Electrochemical Cysteine Sensor on Novel Ruthenium Based Ternary Catalyst

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At present, a voltammetric L-Cystein (Cys) sensor is developed based on carbon nanotube (CNT) supported Ru-Mo-Pd trimetallic catalyst modified glassy carbon electrodes (GCE). Firstly, Ru-Mo/CNT catalysts are prepared via sodium borohydride reduction method and following this Ru-Mo/CNT modified GCE electrode is prepared and Pd electrodeposition at varying Pd concentrations is performed to obtain Ru-Mo-Pd/CNT catalysts. Ru-Mo-Pd/CNT catalyst is characterized by TEM and SEM-EDX. Characterization results reveal that Ru-Mo-Pd/CNT catalyst is successfully synthesized. For electrochemical measurements, GCE is modified with Ru-Mo-Pd/CNT catalysts and electrochemical behavior of the modified GCE is investigated by cyclic voltammetry, differential pulse voltammetry, electrochemical impedance spectroscopy. Ru-Mo-Pd/CNT at 0.0152 mM Pd concentration modified GCE electrode have the best Cys electrooxidation activity. Hence, further electrochemical measurements to determine sensitivity, limit of detection, interference study, and real sample are performed on Ru-Mo-Pd/CNT at 0.0152 mM Pd concentration modified GCE electrode. This sensor has a wide linear response within the range of 5–200 μM with high current sensitivity 0.136 $\mu\text{A}/\mu\text{M}$ and 0.1 μM as lowest detection limit at (S/N=3) signal to noise ratio. Interference studies reveal that Ru-Mo-Pd/CNT sensor is not affected by common interfering species. This novel study reports a strategy to sense Cys on Ru/CNT modified GCE electrode.

Keywords: Cysteine; Ruthenium; Palladium; Molybdenum; electrochemical; sensor

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