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CdS/CdSe Co-sensitized on Different TiO_2 Morphologies and its Application to Quantum Dot-sensitized Solar Cells (QDSSCs)

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With power conversion efficiency in continuous growth, quantum dot-sensitized solar cells (QDSSCs) are recently under high interest; however there is no such perfect cell yet developed for these devices. As the fundamental model of QDSSCs, the morphology of the TiO_2 photoanode plays an important role in photovoltaic performance. Herein, the TiO_2 films based on nanorods (TiR) and arrays of nanorods having flower blossom-like formations on their surface (FTiR) were synthesized by one- and double-step hydrothermal process, respectively. The CdS and CdSe co-sensitized on TiR and FTiR were deposited by using the successive ion layer absorption and reaction (SILAR) and chemical bath deposition (CBD). To study conversion efficiency, FTiR after CdS/CdSe co-sensitized has shown the improving conversion efficiency (η) compared with TiR photoanode. The efficiencies of CdS/CdSe co-sensitized loading were 0.703% and 0.022% for FTiR and TiR photoanodes, respectively. This study revealed a synergistically beneficial effect (enhanced solar-to-current conversion) of the flower blossom-like formations on the nanorods in CdS/CdSe co-sensitized solar cells.

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