGR,

The bulk photovoltaics refers to an effect whereby electrons move directionally in non-centrosymmetric crystals upon light radiation. Here, Nakamura et al. observe this effect in a ferroelectric ...

4 Ferroelectric photovoltaics We have outlined common photovoltaic device architectures, which universally rely on charge separation by variation in material composition. Charge separation due to the innate crystal field in a homogeneous material is also possible, which is the process used in some ferroelectric photovoltaics.

This ferroelectric switchable diode behavior was previously reported only in BFO crystal and epitaxial thin films. The origin of the ferroelectric switchable diode effect has been related to several factors, such as charge injection and trapping [11, 15], the modulated interface Schottky barrier [12, 13], ionic defects and vacancies [14, 45].

It is highly desirable to discover photovoltaic mechanisms that enable enhanced efficiency of solar cells. Here we report that the bulk photovoltaic effect, which is free from the thermodynamic Shockley-Queisser limit but usually manifested only in noncentrosymmetric (piezoelectric or ferroelectric) materials, can be realized in

any semiconductor, including ...

technologies. Photovoltaics (PV) is considered a most promising renewable energy technology for the coming decades, but substantial improvements are yet required to improve efficiencies and reduce thefabrication costs of present day materials. Despite the rapid increase in the PV performance of ferroelectric based solar cells, substantial

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 ...

Marin Alexe. Department of Physics, University of Warwick, Coventry, CV, 47AL UK. Search for more papers by this author. Jens Kreisel, Jens Kreisel. ... triggered notably by low-bandgap ferroelectrics suitable for sunlight spectrum absorption and original photovoltaic effects. Consequently, power conversion efficiencies up to 8.1% were recently ...

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Most known ferroelectric photovoltaic materials have very wide electronic bandgaps (that is, they absorb only high-energy photons) but here a family of perovskite oxides is described that have ...

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 ($$sim$$ ~ 2.62 eV) and an indirect gap ($$sim$$ ~ 1.63 eV) ...

The bulk photovoltaic effect (BPVE) 1,2,3,4,5 in ferroelectric materials has been intensively investigated because of properties such as above bandgap photovoltage generation or the possibility of ...

Recently, the anomalous photovoltaic (PV) effect in BiFeO3 (BFO) thin films, which resulted in open circuit voltages (Voc) considerably larger than the band gap of the material, has generated a revival of the entire field of photoferroelectrics. Here, via temperature-dependent PV studies, we prove that the bulk photovoltaic (BPV) effect, which has been studied in the past ...