Sensitive Electrochemical Detection of Caffeic Acid using a Carboxyl-Functionalized Reduced Graphene Oxide-Modified Glassy Carbon Electrode (ERGO-COOH/GCE)

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A glassy carbon electrode modified by carboxyl-functionalized reduced graphene oxide (ERGO-COOH/GCE) was developed by electrochemical deposition method. The electrochemical behavior of caffeic acid (CA) on the ERGO-COOH/GCE was studied, and an electroanalytical method for the detection of CA in tablets was established. The effects of the modification parameters, the pH of the buffer solution and the scanning rate on the electrochemical behavior of CA were investigated by cyclic voltammetry (CV). The results revealed that modifying the GCE by electrochemical deposition facilitated a more sensitive response to CA on the modified electrode than modifying it by drop coating. The peak current of CA on the ERGO-COOH/GCE was significantly higher than that on the bare glassy carbon electrode (GCE) over five scan cycles, and the optimized the concentration of GO-COOH, the scanning cycles, and the pH were 4 mg·mL⁻¹, 5 cycles, and 2.0, respectively. The redox reaction of CA on the modified electrode was a quasi-reversible process controlled by adsorption and involved the transfer of two electrons and two protons. The ERGO-COOH/GCE showed a linear response to CA in the range of 0.05 ~ 20 μM with a limit of detection of 8 nM (*S/N*=3). The modified electrode exhibited good repeatability and reproducibility and anti-interference performance. The ERGO-COOH/GCE was applied to the detection of CA in caffeic acid tablets with a recovery of 97.7% ~ 108%.

Keywords: Caffeic acid; electrochemical deposition; ERGO-COOH/GCE; modified electrode; differential pulse voltammetry

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