

# Biosensor Amperometrik Berbasis Screen Printed Carbon Electrode Dengan Modifikasi Reduced Graphene Oxide/Polypyrrole/Zinc Oxide untuk Deteksi Dopamin = Amperometric Biosensor Based on Screen Printed Carbon Electrode Modified Reduced Graphene Oxide/Polypyrrole/Zinc Oxide for Dopamine Detection

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## Abstrak

Penyakit Parkinson disebabkan oleh kerusakan neuron penghasil dopamin di batang otak, yang menyebabkan gejala khas seperti tremor, kekakuan otot, dan gangguan keseimbangan. Pembuatan biosensor untuk mendeteksi kadar dopamin menjadi upaya penting dalam deteksi dini dan pengobatan Parkinson. Pada penelitian ini amperometrik biosensor *screen printed carbon electrode* (SPCE) dimodifikasi dengan *reduced graphene oxide* (rGO), *polypyrrole* (PPy), dan *zinc oxide nanoparticle* (ZnO-NP). Hasil modifikasi dibandingkan dengan SPCE yang belum dimodifikasi dalam pendeteksian dopamin. Karakterisasi material dilakukan dengan menggunakan *scanning electron microscope* (SEM), *fourier transform infrared* (FTIR), dan *x-ray diffraction* (XRD). Pengukuran elektrokimia dilakukan dengan metode *cyclic voltammetry* (CV). Hasil penelitian menunjukkan bahwa rGO/PPy/ZnO-NP/SPCE memiliki limit deteksi 0,0464 mM, sensitivitas sebesar 62,37  $\mu\text{A mM}^{-1}\text{cm}^{-2}$  untuk jangkauan linear 0,01 – 1 mM

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Parkinson's disease is caused by damage to dopamine-producing neurons in the brainstem, which causes characteristic symptoms such as tremors, muscle rigidity and balance disturbances. Making a biosensor to detect dopamine levels is an important effort in the early detection and treatment of Parkinson's. In this study the amperometric biosensor *screen printed carbon electrode* (SPCE) was modified with *reduced graphene oxide* (rGO), *polypyrrole* (PPy), and *zinc oxide nanoparticle* (ZnO-NP). Modified results were compared with unmodified SPCE in the detection of dopamine. Material characterization was carried out using a *scanning electron microscope* (SEM), *fourier transform infrared* (FTIR), and *x-ray diffraction*. Electrochemical measurements were carried out using the *cyclic voltammetry* (CV) method. The results showed that rGO/PPy/ZnO-NP/SPCE had a detection limit of 0.0464 mM, a sensitivity of 62.37  $\mu\text{A mM}^{-1}\text{cm}^{-2}$  for a linear range of 0.01 – 1 mM.