Sensitive Determination of Anticancer Drug Methotrexate Using Graphite Oxide-Nafion Modified Glassy Carbon Electrode

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doi: 10.20964/2019.04.03

Received: 28 November 2018 / Accepted: 15 January 2019 / Published: 10 March 2019

In this paper, a graphite oxide-Nafion-glassy carbon electrode (GO-Nafion-GCE) by coating method was fabricated and used for study the electrochemical behavior and measurement of methotrexate (MTX) by cycle voltammetry (CV). The influence factors, such as volume of modifier, type of supporting electrolyte, concentration of electrolyte, scan rate, preconcentration time, and preconcentration potential on the anodic peak current of MTX were examined. The experimental results indicated that the electrode process is an adsorption-diffusion mixed controlled process. Under the experimental conditions of research, the anodic peak current of MTX shows a linear relationship within concentration range of 4.0×10^{-7} – 2.0×10^{-5} mol L⁻¹. The linear relationship can be expressed with the equation of $I_{p,a}(\mu A) = (0.4739 \pm 0.0086)C(\mu M) + (0.2885 \pm 0.0434)$. Under the optimum electrochemical experimental conditions, the limit of detection (LOD) can be calculated to be 9.0×10^{-9} mol L⁻¹ (S/N=3). The proposed method has been used for the detection of MTX in methotrexate injection and urine samples successfully.

Keywords: anticancer drug; methotrexate; graphite oxide-Nafion; determination

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