Fabrication and Electrochemical Study of Novel Photoanodes for Dye-Sensitized Solar Cells

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ABSTRACT

This study divided into two parts, the first part to look at a variety of (LiI, NaI, KI) and Propylene carbonate (PC) ,3-Methoxypropiontrile (MPN) and the colloidal gel polymer (polyacrylonitrile, PAN) the composition of the electrolyte system to cyclic voltammetry (cyclic voltammogram, CV) and AC impedance method (AC Impedance), etc. Characteristics of electrochemical; as a dye-sensitized solar cells (Dye-Sensitized Solar Cell, DSSC) electrolyte systems, measurement of its Photoelectric conversion efficiency on a variety of electrolyte systems for the photovoltaic characteristics of the impact of components.

The second part of this study was primarily aimed at the working electrode, in order to spin a good TiO2 coating solution will be allocated to the ITO coated glass as working electrode after sintering, and with different thickness, to observe the heterogeneous structure of the photoelectric conversion efficiency. Electrolytes are ELM-026 (0.26 M LiI +0.05 M I2 + MPN), EKM-034 (0.34 M KI +0.01 M I2 + MPN) to observe the performance of its IV.

The results showed that TiO2 film with the working electrode is directly proportional to the number of spin-coating, and when the working electrode thickness reached at 9.1 μm (six), with the best of the photoelectric conversion efficiency, when it increased again when the electrode thickness, light no further increase in power conversion efficiency, but slightly short-circuit current Jsc. Electrochemical analysis shows: MPN solvent system, its Jlim size NaI> LiI> KI, solvent PC system, the size of its Jlim for LiI> NaI> KI. Solvent PC / EC = 3:2, the ionic conductivity of up to 8.22 × 10-2 S / m.

Based on the above conclusions, the best known of these study process parameters: TiO2 film thickness 9.1 μm, electrolyte is ELM-026, may be the largest photovoltaic conversion efficiency, η = 6.74%. The structure of TCO/P25-TiO2 (9.1 μm), PV test results are as follows; VOC = 0.740V, JSC = 14.11 mA/cm2, FF = 0.56, η = 5.93%; the structure of TCO / Sol-Gel TiO2 under layer / P25-TiO2 (9.1 μm), PV test results are as follows; VOC = 0.723V, JSC = 15.01 mA/cm2, FF = 0.57, η = 6.14%; the structure of TCO/SnO2 / Sol-Gel TiO2 under layer / P25-TiO2 (9.1 μm), PV test results are as follows; VOC = 0.75V, JSC = 15.22 mA/cm2, FF = 0.58, η = 6.74%.

Keywords : Dye-Sensitized Solar Cell、cyclic voltammogram、AC Impedance、Polymer gel electrolyte

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