Glassy Carbon Electrodes Modified with Molybdenum Carbide (Mo_xC_y) and Decorated with Multiwalled Carbon Nanotubes for the Simultaneous Determination of Hydroquinone and O-Hydroxyaniline Levels

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A sensitive electrochemical sensor decorated with multiwalled carbon nanotubes and molybdenum carbide (MWCNTs- Mo_xC_y) was successfully developed in this study for the simultaneous detection of hydroquinone (HQ) and o-hydroxyaniline (OHX). The MWCNTs- Mo_xC_y nanomaterials were synthesized by high temperature calcination under nitrogen protection, and the morphologies and elements were characterized and analyzed using a scanning electron microscope (SEM) and energy dispersive spectrometry (EDS), respectively. The MWCNTs- Mo_xC_y composite was ultrasonically dispersed into a modification liquid to construct the modified the glassy carbon electrode, and cyclic voltammetry (CV), differential pulse voltammetry (DPV) and chronocoulometry (CC) were used to study the electrochemical performance. In phosphate buffer solution, the synthetic materials displays good redox peaks for hydroquinone (HQ) and o-hydroxyaniline (OHX). The synthesized composite has a large effective surface area, high electron transfer rate and catalytic activity. Under optimum experimental conditions, the MWCNTs- Mo_xC_y /GCE exhibits linear responses to HQ and OHX in the range of 0.1-900.0 μM and 0.8-20.0 μM , respectively, with a limit of determination ($\text{S/N}=3$) calculated to be 0.075 μM and 0.047 μM , respectively. The method was applied to measure the concentrations of these compounds in real water samples and achieved satisfactory results.

Keywords: Multi-walled carbon nanotube; carbon molybdenum compound; hydroquinone; o-hydroxyaniline, cyclic voltammetry; differential pulse voltammetry

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