

Photovoltaic effect magnetic field





Overview

How do magnetic fields affect the photovoltaic process?

Magnetic fields applied to solar cells, can influence different aspects of the photovoltaic process that include, magnetic field-assisted charge separation, magnetic nanostructures for light trapping, and magnetic field-induced quantum effects, among others.

Do magnetic fields affect quantum properties of photovoltaic materials?

Furthermore, influence of magnetic fields on the quantum properties of photovoltaic materials such as magnetoexcitons, magnetoexciton-polaritons, and magnetic field-induced quantum confined Stark effect (QCSE) in which electron-hole pair separation happens to manipulate the electronic and optical properties.

How can optoelectronics contribute to spin photovoltaic effects?

In optoelectronics, the generation and control of spins can open up emerging opportunities for spin-optoelectronics, enabling the exploration of new spin photovoltaic effects and spin photocurrents. In various magnetic heterostructures, spin photovoltaic effects can be realized by different mechanisms.

Does a magnetic field affect organic solar cells?

Previous studies of the effect that a magnetic field has in organic solar cells are based on long time (μ s) OPV dynamic models, with mostly negative magnetic field effects in photocurrent generation 11, 30.

How are spin photovoltaic effects realized?

In various magnetic heterostructures, spin photovoltaic effects can be realized by different mechanisms. For instance, a spin voltage arises from spin-dependent excitation at the interface of a nonmagnetic metal in close proximity to a magnetic insulator (2).



What is the underlying mechanism of bulk photovoltaic effect?

The underlying mechanism is elucidated from the quantum metric dipole distribution in the reciprocal space. The ease of the fabrication and manipulation of MSFEs guarantee practical optoelectronic applications.

Keywords: bulk photovoltaic effect, symmetry constraints, magnetic sliding ferroelectrics, $k \cdot p$



Photovoltaic effect magnetic field

Magnetophotocurrent in Organic Bulk Heterojunction Photovoltaic ...



The authors show that at low temperature and high magnetic field, thermal spin polarization is the chief source of magnetophotocurrent in organic photovoltaic cells. They find that longer-lived charge-transfer excitons substantially increase magnetoconductance, and their clear explanation of the mechanisms for the high-field effects provides hints for device architecture. ...

Suppression of photovoltaic effect by magnetic field in Pr_{0.65}(CaO)

Suppression of photovoltaic effect by magnetic field in Pr_{0.65}(Ca_{0.75}Sr_{0.25})_{0.35}MnO₃/Nb:SrTiO₃ heterostructure C. Luo,¹ K. X. Jin,^{1,a} C. L. Chen,¹ and T. Wu² ¹Shaanxi Key Laboratory of Condensed Matter Structures and Properties and Key Laboratory of Space



Enhanced bulk photovoltaic effect in two-dimensional

While magnetism, hyperferroelectricity, and topological phases in the two-dimensional limit have been widely explored, the direct experimental study on bulk photovoltaic ...



Magnetic bulk photovoltaic effect as a probe of magnetic ...

Different from the photovoltaic effect in a p-n junction, the direct current generated in noncentrosymmetric homogeneous crystals



comes from the second-order optical ...



Magnetic field enhancement of organic photovoltaic cells

The impact of a magnetic field is to intensify the generation of charge transfer states with triplet character via inter-system crossing. As the ground state of the system has singlet



Magnetic field-driven lateral photovoltaic effect in the Fe/SiO₂/p-Si

First, let us discuss the dependence of the LPE on wavelength λ of the optical radiation inducing the effect and the spectral dependence of the LPE sensitivity to magnetic field H . Fig. 2 a shows the LPV dependences on λ for the Fe/SiO₂/p-Si structure, which were measured between contacts 1 and 4 on the Si side V_{14} (?) and between contacts 2 and 3 on ...



Magnetic bulk photovoltaic effect: Strong and weak field

Moreover, the behavior of BPVE under strong magnetic field is still unexplored. In this Letter, using a minimal two-dimensional tight-binding model, we carry out a systematic ...





