Nanostructured photocathodes for infrared photodetectors and photovoltaics

Are nanostructures suitable for wide-band photodetectors?
In such a way, we discussed the most recent developments on IR detectors using InAs and PbS quantum dot nanostructures. Overall, this review gives clear view on the development of suitable device architecture under prominent nanostructures to tune the photodetector performance from UV to IR spectral regions for wide-band photodetectors.

Can inorganic nanostructures be used for infrared photodetection?
This article reviews the state-of-the-art research of low-dimensional inorganic nanostructures and their application for infrared photodetection. Thanks to nano-structuring,a narrow bandgap,hybrid systems,surface-plasmon resonance,and doping,many common semiconductors have the potential to be used for infrared detection.

Why are nanostructured materials attracting interest in photodetectors?
The nanostructured materials and architectures are attracting extensive interests in photodetectors in view of the potential benefits from confined light-matter interaction, fast carrier dynamics and ultrahigh photoconductive gains.

What are the different types of nanowire-based infrared photodetectors?
The current research of nanowire-based infrared photodetectors can be mainly divided into three categories: single nanowire, [7, 43, 64] ensemble (random) nanowire, [65 - 67] and ensemble (ordered) nanowire array [6, 26, 27] based photodetectors.

Can nanostructured plasmonic metamaterials be used for infrared photodetection?
The recent achievements in exploring nanostructured plasmonic metamaterials for the intriguing subwavelength photon confinement and waveguides in devices are also surveyed considering their importance in device integration. An outlook of infrared photodetection is given in the end as a guideline for this vigorous field.

Are infrared photodetectors based on quantum wells?
This review concentrates on the photodetection in the infrared spectrum and recent progresses in constructing advanced infrared photodetectors based on quantum wells, dots, and the rapidly evolving 1D and 2D materials are summarized.

Nanostructured Photocathodes for Infrared Photodetectors and Photovoltaics. The Journal of Physical Chemistry C 2015, 119 (4) ... High performing air stable inverted perovskite solar cells using nanostructured CuSCN thin film as hole transport material. Solar Energy Materials and Solar Cells 2021, 231, 111116.

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Transparent nanostructured photocathodes with beneficial energy level alignment with small bandgap semiconductors can widen the material choices for IR photoelectrodes. Herein we ...

Near infrared light organic photodetectors have attracted tremendous attention due to their tailorable response, ease of processing, compatibility with flexible substrate, room temperature operation and broad applications such as remote sensing, health monitoring, artificial vision, night vision, and so on. ...

Request PDF | Recent advances in development of nanostructured photodetectors from ultraviolet to infrared region: A review | Herein, we aim to evaluate the photodetector performance of various ...

Nanostructured photocathodes for infrared photodetectors and photovoltaics. Ronen Gertman, Adi Harush, Iris Visoly-Fisher. Department of Chemistry; The Swiss Institute for Dryland Environmental and Energy Research; Ben-Gurion University of the Negev. Research output: Contribution to journal > Article > peer-review.

A negative electron affinity photocathode based on GaAs nanopillar-array (NPA) Mie-type resonators is demonstrated and significant quantum efficiency enhancement is observed. Nanophotonic resonance assisted photoelectron emission into vacuum is investigated, indicating an enhanced density of optical states due to increased light concentration and ...

The visible photodetectors can be used in biological sensing, video imaging, and convert communications [4,5,6,7]. Infrared photodetectors can be used as infrared night vision. [8,9,10] The THz photodetectors can be used in the security detection of customs, airports, and other special occasions [11,12,13]. Therefore, the further research of ...

Photocathodes are key elements in high-brightness electron sources and ubiquitous in the operation of large-scale accelerators, although their operation is often limited by their quantum efficiency and lifetime. Here, we propose to overcome these limitations by utilizing direct-laser nanostructuring techniques on copper substrates, improving their efficiency and robustness for ...

Benefiting from a high quantum efficiency, low thermal emittance, and large absorption coefficient, InxGa1-xAs is an excellent group III-V compound for negative electron affinity (NEA) photocathodes. As the emission layer, InxGa1-xAs, where x = 0.15, has the optimal performance for detection in the near-infrared (NIR) region. Herein, an NEA In0.15Ga0.85As ...

