Deposition of ZnS onto Quantum Dot Sensitized Solar Cells as Barrier of Charge Recombination by high Pressure Free Meniscus Coating

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Recently, chemical bath deposition (CBD) and successive ionic layer adsorption and reaction (SILAR) are employed for the deposition Quantum-dot(QD) into TiO_2 matrix. In this work, QDs are deposited by liquid carbon dioxide. Extremely low viscosity and surface tension of l-CO_2 can lead faster diffusion of CO_2 soluble precursor into the mesoporous oxide films. These unique physical properties of l-CO_2 have been utilized in thin film deposition and extended its area. CuS, PbS and CdS were deposited as QDs. As a result, QDs were deposited uniformly in mesoporous titania films. Short circuit current can be increased by uniform QDs. Additionally, for improving efficiency of QDSSC, ZnS were deposited by hFMC as recombination barrier. By ZnS treatment, the IV performance was increased. The structural characteristics, the chemical compositions and the light absorption characteristics of the QDs on the TiO_2 film were investigated using wide-angle XRD, XPS and UV-Vis spectroscopy. HR-TEM was employed for QDs morphology. EPMA and XPS study were investigated for deposition uniformity. Phototovoltaic performance also analized.