Titania@gold plasmonic nanoarchitectures: an ideal photoanode for dye-sensitized solar cells

ABSTRACT

Rapid depletion of fossil fuel leads to increasing energy demand in the near future and it will force us to seek alternative eco-friendly and renewable energy resources. Dye-sensitized solar cells (DSSCs) represent one of the most promising emerging technologies for light-to-electrical energy conversion. Titania is the most widely used photoanode, but its limited performance due to poor interfacial charge transfer and limited optical properties has motivated the quest for modified titania materials to overcome this issue. The emergence of goldï titania nanocomposite materials (Auï TiO2) as a new component to fabricate the DSSCs has opened up new ways to effectively utilize renewable energy sources. This review article mainly focuses on the superior photovoltaic performance of Auï TiO2 nanocomposite materials based photoanode in DSSCs. The review justifies how plasmonic Au influences the visible light absorption, electrons transfer process and solar energy conversion efficiency. Data supporting and confirming the superiority of Au on TiO2 or TiO2 on Au are briefly presented to justify the possibility of electron transfer from dye to conduction band of the TiO2 through Au. This account further highlights the recent developments in these area and points out some specific Auï TiO2 plasmonic nanoarchitectures as photoanode for improved device performance.

Keyword: Plasmonic photoanode; Nanoarchitectures; Dye-sensitized solar cells; Green energy; Renewable energy