[PDF] Spin photovoltaic effect in magnetic van der Waals

DOI: 10.1126/sciadv.abg8094 Corpus ID: 231986578 Spin photovoltaic effect in magnetic van der Waals heterostructures @article{Song2021SpinPE, title={Spin photovoltaic effect in magnetic van der Waals heterostructures}, author={Tiancheng Song and Eric Anderson and Matisse Wei-Yuan Tu and Kyle L. Seyler and Takashi Taniguchi and Kenji Watanabe and ...



Progress in Magnetic Field Effects in Organic Photovoltaic Cell

Keywords: Organic Photovoltaic Cell; Magnetic Field Effects; Singlet; Triplet ?????????????????* ??? 1,? ?,???? 1 ?????????????????(??),?? 2 ?????????????????(??),????????????????

Efficacy of magnetic field on performance of photovoltaic solar ...

In this article, photovoltaic (PV) unit has been combined with new cooling technique to ameliorate the efficiency. The operate fluid was mixed with nano-powder (Fe 3 O 4) and vertical magnetic field has been imposed. These techniques can augment the cooling rate

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Tailoring Bulk Photovoltaic Effects in Magnetic Sliding ...

The bulk photovoltaic effect that is intimately associated with crystalline symmetry has been extensively studied in various nonmagnetic materials, especially ferroelectrics with a ...



Magnetophotocurrent in Organic Bulk Heterojunction Photovoltaic ...

The authors show that at low temperature and high magnetic field, thermal spin polarization is the chief source of magnetophotocurrent in organic photovoltaic cells. They find ...



Photovoltaic Effect

The photoelectro-magnetic (PEM) effect, which is also called the photomagneto-electric (PME) or the magneto-photovoltaic (MPV) effect, was originally discovered in cuprous oxide by Kikoin and Noskov in 1934 213 and later studied by many investigators. 91, .

Magnetic Bulk Photovoltaic Effect: Strong and Weak Field

Request PDF , Magnetic Bulk Photovoltaic Effect: Strong and Weak Field , Shift current and ballistic current have been proposed to explain the bulk photovoltaic effect (BPVE), and there have been

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Photovoltaic efficiency enhancement via magnetism

Magnetic fields applied to solar cells, can influence different aspects of the photovoltaic process that include, magnetic field-assisted charge separation, magnetic nanostructures for light trapping, and magnetic field-induced quantum effects, among others.

Spin photovoltaic effects in magnetic van der Waals heterostructures

as a function of external magnetic field (μH) measured from the four-layer (4L Song T. et al, Spin photovoltaic effect in magnetic van der Waals heterostructures, Science Advances (2021)



Switchable magnetic bulk photovoltaic effect in the two

The bulk photovoltaic effect (BPVE) rectifies light into the dc current in a single-phase material and attracts the interest to design high-efficiency solar cells beyond the pn ...

Photovoltaic Effect of Atomtronics Induced by an Artificial Gauge Field

We investigate the photovoltaic effect of atomtronics induced by an artificial gauge field in four optical potentials. Under an effective magnetic flux, the atom occupation probability would be polarized in a double-dot system, which gives rise to an atomic current. The relation between the atomic current and magnetic flux behaves like the current-phase property ...



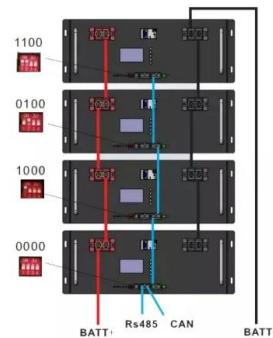


Magnetic field modulation effect on photoelectric effect and its

Fig. 2 (a) shows the magnetic hysteresis loop of the BFNO/n-Si heterojunction at 300 K. In the magnetic field range of -8000 to 8000 Oe, the magnetic moment is affected by the magnetic field modulation and produces swift unidirectional response. Pure BiFeO₃ presents antiferromagnetic character at room temperature [34], [35], [36].

