A redox protein immobilization on Multiporous nanofibers of SnO_2 for improvement of sensing

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Abstract:

A multiporous nanofiber (MPNFs) of SnO2 and chitosan has been used for the immobilization of a redox protein, hemoglobin (Hb), onto the surface of glassy carbon electrode (GCE). The multiporous nanofiber of SnO2 that has very high surface area is synthesized by using electrospinning technique through controlling the tin precursor concentration. Since the constructed MPNFs of SnO2 exposes very high surface area, it increases the efficiency for biomolecule-loading. The morphology of fabricated electrodes is examined by SEM observation and the absorbance spectra of Hb/(MPNFs) of SnO2 are studied by UV-Vis analysis. Cyclic Voltammetry and amperometry are employed to study and optimize the performance of the resulting fabricated electrode. After fabrication of the electrode with the Hb and MPNFs of SnO2, a direct electron transfer between the protein's redox centre and the glassy carbon electrode was established. The modified electrode has showed a couple of redox peak located at -0.29 V and -0.18 V and found to be sensitive to H2O2. The fabricated electrode also exhibited an excellent electrocatalytic activity towards the reduction of H2O2. The catalysis currents increased linearly to the H2O2 concentration in a wide range of 5.0 × 10-6 -1.5 × 10-4 M. Overall experimental results show that MPNFs of SnO2 has a role towards the enhancement of the electroactivity of Hb at the electrode surface. Thus the MPNFs of SnO2 is a very promising candidate for future biosensor applications.

Key Words: multiporous SnO_2 nanofiber, Hemoglobin, Direct electrochemistry, Electrical contact, H_2O_2 sensing