

Table of Contents. 1. Engineering colloidal quantum dots: synthesis, surface chemistry and self-assembly Maryna I. Bodnarchuk and Maksym Kovalenko 2. Aqueous based colloidal quantum dots for optoelectronics Nikolai Gaponik and Vladimir Lesnyak 3. Electronic structure and optical transitions in colloidal semiconductor nanocrystals Todd D. Krauss and Jeffrey J. Peterson 4.

Rapid advances have brought colloidal quantum dot photovoltaic solar power conversion efficiencies of 6% in the latest reports. These achievements represent important first steps toward commercially compelling performance. Here we review advances in device architecture and materials science.

Colloidal semiconductor nanocrystals have generated tremendous interest because of their solution processability and robust tunability. Among such nanocrystals, the colloidal quantum dot (CQD) draws the most attention for its well-known quantum size effects. In the last decade, applications of CQDs have been booming in electronics and optoelectronics, ...

Semiconducting colloidal quantum dots (QDs) have garnered great attention for photovoltaics owing to their unique properties, including decoupled crystallization from film deposition, size-tunable ...

A. Kam. Materials Science, Physics. 2018. Solution-processed nanomaterials such as lead sulfide (PbS) colloidal quantum dots (CQDs) combine various manufacturing benefits and facile ...

Among these, colloidal semiconductor quantum dot photovoltaics have the advantage of a spectrally tuneable infrared bandgap, which enables use in multi-junction cells, as well as the benefit of generating and harvesting multiple charge carrier pairs per absorbed photon.

Colloidal quantum dots (CQDs) have attracted attention as a next-generation of photovoltaics (PVs) capable of a tunable band gap and low-cost solution process. Understanding and controlling the surface of CQDs lead to the significant development in the performance of CQD PVs. Here we review recent progress in the realization of low-cost, efficient lead ...

The increasing demand for sustainable and green energy supply spurred the surging research on high-efficiency, low-cost photovoltaics. Colloidal quantum dot solar cell (CQDSC) is a new type of photovoltaic device using lead chalcogenide quantum dot film as absorber materials. It not only has a potential to break the 33% Shockley-Queisser efficiency ...

Suitable postsynthesis surface modification of lead-chalcogenide quantum dots (QDs) is crucial to enable their integration in photovoltaic devices. Here we exploit arenethiolate anions to completely replace pristine oleate ligands on PbS QDs in the solution phase, thus preserving the colloidal stability of QDs and allowing their solution-based processability into ...

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Solar cells based on solution-processed colloidal quantum dots are promising alternatives to conventional devices. This Review discusses recent advances and outstanding challenges for the field of quantum dot solar cells towards their commercialization.

Quantum dots (QDs) have enticed the researchers, due to their unconventional optical and electronic characteristics, contributing potentially for several applications such as biomedical, sensors, and optical and electronic devices. Properties like tunable band gap, multiple exciton generation and photoluminescence make them better suited for energy devices, ...

This review is focused on new concepts and recent progress in the development of three major quantum dot (QD) based optoelectronic devices: photovoltaic cells, photodetectors and LEDs. In each application, we discuss recent champion devices with a range of architectures and discuss in detail the chronologica Recent Review Articles

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Colloidal-quantum-dot photovoltaics using atomic-ligand passivation ... Colloidal-quantum-dot (CQD) optoelectronics offer a compelling combination of solution processing and spectral tunability

Nearly three decades have passed since the pioneering syntheses of CQDs; since then countless innovations in synthesis and processing of quantum dots have led to multi-functional colloidal nanoparticles and nanomaterials, achieved via advanced control over particle size, shape, and composition.

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Although research into colloidal quantum dots has led to promising results for the realization of photovoltaic devices, a better understanding of the robustness and stability of these devices is ...

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Colloidal quantum dots (QDs) have lately been pursued with intense vigor for optoelectronic applications such as photovoltaics (PV), flexible electronics, displays, mid-infrared ...

Solution-processed colloidal quantum dots (CQDs) are promising candidates for optoelectronic applications, including photodetectors [1, 2], photovoltaics [3, 4] and light-emitting diodes [5, 6]. Among these CQDs, PbSe CQDs possess a broad response range (0.3 - 2 eV) [7, 8], large exciton Bohr radius (46 nm) [9, 10], and strong multiple exciton generation (~ 120% ...

It provides a powerful new degree of freedom in CQD optoelectronics. ... Colloidal quantum dot photovoltaics enhanced by perovskite shelling. Nano Lett. 15, 7539-7543 (2015).

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