

Kwannapat Sorachoti 2006: Crude Dyes Extracted from Plants and *Monascus* Rice Cultures as Sensitizers in Solid-State Dye-Sensitized Solar Cells. Master of Science (Chemistry), Major Field: Chemistry, Department of Chemistry. Thesis Advisor: Ms. Marisa Arunchaiya, Ph.D. 110 pages.
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Natural dye extracts of roselle, turmeric, *Monascus* red, *Monascus* yellow and mixed dye extracts were employed as sensitizers in dye-sensitized solar cells (DSSCs). The absorption bands of the dye extracts in ethanol were 300-700 (λ_{max} 540 nm), 300-510 (λ_{max} 424 nm), 300-620 (λ_{max} 410 and 500 nm), and 300-550 (λ_{max} 360 nm) nm respectively. The cyclic voltammogram of roselle extract in KNO_3 solution showed quasi-reversible reduction wave at potential of -0.63 V and oxidation wave at potential of -0.31 V with reference to Ag/AgCl electrode while those of other three dyes were not observed. In addition, the cyclic voltammograms of mixed extracts containing roselle in KNO_3 solution showed quasi-reversible reduction and oxidation wave at the same potential of roselle extract. The effect of dye concentration on adsorption amount of dye on TiO_2 film was studied by spectroscopic measurement. DSSCs were fabricated by using composite solid electrolyte consisting of polyethylene oxide filled with titanium dioxide and a redox couple of KI and I_2 . The photocurrent of DSSC obtained from roselle extracted was more effective than DSSCs obtained from other three natural dye extracts and mixed dye extracts. Roselle extract showed highest I_{sc} of 0.94 mA cm^{-2} , V_{oc} of 467 mV, whereas ruthenium complex $\text{RuL}_2(\text{NCS})_2$ (N3) showed I_{sc} and V_{oc} of 1.48 mA cm^{-2} and 677 mV. I_{sc} and V_{oc} of other three extracts were 0.27-0.30 mA cm^{-2} and 417-453 mV and those of mixed extracts containing roselle were 0.50-0.70 mA cm^{-2} and 455-487 mV. The I-V characteristics are consistent with the absorption and electrochemical properties observed. The performance of the assembled solid-state DSSCs on exposing under the sun was studied and I_{sc} and V_{oc} were also recorded with 3000 K illuminator after each day of exposure.

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Thesis Advisor's signature

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