SnO₂ Quantum Dots Functionalized 3D Graphene Composite for Enhanced Performance of Electrochemical Myoglobin Biosensor

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In this work, we reported on the electrochemical behaviors and electrocatalysis of myoglobin (Mb) biosensor based on SnO₂ quantum dots functionalized three-dimensional graphene composite (SnO₂-QDs@3DGR) modified carbon ionic liquid electrode (CILE). The SnO₂-QDs@3DGR composite was synthesized via a facile one-step hydrothermal strategy, which offered rich channels, enough active sites, high conductivity and good biocompatibility for bonding with Mb. The direct electron transfer (DET) performance between Mb and SnO₂-QDs@3DGR modified electrode was greatly improved with electrochemical responses increased. In cyclic voltammetric investigation, a pair of well-defined redox peaks of Mb were observed with the formal peak potential of -0.263 V (E⁰) and a peak-to-peak separation of 75 mV (ΔE_p). The heterogeneous electron transfer constant (*k_s*) was calculated as 1.34 s⁻¹. Furthermore, the modified electrode with chitosan (CTS) film (CTS/Mb/SnO₂-QDs@3DGR/CILE) was used for the electrocatalysis of trichloroacetic acid, which showed a wider linear response from 5.0 to 94.0 mmol L⁻¹ with the limit of detection as 0.35 mmol L⁻¹.

Keywords: 3D graphene · SnO₂ quantum dots · Direct electrochemistry · electrocatalysis · trichloroacetic acid

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