Electrochemistry of Hemoglobin-Ionic Liquid-Graphene-SnO₂ Nanosheet Composite Modified Electrode and Electrocatalysis

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doi: 10.20964/2017.03.66

Received: 27 December 2016 / Accepted: 23 January 2017 / Published: 12 February 2017

A composite that consisted of SnO₂ nanosheet, graphene (GR), ionic liquid (IL) and hemoglobin (Hb) was modified on carbon ionic liquid electrode (CILE). By using Nafion film for fixing, the modified electrode was named as Nafion/Hb-IL-GR-SnO₂/CILE. Spectroscopic data indicated that Hb molecules kept native structure within the composite. Cyclic voltammetric data gave a pair of well-defined redox peak in 0.1 mol L⁻¹ phosphate buffer solution, proving that direct electron transfer of Hb in the composite with CILE was realized. The result was due to synergistic effects of the materials used, which fastened the electron transfer rate. Nafion/Hb-IL-GR-SnO₂/CILE had excellent electrocatalytic ability to the reduction of trichloroacetic acid in a linear concentration range from 2.0 to 11.0 mmol L⁻¹ with a detection limit of 0.615 mmol L⁻¹. The modified electrode was valuable for the preparation of a third-generation electrochemical biosensor.

Keywords: SnO₂ nanosheet, Graphene, Direct electrochemistry, Hemoglobin, Carbon ionic liquid electrode

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