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OPTICAL ABSORPTION STUDY OF NATURAL PIGMENTS FOR CO-SENSITIZED SOLAR CELLS

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Abstract

Dye-sensitized solar cells are the third-generation photovoltaic devices with low fabrication cost. Light absorption, charge injection, charge transportation and charge collection are the main process of a dye-sensitized solar cell. In order to enhance the light absorption process, the photoanode can be modified either by modifying the photoanode material or using a suitable dye. In a conventional dye-sensitized solar cell, Ru-based commercially available dyes are used. They show better performance in the solar energy conversion process but they are high-cost materials. In order to reduce the production cost, natural pigments can be used as sensitizers. The performance of the cell can be further improved by using two or more dyes as co-sensitizer materials. In this study, dye pigments have been extracted from water hyacinth, bougainvillea, false daisy, killiseriya, jamun fruit, pomegranate fruit, teak leaf and neem leaf and characterized. In order to enhance the photon absorption, possibility of co-sensitization has been studied. The maximum wavelength corresponding to the optical absorption for each dye and co-sensitized dye were identified for solar cell application. To identify the suitable dye material for TiO_2 based dye-sensitized solar cells, TiO_2/dye electrodes were fabricated and characterized. The mixture of jamun dye and bougainvillea dye (1:1) shows better absorption in the visible region. Similarly, the combinations of pomegranate dye and jamun dye (1:1) also shows better absorption in the visible region. These two co-sensitized dyes can be applied to the dye-sensitized solar cell as co-sensitizers.

Keywords: *dye-sensitized solar cell, absorption, co-sensitization, natural dyes*