

Synthetic Dyes as Photosensitizers for Dye Sensitized Solar Cells: A Comparative Study

H.N.M. Sarangika¹, J.P.I.B.R. Ruveshana¹, M.A.K.L. Dissanayake² and G.K.R. Senadeera³

¹*Department of Physical Sciences and Technology, Sabaragamuwa University of Sri Lanka, Belihul Oya, Sri Lanka*

²*National Institute of Fundamental Studies, Hantana Road, Kandy, Sri Lanka*

³*Department of Physics, The Open University of Sri Lanka, Nawala, Sri Lanka*

The dye is an essential component of the Dye Sensitized Solar Cells (DSSC) and methods to improve the efficiency of DSSCs have been investigated over the last two decades. The most successful synthetic dyes are based on ruthenium complexes. However, ruthenium based compounds are relatively expensive. Finding more economical synthetic organic dyes with comparable characteristics of ruthenium is therefore beneficial. In the present study, six different organic dyes namely 1,10-Phenanthroline, Dimethyl yellow, Bromocresol purple, Alizarin red, Chlorophenol red and Cresol red were selected as sensitizers. Nanostructured TiO₂ films were dipped in ethanolic solutions of each dye for 24 hours and DSSCs were assembled with the configuration of FTO/TiO₂/electrolyte/Pt counter electrode. A liquid electrolyte composed of Tetrapropylammonium iodide (Pr4N⁺I⁻), Iodine (I₂), Ethylene carbonate and acetonitrile with optimized composition was employed as the electrolyte. Conversion efficiency of the fabricated DSSCs was tested under the illumination of 100 mW cm⁻². The highest overall conversion efficiency of 0.421% with 60% of fill factor was obtained for the dye sensitized solar cells sensitized with Alizarin red. Further investigations on structural modifications of Alizarin red will be studied in order to enhance the efficiency of DSSCs.

Keywords: Photosensitizers, Synthetic dyes, Dye sensitized solar cells