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| Title | Cobalt Oxide Nanorod-Modified GCE as Sensitive Electrodes for Simultaneous Detection of Hydroquinone and Catechol | | |
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| Abstract |  |
| An electrochemical sensor based on a cobalt oxide nanorod (Co3O4NR) modified glassy carbon electrode (GCE) (Co3O4NR-GCE) was prepared for simultaneous and selective determination of hydroquinone (HQ) and catechol (CT). Surface morphology and crystallinity of Co3O4NR were investigated employing field emission scanning electron microscopy (FESEM) and X-ray diffraction (XRD) analysis. The structure (16 nm) of the Co3O4 nanorod was observed in the FESEM image. A sharp peak pattern in the XRD survey revealed the following crystal planes in Co3O4NR material: (111), (220), (311), (222), (400), (422), (511), and (440). Electrochemical characterization of modified Co3O4NR-GCE was carried out performing cyclic voltammetry (CV) and electrochemical impedance spectroscopy (EIS). Selective and simultaneous detection of HQ and CT was carried out by performing CV and differential pulse voltammetry (DPV) analysis. In both studies, modified Co3O4NR-GCE showed well defined oxidation and reduction peaks for HQ and CT with enhanced peak current, and the oxidation peaks for HQ and CT were observed at 0.152 V and 0.254 V, respectively, in the CV analysis. Scan rate and pH variation analysis were performed to evaluate different kinetic parameters, including charge transfer coefficient (α = 0.56 for HQ and 0.66 for CT), heterogeneous charge transfer rate constant (ks = 56 for HQ and 72 for CT), and the number of electrons involved in HQ and CT oxidation. Quantitative analysis of HQ and CT was studied by observing the current response of DPV analysis with respect to concentration variation. Here, the detection limit was calculated as 0.2 µM for HQ with a linear concentration range of 5–200 µM, and 0.4 µM for CT with a linear concentration range of 5–150 µM. The practical applicability of the proposed sensor was investigated using sample solutions prepared in tap water. The reported sensor showed impressive selectivity towards HQ and CT in the presence of common interferents. | |