Abstract No: *ASRS 17*

EFFICIENCY IMPROVEMENT OF DYE-SENSITIZED SOLAR CELL BY THE COMPOSITE OF TITANIUM DIOXIDE NANOPARTICLES AND ELECTROSPUN TITANIUM DIOXIDE NANOFIBER

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In general Dye-sensitized solar cell (DSSC) comprises of an electrode P-25 titanium dioxide (TiO_2), sensitized with Ruthenium based Dye fabricated on a transparent substrate Fluorine doped Tin Oxide (FTO) glass, a Pt counter electrode and an electrolyte between the electrodes. This paper presents, the investigation of increment of photoelectric conversion efficiency (PCE) of DSSC by using optimized composite ratio of 5 % TiO_2 electrospun nanofibers with the 95 % of TiO_2 nanoparticles by weight. The two sets of DSSCs of one electrode only with TiO_2 nanoparticles as reference set of cells and the other being the composition of TiO_2 Nanofibers (NFs) with TiO_2 nanoparticles (NPs) and their current I, voltage V and fill factor were measured in order to investigate the photoelectric conversion efficiency. The active area of electrodes were $0.25\ cm^2$. The cells were characterized by current density-voltage (J–V) characteristic, under the solar simulator light of $1000\ W\ m^{-2}$. As a result, PCE of the reference DSSC with pristine TiO_2 nanoparticles electrode was 5.045 %, though the photoelectric conversion efficiency of DSSC with an innovative electrode of 5 % of TiO_2 nanofibers with 95 % of TiO_2 nanoparticles were 6.948 %, thus PCE enhanced by 37.72 % for 5 % of TiO_2 nanofibers and 95 % TiO_2 nanoparticles composition. Hence the high PCE of the DSSCs by the increased short-circuit photocurrent by enhanced light harvesting caused by the TiO_2 nanofibers given that plenty of dye absorption for light harvesting as well as clever tracks for electrolyte contact.

Keywords*: Dye-sensitized solar cells, Electrospin, Light harvesting, Photoelectric conversion efficiency, TiO_2 Nanoparticles and Nanofibers*.

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