# A Study of the Power Generation Efficiency of Natural Dyes in Daily Life on Dye-Sensitized Solar Cell (DSSC) According to Chemical Structures

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This research aims to produce eco-friendly and economically efficient DSSC that can replace even chemical dyes by using vegetable extracts and household food waste as natural dyes. To find the optimal condition for improving power generation, the TiO2 mortar was covered with conductive glass and carbon coated using a candle. Methylene blue and KI.I2 electrolyte were added to facilitate electron flow, and then an incandescent light bulb was irradiated and the voltage was measured by a multi-tester. With changing various experimental variables, anatase TiO2 and graphite as a photoelectrode material and carbon coated conductive glass showed 86 mV, 184 mV, and 84mV of high voltages, respectively. In experiments with 16 chemical dyes and 10 vegetable extracts, the higher the bluer and darker colors and the higher the content of OH or C=O groups, the higher the power generation efficiency. These results were analyzed to be related to the chemical structure of the materials with good electrical conductivity, surface area, asymmetry, and highly adsorbable functional groups. Under optimal conditions, coffee grounds showed 53mV of the highest voltage among household food waste due to its high light absorption intensity and porosity. Natural dyes with this chemical structure like coffee grounds can be used to construct DSSCs and will be used as renewable energy to contribute to solving climate problems.

**Awards Won:**