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The effect of surface plasmon resonance on the photovoltaic properties of CdS quantum dot sensitized solar cells

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ABSTRACT

Use of surface plasmon resonance effect by the Ag nanoparticles (AgNPs) towards the photo physical properties of CdS quantum dot sensitized TiO₂ based solar cells (QDSSCs) was investigated under the illumination of 100 mW cm⁻² (AM 1.5). Deposition of CdS on TiO₂ electrodes were done by successive ionic layer adsorption and reaction (SILAR) method with ten cycles. Current voltage characteristics of QDSSCs fabricated with optimum amount of AgNPs (0.2 % w/v) in TiO₂ showed ~ 26% increment in the power conversion efficiency from 1.09 to 1.37%. Surface morphological studies of photoanodes were carried out with scanning electron microscopy, high-resolution transition electron microscopy and energy dispersive X-ray measurements (EDX). The existence of spherical shape Ag nanoparticles in TiO₂ with an average particle size of 35 nm was confirmed by EDX analysis. The estimated average size of the TiO₂ and CdS particles appears to be around 40 nm and 4.2 nm respectively.

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