Electrochemical Determination of Tyrosine and Nitrite Using CS/CMWNTs/GCE-modified Electrode

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A novel electrode was successfully made by modifying a glassy carbon electrode (GCE) with a chitosan (CS)/carboxylated multi-walled carbon nanotube (CMWNT) composite. The electrochemical behavior of L-tyrosine (L-Tyr) and nitrite (NO_2^-) was investigated using cyclic voltammetry, and the detection conditions of L-Tyr and NO_2^- were explored. The effective area of the CS/CMWNTs/GCE was calculated to be $7.2534 \times 10^{-6} \text{ cm}^2$. The surface area of the electrode membrane surface increased significantly. Accelerating the electron transfer of $\text{K}_3[\text{Fe}(\text{CN})_6]$ is beneficial for the adsorption and enrichment of the measured substance. The results showed that the amperometric response of the sensor reached a maximum when the pH of phosphate-buffered saline (PBS) was 3.6 and 4.7 for L-Tyr and NO_2^- , respectively. The modified electrode could detect L-Tyr and NO_2^- in the linear concentration ranges of 1.0×10^{-8} – 2.0 M and 1.5×10^{-8} – 0.3 M , respectively. The detection limits were $1.6 \times 10^{-9} \text{ M}$ and 2.1×10^{-9} for L-Tyr and NO_2^- , respectively ($\text{S/N} = 3$). These results demonstrate the high stability and reproducibility of detection, obtained using the CS/CMWNTs/GCE. The modified electrode was applied to determine the L-Tyr content of amino acid injections and the NO_2^- content of salted radish.

Keywords: Carboxylated multi-walled carbon nanotubes, chitosan, CS/CMWNTs/GCE, tyrosine, NO_2^-

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