PENGARUH pH PENGEKSTRASI DAN KONSENTRASI DAUN BANDOTAN (*Ageratum conyzoides L*) PADA PROSES EKSTRASI TERHADAP SIFAT OPTIK FOTOSENSITIZER DAN KINERJA *DYE-SENSITIZED SOLAR CELL*

SKRIPSI

diajukan untuk memenuhi sebagaian syarat untuk memperoleh gelar Sarjana Sains pada Program Studi Fisika

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FAKULTAS PENDIDIKAN MATEMATIKA ILMU PENGETAHUAN ALAM

UNIVERSITAS PENDIDIKAN INDONESIA

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Pengaruh pH Pengekstrasi dan Konsentrasi Daun Bandotan (*Ageratum conyzoides L*) pada Proses Ekstrasi terhadap Sifat Optik Fotosensitizer dan Kinerja *Dye-Sensitized Solar Cell*

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Sebuah skripsi yang diajukan untuk memenuhi salah satu syarat memperoleh gelar Sarjana Sains pada Fakultas Pendidikan Matematika dan Ilmu Pengetahuan Alam

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PERNYATAAN

Dengan ini saya menyatakan bahwa skripsi dengan judul "Pengaruh pH Pengekstrasi dan Konsentrasi Daun Bandotan (*Ageratum conyzoides L*) pada Proses Ekstrasi terhadap Sifat Optik Fotosensitizer dan Kinerja *Dye-Sensitized Solar Cell*" ini beserta seluruh isinya adalah benar-benar karya saya sendiri. Saya tidak melakukan penjiplakan atau pengutipan dengan cara yang tidak sesuai dengan etika ilmu yang berlaku dalam masyarakat keilmuan. Atas pernyataan ini, saya siap menanggung risiko/sanksi apabila di kemudian hari ditemukan adanya pelanggaran etika keilmuan atau ada klaim dari pihak lain terhadap karya saya ini.

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PENGARUH pH PENGEKSTRASI DAN KONSENTRASI DAUN BANDOTAN (*Ageratum conyzoides L*) PADA PROSES EKSTRASI TERHADAP SIFAT OPTIK FOTOSENSITIZER DAN KINERJA *DYE-SENSITIZED SOLAR CELL*

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ABSTRAK

PENGARUH pH PENGEKSTRASI DAN KONSENTRASI DAUN BANDOTAN (*Ageratum conyzoides L*) PADA PROSES EKSTRASI TERHADAP SIFAT OPTIK FOTOSENSITIZER DAN KINERJA *DYE-SENSITIZED SOLAR CELL*

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Dye-Sensitized Solar Cell (DSSC) adalah salah satu jenis sel surya generasi ketiga yang menggunakan *dye* sebagai lapisan pemeka cahaya dan saat ini masih dalam tahap pengembangan. DSSC menawarkan beberapa keunggulan dibandingkan generasi sebelumnya, seperti biaya produksi yang rendah, proses pembuatan yang sederhana, ramah lingkungan, tidak beracun, dan ringan. Namun, dalam pengembangannya, *dye* alami yang berasal dari bahan-bahan alam menghasilkan efisiensi yang lebih rendah dibandingkan dengan *dye* konvensional seperti N719. Penelitian ini difokuskan pada sifat optik dan kinerja DSSC yang dipengaruhi oleh pH pelarut dan konsentrasi daun bandotan *(Ageratum conyzoides L*). Dalam penelitian ini, pH pelarut divariasikan pada pH 1,00, 1,66, 2,27, dan 3,00. *Dye* dengan pH perlarut yang memiliki efisiensi terbaik kemudian divariasikan konsentrasi menjadi $1{,}25gr/50ml$, $2{,}5gr/50ml$, $3{,}75gr/50ml$, dan $5gr/50ml$. Karakterisasi *Fourier Transform Infrared* (FTIR) digunakan untuk mengidentifikasi pigmen yang terkandung dalam *dye*. *UV-Vis spectroscopy*, *cyclic voltammetry*, dan pengukuran karakteristik *J-V* dilakukan untuk menganalisis sifat optik dan kinerja DSSC. Hasil penelitian menunjukkan bahwa sampel dye dalam pelarut pH 1,00 dengan konsentrasi $2{,}5gr/50ml$ terhadap volume pelarut memiliki kinerja terbaik dengan rata-rata $\overline{J_{sc}}$ 0,197 mA/cm^2, $\overline{V_{OC}}$ 0,525 V, $\overline{FF}$ 58,4%, dan rata rata efisiensi $\bar{\eta}$ sebesar 0,000598%. Penelitian ini juga menunjukkan bahwa perubahan pH pelarut dapat memengaruhi struktur molekul penyusun *dye* dan lebar *band gap*, sementara perubahan konsentrasi larutan dapat memengaruhi kemampuan penyerapan cahaya pada DSSC.

ABSTRACT

EFFECT OF EXTRACTANT pH AND CONCENTRATION OF AGERATUM CONYZOIDES L LEAF ON THE OPTICAL PROPERTIES OF PHOTOSENSITIZERS AND PERFORMANCE OF DYE-SENSITISED SOLAR CELLS

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Dye-Sensitised Solar Cell (DSSC) is a type of third-generation solar cell that uses dye as a light-sensitising layer and is currently still under development. DSSCs offer several advantages over previous generations, such as low production costs, simple manufacturing processes, environmentally friendly, non-toxic, and lightweight. However, in its development, natural dyes derived from natural materials produce lower efficiency compared to conventional dyes such as N719. This study focused on the optical properties and performance of DSSC as affected by variations in solvent pH and leaf weight to solvent volume from bandotan leaves (Ageratum conyzoides L). In this study, the pH of the solvent was varied at pH 1.00, 1.66, 2.27, and 3.00. Dye with solvent pH that has the best efficiency was then varied in concentration to $1{,}25gr/50ml$, $2{,}5gr/50ml$, $3{,}75gr/50ml$, *dan* $5gr/50ml$. *Fourier Transform Infrared (FTIR) characterisation was used to identify the pigments contained in the dye. UV-Vis spectroscopy, cyclic voltammetry, and J-V characteristic measurements were performed to analyse the optical properties and performance of the DSSC. The results showed that the dye sample in pH 1.00 solvent with* $2{,}5gr/50ml$ *concentration had the best performance with an average* $\overline{J_{sc}}$ $0.197\ mA/cm^2$, $\overline{V_{OC}}$ *0.525 V,* $\overline{FF}$ *58.4%, and an average efficiency* $\bar{\eta}$ *0.000598%. This study also shows that changes in solvent pH can affect the molecular structure of dye constituents and band gap width, while changes in solution concentration can affect the light absorption ability of DSSC.*

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