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Natural photosensitizers for dye sensitized solar cells (Article)

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Abstract

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Dye-sensitized solar cells (DSSCs) were constructed by using the Lawsonia inermis leaves, SumacRhus fruits, and Curcuma longa roots as **natural** sensitizers of anatase-based nanostructure TiO₂ thin film. Paint-coated on ITO conducting glass. The orange-red Lawsonia, red purple anthocyanin and yellow Curcumin are the main components in the **natural** dyes obtained from these **natural** products. A blend of 50 wt% chitosan and 50 wt% polyethylene oxide (PEO) was used as a solid state thin film electrolyte. The polymer blend was complexed with ammonium iodide (NH₄I) and some iodine crystals were added to the polymer-NH₄I solution to provide I⁻/I₃⁻ redox couple. The ionic conductivity of the polymer electrolyte is 1.18x10⁻⁵ S cm⁻¹ at room temperature. Structural and optical properties of the semiconductor thin films were characterized by X-ray diffractometer and UV-VIS spectrophotometer respectively. The XRD shows nanocrystalline structures for TiO₂ thin films (D=13nm). The photovoltaic properties of the cell have been studied and the best overall **solar energy** conversion efficiency of 1.5% was obtained, under AM 1.5 irradiation, with the red purple SumacRhus extract, that showed a reasonable current density (J_{sc} = 0.93 mA/cm²).

Author keywords

DSSCs, Natural photosensitizers, Photovoltaic, Solar energy, Solid state electrolyte

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