Fabrication and Study Nanostructure Deposited Thin Films Heterojunction Solar Cell

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ABSTRACT

In the present paper, nanostructure tin oxide (SnO$_2$) thin films on Si P-type substrates heterojunction solar cell has been made by using a pulsed 532 nm Nd:YAG laser. Deposition of films is achieved at 400 $^\circ$C substrate temperatures. The X-ray diffraction (XRD) results show that the deposited films are crystalline with tetragonal rutile SnO$_2$ structure. The morphology of deposited films were characterized by scanning electron microscope (SEM) and atomic force microscope (AFM), the grain size value (30–50) nm and rms roughness values are (2.8 nm) for thin films deposited at 400$^\circ$C. Photoluminescence PL spectrum showed good light emission in the visible field. The photovoltaic characteristics included short circuit current (J$^{sc}$), open circuit voltage (V$^{oc}$), where the maximum $J^{sc}$ and $V^{oc}$ obtained at AM1 were 14.3 (mA cm$^{-2}$) and 630(mV), respectively. The fill factor (FF) was (0.68). The fabricated cell exhibits good performance with 7% conversion efficiency.

Keywords: Nanostructure SnO$_2$/Si Heterojunction, Solar Cell, Conversion Efficiency