Conference Abstract

Facile fabrication of nitrogen-doped Titanium dioxide-based dye-sensitized solar cells

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Abstract

Titanium dioxide (TiO_2) is a commonly used semiconductor in Dye-Sensitized Solar cells (DSSCs) as it is inexpensive, abundant and innocuous to the environment. However, lack of response to the visible light and slow electron mobility limit its performance. Doping TiO_2 with a non-metal such as Nitrogen has been found to improve light absorption in the visible region of the solar spectrum and also enhance the charge transport in the DSSCs[1],[2].This study reports a facile method to fabricate the nitrogen-doped TiO_2 photoanode. A series of nitrogen-doped TiO_2 films were prepared by grinding TiO_2 with various amount of NH_4OH and followed by calcination at 500°C. These films were characterized by X-ray diffraction (XRD) and UV-Visible spectroscopy, which confirmed an increase in particle size and red shift in the spectrum by nitrogen-doping respectively. Finally, the photovoltaic devices were fabricated using N719 dye, $I^-/\ I_3^-$electrolyte and Pt counter electrode and device performance was tested under simulated irradiation of intensity 100 mW/cm^2 with AM 1.5 filter. 20% enhancement in Power Conversion Efficiency (PCE) was observed for the optimized Nitrogen-doped TiO_2 based device compared to the control device. Moreover, doping TiO_2 using Nitrogen enhanced the short circuit current density (J_{SC}) from 11.9 to 13.7 mA/cm^2. The improvement in J_{SC} is attributed to the reduced charge transport resistance which was confirmed by the Electrochemical Impedance Spectroscopy (EIS).

Keywords: Dye sensitized solar cell, Photo anode, Doping, TiO_2

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References

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