Scan rate effect of titania for hybrid solar cell applications: structural and electrical study

ABSTRACT

The AIP In this research, hybrid solar cell are produce by a combination of organic (Areca Catechu) extraction and Poly (3-hexylthiophene) (P3HT) and inorganic Titanium Dioxide, TiO2 materials. These hybrid solar cells are fabricated accordingly by layered of ITO/TiO2/P3HT/Areca Catechu/Au by using electrochemical method. The deposition of each layered by EIS was different by varied the scan rate of TiO2 deposition which are 0.05, 0.07, 0.09 and 0.11 vs-1 whereas the number of scans of each layers are fixed to 5 numbers of scans. Nanocrystals TiO2 (anatase structured) was prepared by dissolving the TiO2 nanoparticles with acetic acid which acts as capping agent in order to gain TiO2 nanostructures with better-controlled size and shape. Field Emission Scanning Electron Microscope (FESEM) images indicates that the TiO2 nanoparticles size was found to be around 15-34 nm. The XRD patterns indicate that the TiO2 film was highly crystalline and the anatase structure of TiO2 remains unchanged after annealed process took place at 450 °C. Sheet resistivity of the ITO/TiO2/P3HT/Areca Catechu/Au hybrid solar cell are measured in the dark and under different light intensity by using four point probes and power conversion efficiency are measured by using two point probes. In conclusion, the ITO/TiO2/P3HT/Areca Catechu/Au hybrid solar cell with 0.07 v s-1 scan rate produced the highest electrical conductivity and efficiency with 0.278 Scm-1 and 0.021 % respectively.

Keyword: Hybrid solar cells; Nanocrystals titania; Areca catechu; Poly (3-hexylthiophene)