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A New Non-Enzymatic Amperometric Sensor Based on Nickel Decorated ZIF-8 Derived Carbon Nanoframe for the Glucose Determination in Blood Samples

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The present study demonstrated a highly sensitive non-enzymatic glucose biosensor in real blood samples based on simple evaluated nickel deposited on N-doped porous carbon modified glassy carbon electrode (Ni/NPC/GCE) by applying electrochemical deposition method. The prepared material initially were characterized by cyclic voltammetry, the morphology structure of the as-prepared samples was observed by SEM, and composition, crystals structure of Ni/NPC were identified by SEM mapping and EDS tests. The Ni/NPC/GCE compared with NPC/GCE and NiNPs/GCE performed the best electrocatalytic behavior towards oxidation of glucose in 0.1 M KOH medium. By applied potential of +0.6 V Ni/NPC/GCE showed very high sensitivity of 3753.78 $\mu\text{A}\cdot\text{mM}^{-1}\cdot\text{cm}^{-2}$ in linear range of 1-7940 μM with the correlation coefficient of $R^2=0.995$. The linear ranges get views above the concentration up to 7940 μM with the detection limit of 0.3 μM ($S/N=3$). Amperometric time responses of prepared electrode towards different glucose concentrations are 0.8-1.3s. Finally, several positive characteristics such as very high sensitivity, weak working potential, nice anti-interference properties, long stability, good selectivity, and comparison with some other non-enzymatic sensors Ni/NPC/GCE executed high sensitivity, low detection limit and wide linear range to glucose sensing, thus the selected electrode is supplying for future glucose level determination design.

Keywords: Nickel deposition, N-doped porous carbon, electrodeposition, glucose biosensor

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