

High-pressure free Meniscus Coating of semiconductor nanocrystal CuS, PbS and CdS into nanostructure TiO₂

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Recently, Self-assembled monolayer (SAM) technique, chemical bath deposition (CBD) and successive ionic layer adsorption and reaction are employed for the deposition Quantum-dot (QD) into TiO₂ matrix. In this work, QDs are deposited by liquid carbon dioxide. Extremely low viscosity and surface tension of l-CO₂ can lead faster diffusion of CO₂ soluble precursor into the mesoporous oxide films. These unique physical properties of l-CO₂ have been utilized in thin film deposition and extended its area. CuS, PbS and CdS were deposited as QDs. The structural characteristics, the chemical compositions and the light absorption characteristics of the QDs on the TiO₂ film were investigated using wide-angle X-ray diffractometry (XRD), X-ray photoelectron spectroscopy (XPS) and UV-Vis spectroscopy. High-resolution transmission electron microscopy (HR-TEM) was employed for QDs morphology. EPMA and XPS study were investigated for deposition uniformity. Phototovoltaic performance also analyzed.