# EVALUASI KINERJA SEL SURYA BAHAN ALAM BERBASIS PIGMEN *ACALYPHA SIAMENSIS*: PENGARUH PH

**SKRIPSI**

*Disusun sebagai salah satu syarat untuk memperoleh gelar Sarjana Sains Departemen Pendidikan Fisika Program Studi Fisika Konsentrasi Fisika Material*


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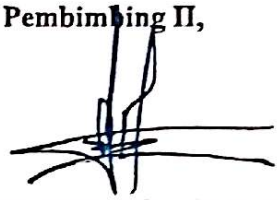

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# EVALUASI KINERJA SEL SURYA BAHAN ALAM BERBASIS PIGMEN *ACALYPHA SIAMENSIS* : PENGARUH PH

**Oleh**

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**Sebuah Skripsi yang diajukan untuk memenuhi salah satu syarat memperoleh gelar Sarjana Sains Program Studi Fisika Departemen Pendidikan Fisika**



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# ABSTRAK

## EVALUASI KINERJA SEL SURYA BAHAN ALAM BERBASIS PIGMEN *ACALYPHA SIAMENSIS* : PENGARUH PH

Oleh

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*Dye-Sensitized Solar Cell* (DSSC) merupakan salah satu jenis sel surya generasi ketiga yang menggunakan *dye* sebagai lapisan pemeka cahaya dan saat ini masih dikembangkan. Biaya produksi yang murah dengan proses yang mudah, ramah lingkungan, tidak beracun, dan ringan merupakan beberapa kelebihan DSSC yang lebih menjanjikan daripada generasi sebelumnya. Penelitian ini bertujuan untuk mengetahui sifat optik dan kinerja DSSC akibat perubahan pH pelarut *natural dye* dari ekstrak daun teh-tehan (*Acalypha Siamensis*). Dalam penelitian ini, keasaman larutan divariasikan dengan pH 1,00, 1,66, 2,27, dan 3,00. *UV-Vis spectroscopy*, *cyclic voltammetry*, dan karakterisasi *J-V* dilakukan untuk mengetahui sifat optik dan kinerja DSSC. Dari penelitian ini, didapatkan gambaran pengaruh kinerja fotosensitizer dari sampel dye (dengan konsentrasi *natural dye* 5% pada larutan) yang diproses dengan pelarut dari berbagai macam variasi pH. Dimana sampel dye dengan pelarut pH 1,00 memiliki *Jsc* 0,119 mA/cm$^2$, *Voc* 0,24 V, *FF* 24,17%, dan *efisiensi* $\eta$ 0,005%. Sampel dye dengan pelarut pH 1,66 memiliki *Jsc* 0.155 mA/cm$^2$, *Voc* 0,24 V, *FF* 47,60%,dan *efisiensi* $\eta$ 0,013%. Sampel dye dengan pelarut pH 2,27 memiliki *Jsc* 0.086 mA/cm$^2$, *Voc* 0,24 V, *FF* 31,10%,dan *efisiensi* $\eta$ 0,005%. Serta sampel *dye* dalam pelarut pH 3,00 memiliki *Jsc* 0,226 mA/cm$^2$, *Voc* 0,24 V, *FF* 78,2%, dan *efisiensi* $\eta$ 0,032%. Berdasarkan penelitian ini dapat disimpulkan bahwa sampel dye dengan pelarut pH 3,00 memiliki kinerja terbaik dibanding ketiga sampel lain dengan pH pelarut yang berbeda, selain itu dari penelitian ini dapat disimpulkan juga bahwa perubahan pH larutan dapat memengaruhi lebar *band gap dye* pada DSSC.

Kata kunci: *Acalypha Siamensis, dye-sensitized solar cell*, pH larutan.

## ABSTRACT

### *EVALUATION OF THE PERFORMANCE OF NATURAL SOLAR CELLS BASED ON ACALYPHA SIAMENSIS PIGMENTS : THE EFFECT OF PH*

By

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*Dye-Sensitized Solar Cells (DSSC) are a type of third-generation solar cell that utilize dyes as light-harvesting layers and are currently under development. They offer advantages such as low production costs, ease of fabrication, environmental friendliness, non-toxicity, and lightweight properties, making them more promising than previous generations. This study aims to investigate the optical properties and performance of DSSCs resulting from variations in the pH of natural dye solvents extracted from the leaves of Acalypha siamensis. In this research, the acidity of the solution was varied with pH levels of 1.00, 1.66, 2.27, and 3.00. UV-Vis spectroscopy, cyclic voltammetry, and J-V characterization were conducted to determine the optical properties and performance of the DSSCs. The study provides an overview of the influence of solvent pH variations on the performance of the photosensitizer derived from the dye samples (with a natural dye concentration of 5% in the solution). The dye sample with a solvent pH of 1.00 exhibited a short-circuit current density (Jsc) of 0.119 mA/cm², an open-circuit voltage (Voc) of 0.24 V, a fill factor (FF) of 24.17%, and an efficiency (η) of 0.005%. The dye sample with a solvent pH of 1.66 showed a Jsc of 0.155 mA/cm², Voc of 0.24 V, FF of 47.60%, and η of 0.013%. The dye sample with a solvent pH of 2.27 had a Jsc of 0.086 mA/cm², Voc of 0.24 V, FF of 31.10%, and η of 0.005%. The dye sample in a solvent with pH 3.00 demonstrated a Jsc of 0.226 mA/cm², Voc of 0.24 V, FF of 78.2%, and η of 0.032%. Based on this study, it can be concluded that the dye sample with a solvent pH of 3.00 exhibited the best performance compared to the other three samples with different solvent pH levels. Additionally, the research indicates that changes in the solution's pH can affect the band gap width of the dye in DSSCs.*



Keywords: *Acalypha Siamensis, dye-sensitized solar cell,* solution pH.

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