SOLID STATE DYE SENSITIZED SOLAR CELLS BASED ON NATURAL DYE

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Dye-sensitized nanoporous TiO_2 solar cell is a promising system for cost-efficient solar energy conversion application. In these solar cells, Ruthenium-based dye molecules, adsorbed on the surface of a sintered nanoporous TiO_2 film, are used to absorb visible light and to inject electrons into the conduction band of the TiO_2. 2,2',7,7'-tetrakis-(N,N-di-4-methoxy phenylamino)-9,9'-spirobifluorene (spiro-MeOTAD) material is used as a hole transporting material to regenerate the photo-oxidized dye molecule. Platinum coated FTO (Fluorine doped Tin Oxide) glass is used as the top contact of the solar cell. This study focuses on the performance of the natural dye extracted from grape (*Vitis vinifera*) fruit coat in the dye sensitized solar cell. UV-VIS absorbance spectrum of nanocrystalline TiO_2 films coated with Ruthenium-based commercially available dye [*cis*-bis(isothiocyanato)(2,2'-bipyridyl-4,4'-dicarboxylato)(2,2'-bipyridyl-4,4'-dinonyl) ruthenium (II)] and natural dye extracted from grape fruit coat were taken. Absorbance spectrums show a similar characteristics for both dye extracted from grape fruit coat and commercial Z907 dye on the nanoporous TiO_2 film. This may be attributed to the strong interaction between the surface of TiO_2 nanoporous film and the carbonyl and hydroxyl groups of molecule on grape fruit coat extract. Current-voltage measurements of these dye-sensitized solar cells were obtained under simulated ($100mWcm^{-2}$, AM 1.5) solar illumination using a computer controlled source measure unit (Keithley-2400). External quantum efficiency (EQE) spectra were obtained using a calibrated silicon photodiode (Newport). Results obtained show that the natural dye extracted from grape fruit coat gives promising performance compared to the commercial dye in the solar energy conversion process.

Keywords: external quantum efficiency, absorption, illumination, sensitization