

Emerging Materials and Nanotechnology 2020: Application and characterization of blueberry fruit pigment as photosensitizer for high performance and stable natural dye sensitized solid state solar cells

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Abstract

The natural dye pigment of blueberry was extracted from its peels using acetonitrile as solvent. This dye was used in a liquid electrolyte-free, natural dye-sensitized solid solar cell (NDSSSC). Natural dyes are inexpensive, non-toxic and are reliable and readily available sources of dyes. However, the typical problem associated with them is their instability towards iodide/tri-iodide electrolyte. This was addressed by introducing p-CuI as the hole-conductor in place of iodide/tri-iodide electrolyte. The hole conductor was applied on dyed nonporous TiO₂ films from a solution containing a crystal growth inhibitor triethylammonium thiocyanate (THT) using drop-casting method. 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. to achieve a highest efficiency(η) of 1.7% with a short circuit current density (J_{sc}) of 11 mA cm⁻², open circuit voltage (V_{oc}) of 0.30 V and fill factor (ff) of 51.8. These are the highest recorded values so far achieved for such solar cells. Stability measurements were carried out for a period of 30 days and promisingly showed a good stability over the liquid type natural dye sensitised solar.

Biography

Asitha Udayanga Malikaramage holds a B. Sc. Degree in Chemistry and Physics stream from University of Peradeniya, Sri Lanka, and currently he is reading for his M.Phil. Degree attached to the Postgraduate Institute of Science, University of Peradeniya. His research focuses on photon upconversion as a tool to harvest infrared radiation for direct illumination in the dark and to fabricate dye-sensitized solar cells to generate electricity under illumination as well as in the dark and is carried out under the supervision of the co-authors of this abstract. He has one international publication and a several communications at international conferences to his credit and he is currently engaged with student mobility programme between Sri Lanka and NorwayA

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