Preparation of Manganese Dioxide Nanozyme as Catalyst for Electrochemical Sensing of Hydrogen Peroxide

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The two-dimensional manganese dioxide nanoflakes (MnO₂ NFs) with peroxidase-like activity was synthesized by a biomineralization method using bovine serum albumin (BSA) as a template. After then MnO₂ NFs was hybridized with reduced graphene oxide (rGO) for electrochemical sensing of hydrogen peroxide (H₂O₂). The composition and structure of MnO₂ NFs were characterized by Energy Dispersive X-ray Spectrometer (EDX) and Transmission Electron Microscope (TEM), and the morphology of hybridized material were characterized by Scanning Electron Microscopy (SEM). Electrochemical experiments showed that the hybridized material exhibited good sensing performance toward the reduction of H₂O₂ with broad linear ranges of 20 nM to 5 μM and 5 μM to 800 μM. The limit of detection is 14.92 nM (S/N=3). The good sensing performance is ascribed to the synergistic effects of the special morphology of MnO₂ NFs and good conductivity of the reduced graphene oxide (rGO). The proposed sensor can be used for monitoring the H₂O₂ content in real biological environments with good stability, repeatability and selectivity.

Keywords: MnO₂ NFs, enzyme-like, H₂O₂ sensing, ultrasensitive

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