

# **AN ENHANCEMENT OF EFFECIENCY OF SOLID- STATE DYE-SENSITIZED SOLAR CELL BY COUPLING TWO METAL CENTERED DYES**

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## Abstract

After nearly decade of extensively investigate on dye – sensitized photo electro chemical solar cells based on the nano structured semiconductor films, the dye-sensitized solar cells have begun to receive considerable attention as the promising system for conversion energy. However, solid-state solar cells aroused much attention due to capability of usage in electronic devices than dye sensitized solar cells with liquid electrolyte. Several types of organic dyes, natural pigments, various types of hole-conductors have been used by aiming uplift of performance of the n-semiconductor|dye|p-semiconductor (NDP) cells.

The main objective of this work was to enhance the photo performance of the solid state Dye sensitized solar cells by coupling two metal centered dyes. In there used the ruthenium( $\square$ ) polypyridyl complexes. those are cis-bis(isothiocyanato)-bis(2,2'-bipyridyl-4,4'-dicarboxylato)ruthenium(II) (N719) and triscarboxy-ruthenium terpyridine [Ru(4,4',4''-(COOH)<sub>3</sub>-terpy)(NCS)<sub>3</sub>] (Black dye) as the metal centered dyes.

Experiments were carried out by changing the cell configuration according to the dye immersing sequence. TiO<sub>2</sub> semiconductor was used as the anode of the cell and the CuI was used as the hole collector or the p type semiconductor. In there mainly got the results for the cell configurations that having CuI|N719|TiO<sub>2</sub>, CuI|Black dye|TiO<sub>2</sub>, CuI|Black|N719|TiO<sub>2</sub> and CuI|N719|Black|TiO<sub>2</sub>. I-V characteristics data of Open Circuit Voltage  $V_{oc}$ , Short-circuit current  $I_{sc}$  and the Fill Factor FF, were determined and UV-VIS-NIR spectrometer data were obtained for the each cell configuration and dyes, dye mixtures that used.

In this work, maximum power conversion efficiency of 4.98 % was obtained for solar cell with the configuration of CuI|N719|Black|TiO<sub>2</sub> by coupling of two metal centered dyes on TiO<sub>2</sub> electrodes. The enhancement of photo-performances of the cell was explained by acceleration of an extra electron flow toward the TiO<sub>2</sub> electrode. But it was observed that the configuration that having CuI|Black|N719|TiO<sub>2</sub> shows the low photo-performance than the cell configuration of CuI|N719|Black|TiO<sub>2</sub>.