



Flexible quantum dot solar cells

A groundbreaking research breakthrough in solar energy has propelled the development of the world's most efficient quantum dot (QD) solar cell, marking a significant leap towards the ...

Gao, J. et al. Quantum dot size dependent J-V characteristics in heterojunction ZnO/PbS quantum dot solar cells. *Nano Lett.* 11, 1002-1008 (2011). Article CAS Google Scholar

Uniform zinc oxide (ZnO) nanosheet arrays were grown on woven titanium wires using a low temperature hydrothermal method. Photoanodes were prepared by depositing CdS and CdSe quantum dots onto the ZnO nanosheet arrays by a successive ionic layer adsorption and reaction (SILAR) method. Solar cells were assembled and reported flexible quantum dot solar cells. Moreover, we affirmed that flexible CsPbI₃-PQD solar cells, utilizing the proposed ETL, maintained excellent mechanical performance by retaining 94% ...

ARTICLE Flexible and efficient perovskite quantum dot solar cells via hybrid interfacial architecture Long Hu^{1,2,3}, Qian Zhao^{4,5}, Shujuan Huang³, Jianghui Zheng^{6,7}, Xinwei Guan¹, Robert Patterson⁶, Jiyun Kim¹, Lei Shi⁶, Chun-Ho Lin¹, Qi Lei¹, Dewei Chu¹, Wan Tao¹, Soshan Cheong⁸, Richard D. Tilley⁸, Anita W. Y. Ho-Baillie^{6,7}, Joseph M. Luther⁵, Jianyu ...

Thin-film InAs/GaAs quantum dot (QD) solar cells on mechanically flexible plastic films are fabricated. A 4.1-mm-thick compound semiconductor photovoltaic layer grown on a GaAs substrate is transferred onto a plastic film through a low-temperature bonding technique. We also fabricate thin-film InAs/GaAs quantum dot solar cells on Si substrates, as alternative low-cost, ...

Effective management of the insulating ligands is prerequisite for achieving good electrical coupling between colloidal quantum dots (CQDs) and, thus, high-performance solar cells. Here, we developed a rationally designed post-synthetic process for effective control of ligand density on organic-inorganic hybrid formamidinium lead triiodide (FAPbI₃) perovskite ...

Perovskite quantum dots (PQDs) have shown remarkable potential for application in optoelectronic devices, such as photodetectors^{1,2}, light-emitting diodes^{3,4}, and solar cells⁵⁻⁷, ...

As an emerging photovoltaic device, quantum dots sensitized solar cell (QDSSC) has great potential due to tunable band width, wet-chemical synthesis, ... The UV-Vis absorption spectra of CdS/CdSe quantum dots on ...

Di-n-propylamine solution in methyl acetate as an efficient solid-state treatment for CsPbI₃ perovskite quantum dot (PQD) solar cells is successfully demonstrated, and a record power ...

Carbon nanotube/metal-sulfide composite flexible electrodes for high-performance quantum dot-sensitized



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solar cells and supercapacitors

A flexible quantum dot-sensitized solar cell based on ZnO nanorods with a length of 2 μm with a maximum power conversion efficiency of ~1% is achieved for the flexible QDSSC. We report on a flexible quantum dot-sensitized solar cell (QDSSC) based on ZnO nanorods with a length of 2 μm. Due to the good coverage of CdSe QDs on ZnO by the electrophoretic ...

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Lightweight and flexible solar cells are highly interesting materials for use in new applications, such as spacecraft, aircraft and personal pack load. PbS colloidal quantum dots (CQDs) exhibit a broad and strong light absorption spectrum covering the ultraviolet-visible-near infrared region, allowing for in

In spite of significant research and development, leading to flexible and wearable solar panels, second-generation solar cells constitute less than 5 % of the total solar cell market. ... [35], quantum dot sensitized solar cell systems [36], and tandem solar cells [37] are included in the third generation. A specific category ...

Colloidal quantum dot (CQD) solar cells have high potential for realizing an efficient and lightweight energy supply for flexible or wearable ...

Ultra-lightweight and flexible solar cells are desired for many potential applications, such as self-powered aviation, wearable electronics, and the Internet of things. PbS quantum dots (QDs) are good candidates for this purpose due to their low-cost and low-temperature processing.

As such, rigid and flexible PQDSCs present champion PCEs of 15.1% and 12.3%, respectively. To diminish surface defects, Zhang and his group introduced a "surface matrix curing" ... [85, 97] In the context of conventional quantum dot solar cells, designing core-shell structure, for example, ...

With the rapid development in information, communication, energy, medical care, and other fields, the demand for light, strong, flexible, and stable materials continues to grow. Carbon nanotube (CNT) films possess outstanding properties, such as flexibility, good tensile properties, low density, and high electrical conductivity, making them promising ...

The incorporation of nitrogen heteroatoms into carbon lattices leading to nitrogen-doped mesoporous carbon (N-MC) materials with superior catalytic activity when used as CEs in Zn-Cu-In-Se QDSCs showed the best photovoltaic performance and a new PCE record for quantum dot based solar cells.

@article{Aouni2024PerformanceEO, title={Performance enhancement of Flexible quantum dot solar cells via establishing efficient band alignment and high interface electric field}, author={Qoteyba Aouni and Souhil



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Kouda and Ziyad Younsi and Hichem Bencherif and Pierre Gerard Darel Kond Ngue and Khalid Mujasam Batoo and Muhammad Farzik Ijaz and ...

In this regard, we present highly transparent and conducting CuS-nanosheet (NS) networks with an optimized sheet resistance (R_s) as low as $50 \text{ } \Omega \text{ } \text{sq}^{-1}$ at 85% transmittance as a counter electrode (CE) for flexible quantum-dot solar cells (QDSCs). The CuS NS network electrode exhibits remarkable mechanical flexibility under bending tests ...

The electron transport layer (ETL) is a critical component in perovskite quantum dot (PQD) solar cells, significantly impacting their photovoltaic performance and stability. Low-temperature ETL deposition methods are especially desirable for fabricating flexible solar cells on polymer substrates. Herein, we propose a room-temperature-processed tin oxide (SnO_2) ETL ...

Flexible, Stable, and Efficient Counter Electrode for Quantum-Dot-Sensitized Solar Cells Based on Carbon Nanotube Films ACS Appl Mater Interfaces . 2024 Jun 26. doi: 10.1021/acsami.4c06961.

Several types of solar cells have been investigated, including dye-sensitized solar cells (DSSCs), thin-film solar cells, organic solar cells, and quantum dot solar cells. The fast-growing field of solar cells is now largely focused on third-generation solar cells, which is currently a significant active area of research and development.

Among them, quantum dots-sensitized solar cells (QDSSCs) are considered to be one kind of the low-cost solar cells, which encompass devices whose maximum conversion efficiency is above the 32% limit for single junction converters in AM 1.5 sunlight. ... Conventional solar cells with inflexible substrates are limited in many unique commercial ...

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Colloidal quantum dots are a promising candidate material for solar energy generation because of their band gap tunability and solution-based processing flexibility. However, conventional colloidal quantum dot solar cell fabrication techniques are still limited by their lack of scalability, environment conditions, and difficult installation scenarios. Here, we develop spray-casting ...

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