A glassy carbon electrode modified with SnO$_2$ nanofibers, polyaniline and hemoglobin for improved amperometric sensing of hydrogen peroxide

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Abstract The authors describe a glassy carbon electrode (GCE) modified with a multiporous nanofibers prepared from SnO$_2$, polyaniline and hemoglobin, and its application to the amperometric determination of hydrogen peroxide (H$_2$O$_2$). The SnO$_2$ nanofibers were prepared first and then polymerized with polyaniline. Then, the redox protein hemoglobin was co-immobilized with the nanofibers on the surface of the GCE. Chitosan was finally used to improve the stability of the modified GCE. Direct electrochemistry of Hemoglobin at the modified electrode revealed a pair of well-defined redox peaks, with anodic and cathodic peaks at $-0.15$ and $-0.3$ V, respectively. The modified GCE exhibits high catalytic response to hydrogen peroxide. Best operated at $-0.4$ V (vs Ag/AgCl), it displays a linear amperometric response that covers the 2 to 160 $\mu$M H$_2$O$_2$ concentration range, with a lower detection limit of 0.5 $\mu$M. The biosensor has good storage stability, reproducibility and repeatability.

Keywords Direct electrochemistry · Redox protein · Nanomaterials · Electrical contact · Biosensor

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