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Highly efficient electrocatalytic oxidation of nitrite by electrodeposition of Au nanoparticles on molybdenum sulfide and multi-walled carbon nanotube

Ya Zhang*, Fangfang Wen, Jing Tan, Chao Jiang, Min Zhu, Yajie Chen, Honggui Wang *

Jiangsu Key Laboratory of Environmental Material and Engineering, School of Environmental Science and Engineering, Yangzhou University, Yangzhou, 225127, P.R. China.

**Corresponding author. Tel: +86-514-87979528; E-mail address: zhangya@yzu.edu.cn (Y. Zhang), wanghg@yzu.edu.cn (H.G. Wang)*

ABSTRACT

A molybdenum sulfide/multi-walled carbon nanotubes/gold nanocomposite (MoS_2 -MWCNTs-Au) modified glassy carbon electrode (GCE) was developed via a hydrothermal synthesis followed by an electrochemical deposition of gold nanoparticles onto the surface of GCE. Scanning electron microscopy (SEM) and transmission electron microscope (TEM) images indicated the MoS_2 worked as the substrate for MWCNTs and the gold nanoparticles were grown on the MoS_2 -MWCNTs. Cyclic voltammetry (CV) results showed the MoS_2 -MWCNTs-Au modified GCE exhibited the best electrochemical activity in a 0.1 M phosphate buffered saline (PBS) compared to the MoS_2 and MoS_2 -MWCNTs modified GCE. Both CV and differential pulse voltammetry (DPV) results indicated the MoS_2 -MWCNTs-Au had excellent electrocatalytic ability to oxidize nitrite in a pH 5.0 PBS. Quantitative analysis of nitrite was carried out using amperometric $i-t$ method. The amperometric response displayed the MoS_2 -MWCNTs-Au modified GCE could be used to determine nitrite concentration in a wide linear range of 12 and 6500 μM with a detection limit of 4.0 μM . The proposed sensor also showed good anti-interference and real sample analysis properties.

Keywords: Molybdenum sulfide; Multi-walled carbon nanotubes; Au nanoparticles; nitrite; electrocatalytic oxidation.

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