

## INTISARI

### Studi Karakterisasi dan Kinerja Elektrokimia Elektroda SPCE yang Dimodifikasi dengan *Nanofiber PAN/Carbon Dots*

Oleh

Zulfa Nailil Muna  
22/492638/PA/21131

Modifikasi elektroda *Screen-Printed Carbon Electrode* (SPCE) dengan pelapisan menggunakan *nanofiber* berbasis *Polyacrylonitrile* (PAN) yang dikombinasikan dengan *carbon dots* (CDs) telah dilakukan. Proses pembuatan *nanofiber* dilakukan dengan metode *electrospinning* menggunakan larutan PAN yang ditambahkan CDs dengan variasi konsentrasi 1%, 2%, dan 3%. Hasil karakterisasi SEM menunjukkan bahwa *nanofiber* memiliki struktur serat kontinu dengan diameter serat pada rentang 400 nm. Analisis FTIR mengonfirmasi keberadaan gugus fungsi khas PAN serta kontribusi gugus polar dari CDs, yang menandakan keberhasilan inkorporasi CDs ke dalam *nanofiber*. Pengujian sudut kontak menunjukkan peningkatan sifat hidrofilisitas *nanofiber* PAN/CDs. Berdasarkan pengujian *cyclic voltammetry* (CV), elektroda termodifikasi menunjukkan peningkatan performa elektrokimia dibandingkan elektroda bare. Luas permukaan elektrokimia aktif (ECSA) meningkat dari 0,06199 cm<sup>2</sup> pada elektroda bare menjadi 0,06524 cm<sup>2</sup> pada elektroda termodifikasi *nanofiber* PAN. Penambahan CDs ke dalam *nanofiber* PAN secara umum dapat meningkatkan ECSA menjadi 0,06846–0,07422 cm<sup>2</sup>, dengan nilai tertinggi diperoleh pada elektroda PAN/CDs 3%. Peningkatan ECSA ini diikuti oleh kenaikan arus puncak dan penurunan jarak potensial puncak ( $\Delta E_p$ ), yang mengindikasikan peningkatan luas permukaan aktif dan efisiensi transfer elektron pada elektroda termodifikasi.

**Kata kunci:** *Carbon dots, cyclic voltammetry, nanofiber, polyacrylonitrile, SPCE*

## ABSTRACT

### *Characterization and Electrochemical Performance of SPCE Modified with PAN/Carbon Dots Nanofibers*

Oleh

Zulfa Nailil Muna  
22/492638/PA/21131

*Modification of a screen-printed carbon electrode (SPCE) by coating with polyacrylonitrile (PAN)-based nanofibers combined with carbon dots (CDs) was successfully carried out. The nanofibers were fabricated via electrospinning using PAN solutions containing CDs at concentrations of 1%, 2%, and 3%. SEM characterization revealed that the obtained nanofibers exhibited a continuous fibrous structure with an average fiber diameter of approximately 400 nm. FTIR analysis confirmed the presence of characteristic functional groups of PAN as well as polar functional groups originating from CDs, indicating the successful incorporation of CDs into the nanofiber matrix. Water contact angle measurements demonstrated a significant enhancement in the hydrophilicity of PAN/CDs nanofibers. Electrochemical performance evaluated by cyclic voltammetry (CV) showed that the modified electrodes exhibited improved electrochemical behaviour compared to the bare SPCE. The electrochemical active surface area (ECSA) increased from 0.06199 cm<sup>2</sup> for the bare electrode to 0.06524 cm<sup>2</sup> for the PAN nanofiber-modified electrode. The incorporation of CDs further enhanced the ECSA to 0.06846–0.07422 cm<sup>2</sup>, with the highest value obtained for the PAN/CDs 3% modified electrode. This increase in ECSA was accompanied by higher peak currents and a reduced peak-to-peak potential separation ( $\Delta E_p$ ), indicating an enlarged electroactive surface area and more efficient electron transfer at the modified electrode.*

**Keywords:** Carbon dots, cyclic voltammetry, nanofiber, polyacrylonitrile, SPCE