

**ENHANCEMENT OF THE EFFICIENCY OF A DYE-SENSITIZED
SOLID-STATE SOLAR CELL BY ELIMINATING EXCESS IODINE IN CuI**

A.W.M.V Ekanayake¹, G.R.A Kumara*² and R.M.G Rajapakse*³

Postgraduate Institute of Science, University of Peradeniya, Peradeniya, Sri Lanka¹

Institute of Fundamental Studies, Kandy, Sri Lanka²

Department of Chemistry, University of Peradeniya, Peradeniya, Sri Lanka³

Conversion of solar energy into electricity is commonly succeeded by the p-n junction photovoltaic device designs. Besides the use of silicon in solar cell industry, new trend of using TiO₂ as the n-type semiconductor material is prominent in dye-sensitized solar cells (DSCs) due to its low cost and easiness in preparation when compared to silicon. Intension of this research was to enhance the efficiency of a dye-sensitized solid-state solar cell, which uses the Indoline D-149 dye as the sensitizer, by eliminating the excess iodine dissolved in the CuI saturated Acetonitrile solution. TiO₂ films have been prepared on the Fluorine doped Tin Oxide (FTO) glass substrate with a thickness of <20 μm by the deposition of Degussa P-25 TiO₂ nanoparticles in a TiO₂ colloidal suspension. These TiO₂ films were used to configure the Dye-sensitized solid-state solar cells (DSSC) in the form of FTO/TiO₂/D-149 Dye/CuI (With low Iodine)/Pt/FTO. Removal of excess iodine in the saturated CuI acetonitrile solution was done by adding refined, oxide free Cu powder. The optimum efficiency (η) of 2.11% was obtained for the excess iodine eliminated CuI saturated acetonitrile solution, with a corresponding cell parameters of open circuit photovoltage(V_{oc}) of 475 mV. short circuit current density (J_{sc}) of 12.7 mA cm⁻² and a fill factor (FF) of 35%.

Keywords: semiconductor, dye-sensitized, iodine, TiO₂