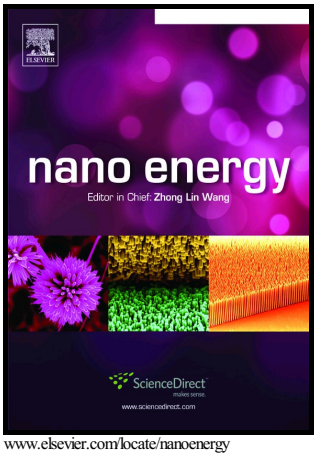

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Abstract:

Colloidal quantum dot (CQD) solar cells are promising devices for solar energy conversion. However, usually the CQD layer in the devices needs to be thin to avoid recombination of the photogenerated charges before reaching the contacts. A microcavity structure with metal layers on both sides on the CQD film gives light interference effects in the CQD layer, which may increase the light absorption in the solar cell. However, such interference effects are not well known for CQD films, and differences compared to solid materials may appear. In this work the interference effects in CQD solar cells with different thicknesses of the CQD layer is investigated and the results are compared to simulations of the electro-optical field in the devices. The results show that the interference effects can be used to enhance the efficiency of the devices and the interference in the microcavity structure is favorable for efficient photocurrent generation also in thin CQD layers. Using the results, solar cells based on thin CQD layers on flexible or glass substrates are prepared and the results are very promising.

Keywords: Quantum Dots, Electro-Optics, Microcavity Structure, Solar Cells, Light Trapping

Colloidal quantum dot (CQD) solar cells have attracted intensively research interest in the past decade owing to their low cost, high stability and low temperature solution processed ability, as well as the possibility of fabricating the solar cells on lightweight