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Hydrogen Peroxide Electrocatalytic Oxidation Using a Shuttlelike Nano-CuO-Modified Electrode

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Editorial

Hydrothermal synthesis was used to make CuO nanocrystals. Scanning electron microscopy was used to examine the nano-morphology. CuO's to create nano-CuO/GCE modified electrode, the generated shuttlelike CuO nanocrystals were changed to Glass Carbon Electrode (GCE). In a 0.01 M NaOH containing 0.09 M KCl electrolytes, the improved electrode demonstrated good electrocatalytic properties towards hydrogen peroxide. The electrocatalytic response current of this sensor was proportional to the H_2O_2 concentration under ideal testing conditions.

In terms of development, there are a range of methods for detecting hydrogen peroxide, including spectrophotometry, fluorimetry, chromatography, chemiluminescence, and titrimetry. Nanoparticles have been widely used as modification materials in a variety of sectors due to their small size, vast surface area, and other unique features. Manganese dioxide, nickel oxide, zinc oxide, and cobalt oxide are just a few of the Nano metal oxides that have sparked a lot of interest in the analytical community. Nano-CuO has been more popular among these nanoparticles due to their unique features such as high stability and good electrical properties. CuO nanoparticles of varied morphologies, such as nanowire, Nano sheet, nanorod, and nanoflower, have been prepared using a variety of synthetic approaches. The electrochemical behaviour of hydrogen peroxide on a nano-CuO-modified electrode was investigated; yielding a detection limit of 0.22 M. CuO nanoflower film may be made in a single step by chemically oxidising the surface of copper foil under hydrothermal conditions and then employed as the active electrode material in nonenzymatic electrochemical sensors for H_2O_2 detection. CuO nanoflowers electrode's large surface-to-volume ratio and excellent electron transport efficiency have enabled steady and extremely sensitive performance for the nonenzymatic H_2O_2 sensor with a detection limit of 0.167 M. The influence of NaOH concentration and nano-CuO film thickness on anodic peak current was investigated in order to optimize the electrocatalytic response to H2O2 on the nano-CuO/GCE. The concentrations of NaOH and KCl were varied from 0.001 to 0.1 M while keeping the system ion concentration at 0.1 M. The peak current was highest when the NaOH concentration was increased to 0.01 M. Once a result, as the concentration of NaOH was increased, it began to gradually drop. As a result, the supporting electrolyte in this experiment was 0.01 M NaOH containing 0.09 M KCl. It shows the response of the prepared sensor to low-concentration H_2O_2, demonstrating the nano-CuO material's effective catalytic property. The response current was found to be linear with H_2O_2 concentration in the range of 0.02 to 250 M. By absorption, the shuttlelike CuO nanoparticles were fixed onto the electrode's surface, considerably increasing the electrocatalytic active area and clearly promoting electron transfer abilities between H_2O_2 molecules and electrode. The nano-CuO/GCE showed strong activity for H_2O_2 redox, and the manufactured sensor had good stability and reproducibility, making it suitable for application as an amperometric sensor for determining low-concentration H_2O_2 in samples. In real samples, some coexisting electroactive species might affect the sensor response. And so three kinds of potential interferences 100 μM Uric Acid (UA), 100 μM Ascorbic Acid (AA), 100 μM Acetaminophen (AP), were examined. Under the same experimental conditions, a substantial anodic peak of H2O2 was seen

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on nano-CuO/GCE, with a potential of 0.19 V. The cyclic voltammetric experiment was carried out using nano-CuO/GCE in a 0.01 M NaOH +0.09 M KCl solution that did not contain H_2O as a control.