



Solar Photovoltaic Heterostructures

Perovskites exhibiting various outstanding properties such as suitable bandgap, large absorption coefficient, good intrinsic carrier mobility etc. are one of the immensely studied class of ...

Abstract. First-principles calculations are performed to explore the geometry, bonding, and electronic structures of six ultrathin photovoltaic heterostructures consisting of pristine and B- or N-doped ...

2D Janus MoSSe/MoGeSiN 4 vdW heterostructures for photovoltaic and photocatalysis applications. Author links open overlay panel Qian-Kui Zhang a, Wen-Hui Zhao a, Zhong-Peng Zhou a, Lie-Mao Cao a, ... Photocatalysis technology [1] and solar cell technology [2], [3] have become two promising methods to produce clean and renewable ...

Among the ZnO-based heterostructures, most utilize Cu₂O as the first heterostructure layer. Cu₂O is an abundant and easily produced material (Ievskaya et al., 2015) that has been used as the p-type layer and owns a bandgap of 2 eV and a 23% theoretical efficiency limit (Rohle et al., 2012) general, the Cu₂O acts as the absorber ...

Janus monolayers, realized by breaking the vertical structural symmetry of two-dimensional (2D) materials, pave the way for a new era of high-quality and high-performance atomically-thin vertical p-n heterojunction solar cells. Herein, employing first-principles computations, Janus group-III chalcogenide mon

The breakthroughs in designing heterostructures offer advanced frontier to versatile electronic and optoelectronic technology where TMDs based heterojunctions are widely discussed due to fascinating properties. Even, MoSTe/WSTe lateral heterostructure (HS) toward solar cell applications and negative differential resistance (NDR) based ...

MX₂/ZrXO van der Waals heterostructures are excellent photovoltaic candidates with a maximum achieved power conversion efficiency of above 22%. ... high absorption efficiency which is good for the ...

The schematic of hybrid solar cells structured with FTO/CdS/Ag₂S/P3HT/Au is shown in Fig. 6 (a). The resulting photovoltaic region has an active area of 0.4 × 1.0 cm² (defined by the Au electrode area). The corresponding energy level of the above photovoltaic device is plotted in Fig. 6 (b).

Absorption in van der Waals heterostructures solar cells. Photovoltaic systems approaching the Shockley-Queisser limit have two prerequisites: a) at an open circuit, every absorbed above-bandgap photon is extracted as an emitted photon at the band-edge of the material. b) at a short circuit, the device must have an external ...

The isolated 2D monolayer can be stacked into arbitrary van der Waals (vdWs) heterostructures without the need to consider lattice matching. Several combinations of 2D/3D and 2D/2D materials have been assembled



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to create vdWs heterojunctions for photovoltaic (PV) and photoelectrochemical (PEC) energy conversion.

Recently, lateral heterostructures based on two-dimensional (2D) materials have provided new opportunities for the development of photovoltaic nanodevices.

the recent progress on photovoltaic solar cells of these 2D materials and their heterostructures with different device configurations. The p-n junction solar cells of vertical and lateral configuration devices are discussed in detail based on their stacking using mechanical transfer method or fabricated using CVD technique.

1. Introduction. As an environmentally friendly energy utilization program, solar photovoltaic power generation has made a great contribution to solving the world's energy shortage problem. 1 Currently, the main obstacle to the use of solar energy is the lack of photovoltaic materials with high conversion efficiency from sunlight to electricity. ...

The bulk photovoltaic effect (BPVE) originating from spontaneous charge polarizations can reach high conversion efficiency exceeding the Shockley-Queisser limit. ... heterostructures provide the ...

Two-dimensional layered materials (2DLMs) have been a central focus of materials research since the discovery of graphene just over a decade ago. Each layer in 2DLMs consists of a covalently bonded, dangling-bond-free lattice and is weakly bound to neighbouring layers by van der Waals interactions. This makes it feasible to isolate, mix ...

Solar photovoltaics provides a practical and sustainable solution to the increasing global energy demand. Using first-principles calculations, we investigate the energetics and electronic properties of two-dimensional lateral heterostructures by group-III monochalcogenides and explore their potential applications in photovoltaics. The band ...

Mixed 2D and 3D perovskite heterostructures have stood out among the various perovskite structure types as potential high-performance solar cell ...

2D vdW heterostructures for an efficient HC solar cell. Furthermore, we highlight the challenges and opportunities involved in successfully utilizing HCs in practical solar cells with efficiencies

Here, we reviewed the recent progress on photovoltaic solar cells of these 2D materials and their heterostructures with different device configurations. The p ...

Heterostructures based on atomically thin semiconductors are considered a promising emerging technology for the realization of ultrathin and ultralight photovoltaic solar cells on flexible substrates.

P-n photovoltaic junctions are essential building blocks for optoelectronic devices for energy conversion. However, this photovoltaic efficiency has almost reached its theoretical limit. Here, a brand-new excitonic



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photovoltaic effect in 2D CsPbBr₃/CdS heterostructures is revealed. These heterostructures, synthesized by epitaxial growth, ...

Engineering ferroelectric-nanonet-based heterostructures enables superior photovoltaic effect and asymmetric switchability. Author links open overlay panel Shujie Sun a, Dongxiao Yang a ... with the help of photovoltaic (PV) devices or solar cells, has undoubtedly proven to be a promising approach to tackle currently increasing energy ...

The structural, electronic, and optical properties of heterostructures formed by transition metal dichalcogenides MX₂ (M = Mo, W; X = S, Se) and graphene-like zinc oxide (ZnO) were investigated ...

Request PDF | Two-Dimensional Layered Semiconductor/Graphene Heterostructures for Solar Photovoltaic Applications | Schottky barriers formed by graphene (monolayer, bilayer, and multilayer) on 2D ...

DFT investigation of the electronic and optical properties of hexagonal MX₂/ZrXO (M = W, Mo and X = S, Se) van der Waals heterostructures for photovoltaic solar cell application

The van der Waals heterostructure of Janus materials with a TMD monolayer was used to create a two-dimensional class of nanomaterials for photovoltaic solar cell applications. It is one of the potential methods for enhancing the performance of photovoltaic systems. Two monolayers of different 2D materials, Janus (Z

Heterostructures for Photovoltaic and Photoelectrochemical Solar. Energy Conversion. ... such as photovoltaic solar cells 10, 11, photodetectors 12,13, and light-emitting diodes 14 . However, the ...

A single-junction heterostructure based on transition metal chalcogenides has been modeled using a solar cell capacitance simulator (SCAPS) to explore non-toxic materials for solar cell applications. The performance parameters of the proposed AZO/ZrS₂/MoS₂ heterojunction have been analyzed by varying the thickness of each ...

Recently, lateral heterostructures based on two-dimensional (2D) materials have provided new opportunities for the development of photovoltaic nanodevices. In this work, we propose a novel lateral SnSe/GeTe ...

Two more heterostructures were prepared by varying the melamine amount (4 g, 6 g). These heterostructures were named ZnO/g-CN-2 and ZnO/g-CN-3. The schematic diagram of the synthesis process is ... Examination of the effect of selected factors on the photovoltaic response of dye-sensitized solar cells. Energy Fuels, 34 ...

Recently, lateral heterostructures based on two-dimensional (2D) materials have provided new opportunities for the development of photovoltaic nanodevices. In this work, we propose a novel lateral SnSe/GeTe heterostructure (LHS) with high photovoltaic performance and systematically investigate the structural



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