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Flake-like Cu_2O on TiO_2 nanotubes array as an efficient nonenzymatic H_2O_2 biosensor

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Abstract This work provides a new method for fabrication of the flake-like Cu_2O/TNA electrode as a H_2O_2 sensor. The flake-like Cu_2O/TiO_2 nanotubes array (TNA) electrode was sucessfully 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 Cu_2O/TNA electrode displayed a good catalytic performance towards the reduction of H_2O_2 with a response time of 4 s, a wide linear dependence on a concentration of H_2O_2 from 0.5 mM to 8 mM, a good sensitivity of 412.11 μA $cm^{-2}mM^{-1}$ and a detection limit of 90.5 μM at a working voltage −0.40 V (vs. Hg/Hg_2Cl_2). The electrocatalytic mechanism of the flake-like Cu_2O/TNA electrodes was also proposed.

Keywords: Nonenzymatic sensor; Flake-like morphology; Cu_2O; TiO_2 nanotubes array; Electrocatalysis