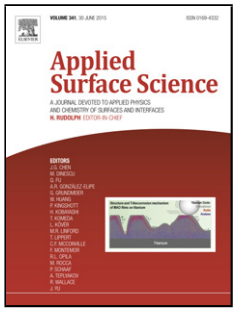

Title: Fabrication of highly electro catalytic active layer of multi walled carbon nanotube/enzyme for Pt-free dye sensitized solar cells

Author: Alvira Ayoub Arbab Kyung Chul Sun Iftikhar Ali Sahito Muhammad Bilal Qadir Sung Hoon Jeong

PII: S0169-4332(15)01065-X
DOI: http://dx.doi.org/doi:10.1016/j.apsusc.2015.04.199
Reference: APSUSC 30292

To appear in: *APSUSC*

Received date: 28-1-2015
Revised date: 25-4-2015
Accepted date: 27-4-2015

Please cite this article as: A.A. Arbab, K.C. Sun, I.A. Sahito, M.B. Qadir, S.H. Jeong, Fabrication of highly electro catalytic active layer of multi walled carbon nanotube/enzyme for Pt-free dye sensitized solar cells, *Applied Surface Science* (2015), http://dx.doi.org/10.1016/j.apsusc.2015.04.199

Fabrication of highly electro catalytic active layer of multi walled carbon nanotube /enzyme for Pt-free dye sensitized solar cells

Alvira Ayoub Arbab[a], Kyung Chul Sun[b], Iftikhar Ali Sahito[a], Muhammad Bilal Qadir[a], Sung Hoon Jeong*[a]

alvira_arbab@yahoo.com, hytec@hanyang.ac.kr, iftikhar.sahito@faculty.muet.edu.pk, bilal_ntu81@hotmail.com, shjeong@hanyang.ac.kr*

Phone: +821032090498*(corresponding author)

[a] Department of Organic and Nano Engineering, Hanyang University, Seoul 133-791, Korea
[b]Department of Fuel cells and hydrogen technology, Hanyang University, Seoul 133-791, Korea

Abstract

Highly dispersed conductive suspensions of multi walled carbon nanotubes (MWCNT) can have intrinsic electrical and electrochemical characteristics, which make them useful candidate for platinum (Pt)-free, dye sensitized solar cells (DSSCs). High energy conversion efficiency of 7.5% is demonstrated in DSSCs, based on enzyme dispersed MWCNT (E-MWCNT) layer deposited on fluorine doped tin oxide (FTO) glass. The E-MWCNT layer shows a pivotal role as platform to reduce large amount of iodide species via electro catalytically active layer, fabricated by facile tape casting under air drying technique. The E-MWCNT layer with large surface area, high mechanical adhesion, and good interconnectivity is derived from an appropriate enzyme dispersion, which provides not only enhanced interaction sites for the electrolyte/counter electrode interface but also improved electron transport mechanism. The surface morphology and structural characterization were investigated using field emission-scanning electron microscopy (FE-SEM), transmission electron microscopy (TEM), x-ray photoelectron spectroscopy (XPS), Ramen spectroscopy and electronic microscopy techniques. Electro catalytic activity (ECA) and electrochemical properties of E-MWCNT counter electrode (CE) were investigated using cyclic voltammetry (CV), and electrochemical impedance spectroscopy (EIS) measurements. The high power conversion efficiency (PCE) of E-MWCNT CE is associated with the low charge transfer resistance (R_{CT} =1.39 Ω cm^2) and