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Fabrication of natural dye sensitized solar cells with eastern black nightshade extract

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Energy crisis is one of the biggest challenges for the humans in the world today. Considerable efforts have put by many researchers to tackle this issue. Solar cells represent critical role for extracting energy from the sun which is the most promising natural energy source. The dye-sensitized solar cells (DSSCs) have attracted much attention owing to their simple structure, transparency, flexibility, low production cost, and wide range of application. The function and structure of the dye-sensitized solar cells are based on the sensitization of the wide band gap semiconducting materials which are arranged as a sandwich-liked structure that consists of a photo-sensitized semiconductor formed between an anode and a cathode (an electrolyte). The essential sensitization of wide bandgap semiconductor electrodes is achieved by incorporating dye molecules in its structure. In this study, we focused on the Eastern black nightshade (*Solanum ptycanthum*) natural dye as the sensitizer of TiO₂ photoelectrode. The power conversion efficiency of the Eastern black nightshade dye incorporated solar cells was 0.00616%. It was a clear improvement of the power conversion efficiency of the reference solar cell which was made up with the Grapes dye under the same experimental conditions. The power conversion efficiency of the reference solar cell was 0.00265%. These results reveal that the Eastern black nightshade natural dye has improved the power conversion efficiency of dye-sensitized solar cells compared to those with Grapes dye which is one of the most popular dye among the researches.

Keywords: Natural dye sensitized solar cell, Eastern black nightshade (*Solanum ptycanthum*) and TiO₂