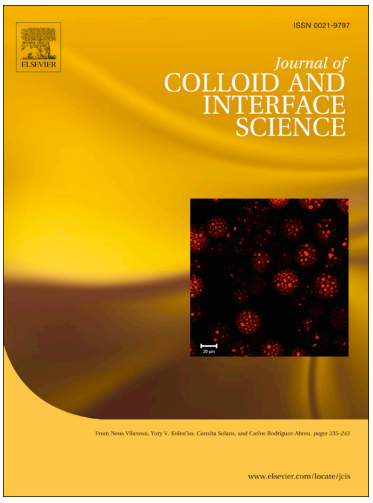

Regular Article

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Enhanced light absorption and charge recombination control in quantum dot sensitized solar cells using tin doped cadmium sulfide quantum dots

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Abstract

The photovoltaic performance of quantum dot sensitized solar cells (QDSSCs) is limited due to charge recombination processes at the photoelectrode/electrolyte interfaces. We analyzed the effect of Sn^{4+} ion incorporation into CdS quantum dots (QDs) deposited onto TiO_2 substrates in terms of enhancing light absorption and retarding electron-hole recombination at the TiO_2/QDs/electrolyte interfaces. Sensitization involved depositing CdS QDs with different Sn^{4+} concentrations on the surface of TiO_2 using a facile and cost-effective successive ionic layer adsorption and reaction (SILAR) method. Optimized photovoltaic performance of Sn-CdS sensitized QDSSCs was explored using CuS counter electrodes (CEs) and a polysulfide electrolyte. Structural and optical studies of the photoanodes revealed that the gaps between CdS nanoparticles were partially filled by Sn^{4+} ions, which enhanced the light absorption of the solar cell device. Electrochemical impedance spectroscopy (EIS) and open circuit voltage decay