515/E1

Electrophoretically deposited TiO_2 nanotubes for dye sensitized solar cells

P R Chandrasekara[1] and J Akilavasan[2*]

[1]*Uva Wellassa University*
[2]*Institute of Fundamental Studies*

In dye sensitized solar cells (DSSCs), charge recombination is one of the major factors that reduces cell performance by reducing short circuit current. Random nature of the TiO_2 nanocrystalline particle network results in charge carriers to recombine as they travel through the surface of the nanocrystalline network reducing cell performance. In order to overcome this problem, TiO_2 nanotubes can be fabricated into DSSC as they provide a straight pathway to electron transport. In this investigation, TiO_2 nanotubes were synthesized via hydrothermal treatment of TiO_2 nanoparticles (P25, Degussa). 2 g of Degussawere hydrothermally treated with 10 M NaOH (aq) in a Teflon lined autoclave at 150 ^{0}C for 48 hours. The final product was washed with 0.1 M HCl and distilled water repeatedly until pH reaches the critical value of 8.5. The working electrode for DSSC based on TiO_2 nanotubes was prepared by electrophoretic deposition of nanotube suspension prepared by ultra sonicating the precipitate for 60minutes. Electrophoretic deposition was carried out at an optimized voltage of 40 V and time for 7 minutes at room temperature followed by sintering at 450 ^{0}C for 30minutes. Working Electrode was sensitized with (N3) dye by dipping the electrode into a dye solution containing 0.3 m*Mcis*-Ru L2 $(SCN)_2$ (L=2, 2'-bipyridyl-4, 4'-dicarboxylic acid) for 12 hours. Finally, DSSC based on TiO_2 nanotubes was assembled using Pt as counter electrode and iodine/triiodine redox couple as electrolyte. An open circuit voltage (*Voc*) of 750 mV and short circuit current density (*Jsc*) of 3.8 mA/cm^2 was observed under standard AM 1.5 G solar irradiation.

akilavasan@gmail.com Tel : 0770497749