Application of Gold Nanoparticles and Nano-Diamond Modified Electrode for Hemoglobin Electrochemistry

Hui Cheng^{1,2}, Yunxiu Sun¹, Bo Shao², Ying Deng², Xiaoping Zhang^{2,*}, Guangjiu Li^{1*}, Wei Sun²

¹ Key Laboratory of Optic-electric Sensing and Analytical Chemistry for Life Science of Ministry of Education, Shandong Key Laboratory of Biochemical Analysis, College of Chemistry and Molecular Engineering, Qingdao University of Science and Technology, Qingdao 266042, P R China

² Key Laboratory of Laser Technology and Optoelectronic Functional Materials of Hainan Province, College of Chemistry and Chemical Engineering, Hainan Normal University, Haikou 571158, P R China

*E-mail: 254787885@qq.com and lgjqust@126.com

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In this paper nano-diamond (ND) decorated carbon ionic liquid electrode (CILE) was constructed by drop-casting, which was further modified by electrodeposited gold nanoparticles (AuNPs), hemoglobin (Hb) and Nafion orderly to obtain an electrochemical biosensor (Nafion/Hb/AuNPs/ND/CILE). The morphology of AuNPs/ND composite was checked by scanning electron microscopy. A pair of redox peaks of Hb on the modified electrode with good reversibility and symmetry appeared in cyclic voltammograms. The effects of pH and scan rate on Hb electrochemistry were further investigated to calculate the electrochemical parameters. The Hb based biosensor showed excellent electrocatalytic ability to the reduction of various substrates such as sodium nitrite, trichloroacetic acid and potassium bromate with the detection range from 0.07 to 2.60 mmol L⁻¹, 1.00 to 500.00 mmol L⁻¹ and 0.35 to 12.00 mmol L⁻¹, respectively. Nafion/Hb/AuNPs/ND/CILE showed good reproducibility and stability, which was applied to the analysis KBrO₃ content in real sea water samples.

Keywords: Gold nanoparticle; Nano-diamond; Electrochemistry; Carbon ionic liquid electrode; Hemoglobin.

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