INCREASING THE EFFICIENCY OF A DYE-SENSITIZED SOLID-STATE SOLAR CELL BY IODINE ELIMINATION PROCESS IN HOLE CONDUCTOR MATERIAL

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Abstract: Use of silicon in photovoltaics are so popular in these days. Besides the use of silicon, use of Titanium dioxide as the n-type semiconductor material is trending in the emerging dye-sensitized solar cells due to its low cost, nontoxic and easiness in preparation when compared to silicon. Objective of this research is to enhance the efficiency of a dye-sensitized solid state solar cell, fabricated using D-149 and N-719 dyes as the sensitizers and excess iodine eliminated cuprous iodide hole conductor. P-25 Degussa titanium dioxide in a titanium dioxide colloidal suspension was used to deposit the Titanium dioxide thin films with a thickness less than 20 micrometres on fluorine doped tin oxide glasses. Titanium dioxide films were then immersed in a dye solution to make the dye-sensitized solid-state solar cell. Refined copper powder treated cuprous iodide saturated acetonitrile solution was used to deposit the Iodine eliminated Cuprous iodide on to the working electrode. Optimum efficiency of 2.11% was obtained for the dye-sensitized solid-state solar cell fabricated using D-149 dye and 1.6% was obtained for N-719 dye. The highest corresponding solar parameters were shown for the dye-sensitized solid-state solar cell fabricated for D-149 dye and they were as open circuit photovoltage of 475 mV, short circuit current density of 12.7 A cm^{-2}.

Keywords: Iodine; Titanium dioxide; Dye; Solar cells