Electrochemically Co-Deposition of Palladium Nanoparticles and Poly(1, 5-diaminonaphthalene) onto Multiwalled Carbon Nanotubes (MWCNTs) Modified Electrode and its Application for Amperometric Determination of Nitrite

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In this article, palladium nanoparticles (PdNPs) and 1, 5- diaminonaphthalene (1, 5-DAN) were electrochemically co-deposited onto multiwalled carbon nanotubes (MWCNTs) modified glassy carbon electrode (PdNPs-poly(1, 5-DAN)/MWCNTs/GCE). The morphology and properties of PdNPs-poly(1, 5-DAN)/MWCNTs/GCE were characterized by scan electron microscope (SEM), energy dispersive X-ray spectrum (EDX) and electrochemical techniques. The proposed sensor exhibited an excellent electrocatalytic performance for nitrite detection. The oxidation potential for nitrite detection at the fabricated sensors was decreased (0.792 V) and peak current was evidently improved, mainly due to the high synergistically catalytical effect of Pd nanostructures, poly(1, 5-DAN) and MWCNTs. The results revealed that the electrooxidation mechanism of nitrite was involved two electrons transfer in the irreversible reaction at the PdNPs-poly(1, 5-DAN)/MWCNTs/GCE. The oxidation peak current of nitrite was proportional to its concentration with the linear range of 0.25 μM ~ 0.1 mM by amperometry, and the limit of detection (LOD) was as low as 0.08 μM ($S/N = 3$). Furthermore, as-prepared sensors had good anti-fouling property, long-term stability and excellent practical ability, which was successfully applied to detect nitrite in real water samples and gained satisfactory recoveries of 97% ~ 105%.

Keywords: Palladium; Diaminonaphthalene; Synergistic effect; Electrooxidation

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