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A conductive crosslinked graphene/cytochrome c networks for the electrochemical and biosensing study

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Abstract The direct electrochemistry of catalytically active cytochrome C (Cyt c) adsorbed together with a 3-dimensional network of chemically synthesized graphene on glassy carbon electrode has been readily obtained in aqueous phosphate buffer. Direct electrical communication between the redox center of Cyt c and the modified graphene-based electrode was established. The modified electrode was employed as a high-performance hydrogen peroxide (H_2O_2) biosensor. The Cyt c present in modified electrode exhibited a pair of quasi-reversible redox peaks with a midpoint potential of −0.380 and −0.2 V, cathodic and anodic, respectively. Investigations into the electrocatalytic activity of the modified electrode upon hydrogen peroxide exposure revealed a rapid amperometric response (5 s). Under optimized conditions, the linear range of response to H_2O_2 concentration ranged from 5×10^{-7} to 2×10^{-4} M with a detection limit of 2×10^{-7} M at a signal-to-noise ratio of 3. The stability, reproducibility, and selectivity of the proposed biosensor are discussed in relation to the morphology and composition of the modified electrode.

Keywords Graphene electrode · Crosslinked networks · Cytochrome C · Direct electrochemistry · Biosensor