P-189

Characteristics of dye-sensitized solar cells using heat treated multi-walled CNT counter electrode

문준희, 황숙현, 이수경, 김금채, 김도현, 이동윤*, 전민현†

인제대학교 나노공학부, 매뉴팩쳐링 연구소; *한국전기연구원, 광전기연구그룹

(mjeon@inje.ac.kr†)

Studies on dye-sensitized solar cells have been intensively carried out until now. We recently reported the electrochemical properties using carbon nanotubes (CNTs) grown on p-type Si substrate as the counter electrode. In order to measure the electrochemical properties and energy conversion efficiency of the CNT electrode itself, we prepare the CNTs paste on F-doped SnO2 (FTO) glass using CNTs powder, de-ionized water and CMC (Carboxyl Methyl Cellulous). CNTs are synthesized by thermal chemical vapor deposition at 900 ℃ and iron nanoparticles are used as catalysts for growing multi-walled CNTs. In order to improve redox reaction, the rapid thermal annealing (RTA) treatments on the CNTs are carried out at the growth temperature. In the result of electrochemical properties, the total resistivity of CNTs on the FTO substrate is much lower than that of CNTs on Si substrate at the interface and also, the response time of reaction is faster. In case of FTO substrate, we can observe only a single semi circle in nyquist plot. We can evaluate electrochemical properties of CNT electrode itself and it is measure that the FTO sample demonstrates over 60 % of the fill factor (FF) and higher 3% of the energy conversion efficiency.

Keywords: dye-sensitized solar cell, RTA, carbon nanotubes, counter electrode

P-190

Comparative analysis of multi-walled CNT based electrodes as counter electrodes in dye-sensitized solar cells employing

김금채, 황숙현, 문준희, 이수경, 이동윤*, 김도현, 전민현†

인제대학교 나노공학부 나노매뉴팩쳐링 센터; *한국 전기 연구원, 광전기 연구 그룹

(mjeon1@inje.ac.kr†)

Dye-sensitized solar cells(DSSCs) is of great interest as one of renewable energy sources. So far, many investigations related to TiO2 electrode, dye, electrolyte etc. were carried out. In recent years, carbon structures with many advantages have been studied as a new counter electrode materials replacing metal counter electrode. We prepare multi-walled carbon nanotubes (MWNTs) with different diameter as counter electrode material of DSSCs. MWNTs on p-type Si substrate are grown by thermal chemical vapor deposition (CVD) method. Iron nanoparticles are used as catalysts for growing MWNTs. In this electrochemical cell, MWNTs electrode is a working electrode and Pt plate is a counter and reference electrode. The structural properties of MWNTs are investigated by field-emission scanning electron microscopy (FE-SEM). Electrochemical properties of MWNTs are measured by electrochemical impedance spectroscopy (EIS) and energy conversion efficiencies of DSSCs are measured under solar simulator. Based on the results of I-V properties of DSSCs, MWNTs electrode with the larger diameter has shown the higher open circuit voltage and the short circuit current.

Keywords: Carbon nanotube, dye-sensitized solar cell, electrode, impedance, energy conversion efficiencies