

Boosting photovoltaic performance of dye-sensitized solar cells using silver nanoparticle-decorated N,S-co-doped-TiO₂ photoanode

ABSTRACT

A silver nanoparticle-decorated N,S-co-doped TiO₂ nanocomposite was successfully prepared and used as an efficient photoanode in high-performance dye-sensitized solar cells (DSSCs) with N719 dye. The DSSCs assembled with the N,S-TiO₂@Ag-modified photoanode demonstrated an enhanced solar-to-electrical energy conversion efficiency of 8.22%, which was better than that of a DSSC photoanode composed of unmodified TiO₂ (2.57%) under full sunlight illumination (100mWcm⁻², AM 1.5 G). This enhanced efficiency was mainly attributed to the reduced band gap energy, improved interfacial charge transfer, and retarded charge recombination process. The influence of the Ag content on the overall efficiency was also investigated, and the optimum Ag content with N,S-TiO₂ was found to be 20wt%. Because of the enhanced solar energy conversion efficiency of the N,S-TiO₂@Ag nanocomposite, it should be considered as a potential photoanode for high-performance DSSCs.

Keyword: Photovoltaic performance; Dye-sensitized solar cells; Silver nanoparticle-decorated N,S-co-doped-TiO₂; Photoanode