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Flake-like Cu₂O on TiO₂ nanotubes array as an efficient nonenzymatic H₂O₂ biosensor

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Abstract This work provides a new method for fabrication of the flake-like Cu₂O/TNA electrode as a H₂O₂ sensor. The flake-like Cu₂O/TiO₂ nanotubes array (TNA) electrode was successfully constructed by potentiostatic electrodeposition combining subsequent cyclic voltammetry (CV) technology in NaOH solution. The catalytic performance of the sensor was studied in 0.1 M phosphate buffer (PBS, pH=7.4). It was found that the flake-like Cu₂O/TNA electrode displayed a good catalytic performance towards the reduction of H₂O₂ with a response time of 4 s, a wide linear dependence on a concentration of H₂O₂ from 0.5 mM to 8 mM, a good sensitivity of 412.11 $\mu\text{A cm}^{-2}\text{mM}^{-1}$ and a detection limit of 90.5 μM at a working voltage -0.40 V (vs. Hg/Hg₂Cl₂). The electrocatalytic mechanism of the flake-like Cu₂O/TNA electrodes was also proposed.

Keywords: Nonenzymatic sensor; Flake-like morphology; Cu₂O; TiO₂ nanotubes array; Electrocatalysis

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