Preparation of Samarium Oxide Nanoparticles Decorated Functionalized Multiwall Carbon Nanotubes Modified Electrode for the Electrochemical Determination of Catechol

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Herein, we describe the innovative and simple voltammetric method based on the samarium oxide (Sm_2O_3) decorated functionalized multiwall carbon nanotubes ($\text{Sm}_2\text{O}_3/\text{f-MWCNTs}$) using as an electrode material for the detection of catechol (CC). The as-prepared $\text{Sm}_2\text{O}_3/\text{f-MWCNTs}$ composite was confirmed by using scanning electron microscopy (SEM), energy dispersive X-ray spectroscopy (EDX) and fourier-transform infrared spectroscopy (FT-IR). The electrochemical properties of the $\text{Sm}_2\text{O}_3/\text{f-MWCNTs}$ were investigated by electrochemical impedance spectroscopy (EIS), cyclic voltammetry (CV) and differential pulse voltammetry (DPV). The as-proposed $\text{Sm}_2\text{O}_3/\text{f-MWCNTs}$ modified GCE exhibited an excellent electrocatalytic activity towards oxidation of CC. The electrochemical studies of DPV displays wide linear response range, lower detection limit and well sensitivity of 0.1-1249 μM , 0.03 μM and 0.213 $\mu\text{A}\mu\text{M}^{-1}\text{cm}^{-2}$, respectively. The as-prepared electrochemical sensor had good stability, repeatability and reproducibility for the determination of CC. Besides, the prepared electrode material modified GCE was successfully applied to the real sample analysis in various water samples and the obtained recovery from 94.5 to 99 % is confirm that the $\text{Sm}_2\text{O}_3/\text{f-MWCNTs}/\text{GCE}$ had better practical reliability to the determination of CC.

Keywords: Multiwall carbon nanotubes, Electrochemical sensor, Catechol, Differential pulse voltammetry, Low detection limit.

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