Fe₃O₄ Decorated Reduced Graphene Oxide Modified Electrode for Electrochemistry of Hemoglobin and Its Application as Trichloroacetic acid and Nitrite Sensor

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An electrochemical biosensor was designed by using Fe₃O₄@reduced graphene oxide (Fe₃O₄@rGO) composite as the electrode modifier. Hemoglobin (Hb) could achieve direct electron transfer on the modified electrode due to the advantages of Fe₃O₄@rGO such as remarkable conductivity, excellent biocompatibility and big surface area. In addition, this electrochemical biosensor (Nafion/Hb/Fe₃O₄@rGO/CILE) also displayed electrocatalytic performance to different substrates such as trichloroacetic acid (TCA) and sodium nitrite (NaNO₂) with the detection limit as 1.67 mmol/L and 13.33 μmol/L (3σ). The apparent Michaelis-Menten constant (K_M^{app}) were calculated as 33.89 mmol/L and 0.44 mmol/L, respectively. Furthermore, real samples (medical facial peel solution and pickle juice solution) were analyzed by this electrochemical sensor with acceptable recoveries. Therefore, Fe₃O₄@rGO modified electrode was used for the construction of electrochemical sensing device with the ability to accelerate the electron communication of Hb.

Keywords: Fe₃O₄@reduced graphene oxide; Hemoglobin; Direct electron transfer; Electrocatalysis; Electrochemical biosensor

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