Natural Dye of Red Dragon Fruit (Hylocereus costaricencis) Peel Extract for Dye Sensitized Solar Cells (DSSC) Application

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Solar cell is a device that can convert visible light into electricity through photovoltaic effect. Dye-sensitized solar cell (DSSC) is a type of solar cells. DSSC works based on photo-electrochemical reaction concept as occurred in photosynthesis in green plants. The main component of DSSC is dye, which serves as a sensitizer to absorb sunlight and generate electrons or electric current. In this study, we report the use of natural dyes from red dragon fruit peel extract for the application of dye-sensitizer in DSSC. Red dragon fruit peel was cut and extracted in 96% ethanol at pH 2-3 for 2 hours. Then, the extract was filtered and evaporated at 35°C. Then it was added with additives. The dye extract was characterized using UV-VIS and FT-IR spectrophotometer. The result shows that natural dye extract contained in the skin of red dragon fruit is a betacyanin. DSSC was prepared on Flourine Tin Oxide (FTO) coated glass substrate. First, the substrate was coated with Titanium Dioxide (TiO2) and immersed in the red dragon fruit peel extract for 48 hours. A platinum coated substrate was assembled with dye substrate to form a sandwich-type device. Finally, a solution of KI/I2 electrolytes was injected into the device. The device which using natural dye + acetic acid was illuminated under 500 W/m2 xenon lamp irradiations produced a voltage of 508 mV and an electric current of 0.50 mA, respectively, with an efficiency of 0.13 %. Keywords: solar cell, DSSC, natural dye, red dragon fruit peel, betacyanin.

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