Sittingizing conjugated polymers with infrared-active nanocrystal quantum dots provides a spectrally tunable means of accessing the infrared while maintaining the advantageous properties of polymers, and makes use of the wavelength tunability afforded by the nanocrystals to show photocurrent spectra tailored to three different

regions of the infrared spectrum. In ...

In this section, we discuss the device fabrication, array design, working mechanism and current progress of III-V nanowire array-based infrared photodetectors based on a variety ...

Transparent nanostructured photocathodes with beneficial energy level alignment with small bandgap semiconductors can widen the material choices for IR photoelectrodes. ...

The flexible switching between the three modes makes the heterostructure a potential candidate for next-generation photodetectors from visible to longwave infrared ...

This study investigates the impact of proton irradiation on perovskite devices fabricated fully through vacuum deposition. Exposure to irradiation induces changes in both electrical and optical ...

1. Introduction. Photocathodes can emit photoelectrons due to the photoelectric effect, which has been extensively applied in electronic sources [], photodetectors [], photocatalytic fuel cells [], and sensors [].Negative electron affinity (NEA) photocathodes exhibit super electron emission under light illumination owing to the fact that the photoelectrons can diffuse to the surface and reach ...

Room-temperature (RT) high-performance mid-wavelength infrared (MWIR) Lead Selenide (PbSe)/Cadmium Selenide (CdSe) heterostructure nanocrystal photoconductors are designed and fabricated on commercial silicon dioxide on silicon (SiO 2 /Si) wafer via vapor phase deposition. Tunable absorption edges at 3.75 and 4.0 mm are demonstrated with different ...

solar cells, where light absorption enhancement has been ... nanowire photodetectors, Appl. Phys. A 122, 1003 ... Recent studies on nanostructured photocathodes have shown 2 -3 times improvement ...

Photocathodes are key elements in high-brightness electron sources and ubiquitous in the operation of large-scale accelerators, although their operation is often limited by their quantum efficiency and lifetime. Here, we propose to overcome these limitations by utilizing direct-laser nanostructuring techniques on copper substrates, improving their efficiency and ...

This review provides the complete insight on the research progress of photodetectors based on nanostructured metal sulfide films, which are classified into three categories such as ultraviolet (UV), visible, and infrared (IR) photodetectors. Initially, the fundamentals of photodetectors with various figures of merit are discussed.

The nanostructured III-nitride strategy provides a route towards realistic room temperature intermediate band solar cells while leveraging the cost benefits of silicon substrates.

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The development of CNT-based photodetectors goes a long way since the first CNT photoconductor [7].Numerous materials synthesis methods and device optimization collectively contribute to improve performance of the fabricated photodetectors [8, 9].Typically, high-quality CNT networks and aligned arrays with the semiconducting purity of 99.9999 % ...

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And state-of-the-art PCEs of over 16% have been achieved with single-junction solar cells based on Y6 and its derivatives. 34, 47-51 Besides, semitransparent polymer solar cells based on PM6:Y6 with PCE of over 12% and AVT of over 18% have also been demonstrated. 52 Lee et al prepared low-bandgap small molecules COTIC-4F and SiOTIC-4F that are ...

Infrared photodetectors are finding widespread applications in telecommunication, motion detection, chemical sensing, thermal imaging and bio-medical imaging, etc. The nanostructured materials and architectures are attracting extensive interests in photodetectors in view of the potential benefits from confined light-matter interaction, fast carrier dynamics and ...

Nanostructured Photocathodes for Infrared Photodetectors and Photovoltaics. The Journal of Physical Chemistry C 2015, 119 (4), 1683-1689. DOI: 10.1021/jp510484n. Yuki Tsuda, Kyota Uda, Misaki Chiba, He Sun, Lina Sun, Matthew Schuette White, ...

Nanostructured Materials and Architectures for Advanced ... in developing infrared photodetectors.[4,5] In this period, Hg ... photovoltaic type photodetectors could be feasibly constructed