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Application and Characterization of Blueberry Fruit Pigment as the Photosensitizer for High Performance and Stable Natural Dye Sensitized Solid Solar Cells

A. Malikaramge ¹, P. Nagarajan ², G. Rjapakse ¹, A. Kumara ³,
Dhayalan Velauthapillai ⁴, P. Ravirajan ⁵

¹Postgraduate Institute of Science, University of Peradeniya, Peradeniya, Sri Lanka.

²PSG College of Technology, Department of Physics & Material Sciences, Coimbatore, India.

³National Institute of Fundamental Studies, Hantana Road, Kandy, Sri Lanka.

⁴Faculty of Science and Engineering, Western Norway University of Applied Sciences, Bergen, Norway

⁵Department of Physics, University of Jaffna, Jaffna, Sri Lanka.

Email: asitha4htc@gmail.com

Abstract

The natural dye pigment of blueberry was extracted from its peels using our own acetonitrile assisted method and used in a liquid electrolyte free natural dye sensitized solid solar cell (NDSSSC) which exhibited the highest efficiency (η) of 1.7% and short circuit current density ($J_{sc} = 11 \text{ mA/cm}^2$) for the blueberry dye sensitized any type of solar cell. Natural dyes are always inexpensive, nontoxic and reliable sources that can be used in photovoltaic application as a cheap alternative for commercial expensive synthetic dyes. The typical problems of stability of natural pigments and the unreliability, expensiveness and the toxicity of the iodide / tri-iodide electrolyte were addressed by introducing a deposition of p-CuI on dye incorporated nanoporous TiO_2 films from a solution containing a crystal growth inhibitor Triethylamine Hydrothiocyanate (THT) by drop casting method in order to make a NDSSSC. I-V characteristics and impedance measurements were carried out to investigate the photovoltaic performance and further characterized by UV-Visible spectroscopy, FTIR spectroscopy and SEM. Stability measurements were carried out for a period of 30 days and promisingly showed a good stability

Keywords: Natural dye, DSSC, Blueberry dye, solid cells, Copper Iodide