Title: Spin Photovoltaic Effect in Magnetic van der Waals ...

breaking. Here, we report spin photovoltaic effects in vdW heterostructures of atomically thin magnet chromium triiodide (CrI₃) sandwiched by graphene contacts. In the absence of a magnetic field, the photocurrent displays a distinct dependence on light helicity



Hall-Bulk photovoltaic effect in BiFeO₃/SrTiO₃ at low

In order to quantify the effect of the magnetic field on the BPV currents, we add the magnetic field dependence of the BPV current amplitude and angle into Eqs. 1 and 2. The expressions of BPV

Short-lived charge-transfer excitons in organic photovoltaic cells

The external magnetic field effect on the singlet sensitized photolysis of dibenzoyl peroxide. Chem. Phys. Lett. 41, 267-269 (1976). Article CAS





Magnetic bulk photovoltaic effect: Strong and weak field

The bulk photovoltaic effect (BPVE) refers to the DC current generation from uniform light illumination in a homogeneous material lacking inversion symmetry, in contrast to ...

Photovoltaic efficiency enhancement via magnetism

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Effect of magnetic field on the photovoltaic properties of YBa

The obvious photovoltaic effect ($V_{oc} \sim 30 \mu V$) induced by purple-laser illumination at high T_c superconductor $YBa_2Cu_3O_{6.96}/Ag$ (YBCO/Ag) heterojunction has been observed, revealing that there ...

Magnetic field-driven lateral photovoltaic effect in the $Fe/SiO_2/p-Si$...

We demonstrate that the lateral photovoltaic effect in the $Fe/SiO_2/p-Si$ structure not only strongly depends on the optical radiation wavelength and temperature, but is also sensitive





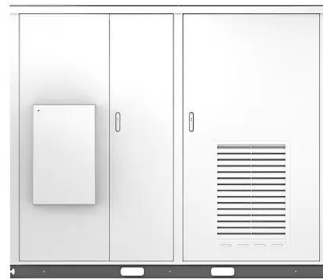
[Phys. Rev. B 109, 064407 \(2024\)](#)

Inspired by recent advancements in the bulk photovoltaic effect which can extend beyond the independent-particle approximation (IPA), this study delves into the influence of collective spin dynamics in an antiferromagnet on photocurrent generation using a time domain calculation. In the linear and photocurrent conductivity spectra, we observe peaks below the ...

Improving solar control of magnetism in ternary organic photovoltaic

The growing demand for storage space has promoted in-depth research on magnetic performance regulation in an energy-saving way. Recently, we developed a solar control of magnetism, allowing the magnetic moment to be manipulated by sunlight instead of the magnetic field, current, or laser. Here, binary and ternary photoactive systems with different ...

Solar

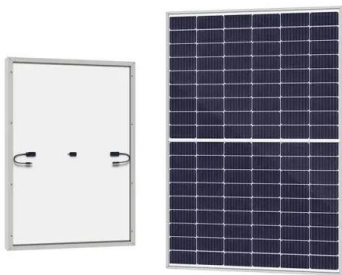
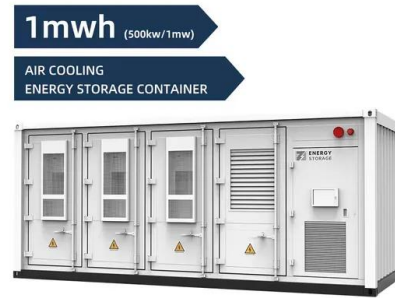


Enhancing ferroelectric photovoltaic effect by polar order

The discovery of photovoltaic effect in ferroelectric materials can be traced back to more than 50 years ago (1 Magnetic field modulation effect on photoelectric effect and its explanation in BiFe_{0.9}Ni_{0.1}O₃/n-Si multiferroic heterojunction, Results in Physics, 58,

Magnetic bulk photovoltaic effect: Strong and weak field

The bulk photovoltaic effect (BPVE) rectifies light into the dc current in a single-phase material and attracts the interest to design high-efficiency solar cells beyond the pn junction



Size-dependent magnetic tuning of lateral photovoltaic effect in

In this article, we report a magnetic tuning lateral photovoltaic effect (LPE) in a nonmagnetic Si-based Schottky junctions. In the magnetic field intensity range of 0 to 1.6 T, the

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