Glucose biosensor based on activated carbon - $NiFe_2O_4$ nanoparticles composite modified carbon paste electrode

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Abstract	Carbon-based materials continue to pique the interest of many scientists due to their desirable characteristics such as large surface area, high electrical conductivity, and stability. This study aimed to describe the use of local coconut shell-based activated carbon (AC) to produce carbon paste electrodes used in the development of glucose biosensor. Subsequently, the performance of the carbon paste electrode was enhanced by using NiFe2O4 nanoparticles (NiFe-nps) to improve the electron transfer and redox potential behavior. The results showed that the best carbon paste electrode contains an activated carbon-paraffin oil ratio of 2:0.75b/b, with 8% of NiFe-nps added to the activated carbon. The detection of hydrogen peroxide using an AC-NiFe2O4/CPE electrode showed an oxidation peak at 0.35 V and reduction peak at 0.5 V, with the optimum operational condition using 100 mM phosphate buffer and optimum pH of 7.5. The glucose oxidase enzyme (GOx) was immobilized on the AC-NiFe2O4/CPE electrode for glucose determination, and the modified GOx-AC- NiFe2O4/CPE showed a linear response to detect glucose in both the oxidation (0.12 V) and reduction (-0.4 V) peaks. This analysis was conducted using cyclic voltammetry under optimal conditions. The fabricated glucose biosensor did not reveal any significant difference in detecting glucose in blood samples when compared to the standard method used in the hospital.
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