Titanium Dioxide Nanoparticle and Carbon Nanotube Incorporated Carbon Nanofiber Nanocomposite Modified Electrode for Hemoglobin Electrochemistry

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This study aimed to achieve direct electron transfer of bovine hemoglobin (Hb) on titanium dioxide nanoparticle and carbon nanotubes incorporated carbon nanofiber (TiO₂-CNT-CNF) nanocomposite modified carbon ionic liquid electrode (CILE). Electrochemical method was used to check the properties of the modified electrode (Nafion/Hb/TiO₂-CNT-CNF/CILE), which confirmed the realization of direct electrochemical reaction with a pair of well-shaped redox peaks on cyclic voltammograms. UV-visible and FT-IR spectra were used to prove the biocompatibility between nanocomposite and Hb molecules. The study also revealed that Nafion/Hb/TiO₂-CNT-CNF/CILE had well electrocatalytic reduction ability to trichloroacetic acid and hydrogen peroxide with good linear relationship between peak current and concentration. Quality analysis of medical sample solution was realized with satisfactory results. The paper demonstrated the potential application of TiO₂-CNT-CNF nanocomposite in the field of third generation electrochemical Hb sensor.

Keywords: Hemoglobin, Direct electrochemistry, Titanium dioxide, Carbon nanofiber, Carbon nanotube

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