Effect of Solvents in the Extraction and Stability of Anthocyanin from the Petals of Caesalpinia pulcherrima for Natural Dye-Sensitized Solar Cell

Authors : N. Prabavathy, R. Balasundaraprabhu, S. Shalini, Dhayalan Velauthapillai, S. Prasanna, N. Muthukumarasamy

Abstract : Dye sensitized solar cell (DSSC) has become a significant research area due to their fundamental and scientific importance in the area of energy conversion. Synthetic dyes as sensitizer in DSSC are efficient and durable but they are costlier, toxic and have the tendency to degrade. Natural sensitizers contain plant pigments such as anthocyanin, carotenoid, flavonoid, and chlorophyll which promote light absorption as well as injection of charges to the conduction band of TiO2 through the sensitizer. But, the efficiency of natural dyes is not up to the mark mainly due to instability of the pigment such as anthocyanin. The stability issues in vitro are mainly due to the effect of solvents on extraction of anthocyanins and their respective pH. Taking this factor into consideration, in the present work, the anthocyanins were extracted from the flower Caesalpinia pulcherrima (C. pulcherrimma) with various solvents and their respective stability and pH values are discussed. The usage of citric acid as solvent to extract anthocyanin has shown good stability than other solvents. It also helps in enhancing the sensitization properties of anthocyanins with Titanium dioxide (TiO2) nanorods. The IPCE spectra show higher photovoltaic performance for dye sensitized TiO2nanorods using citric acid as solvent. The natural DSSC using citric acid as solvent shows a higher efficiency compared to other solvents. Hence citric acid performs to be a safe solvent for natural DSSC in boosting the photovoltaic performance and maintaining the stability of anthocyanins.

Keywords : Caesalpinia pulcherrima, citric acid, dye sensitized solar cells, TiO_2 nanorods
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