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Electrical polymerization of a tetrazole polymer-modified electrode and its catalytic reaction toward dopamine

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A B S T R A C T

A conducting polymer-modified electrode was proposed in this article, which was fabricated by electropolymerization of 5-amino-1H-tetrazole (ATet) on a glassy carbon electrode. Electrochemical studies such as differential pulse voltammetry and chronoamperometry were performed for the evaluation of the rate constant of the catalytic reaction, the diffusion coefficient of the analyte dopamine, and the linear dynamic range of the analyte determination. The film modified electrode has superior resolving power in quantitative determination from the mixture of analytes and it was found to be an efficient functionalized electrode for its sensitivity and selectivity toward the analyte of interest.

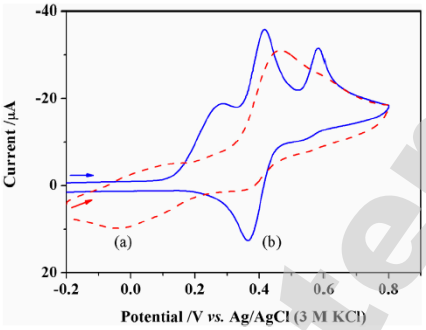
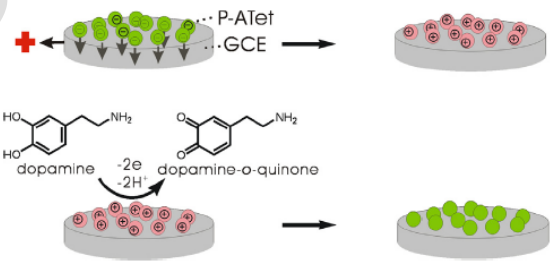


Fig. 8. Merged cyclic voltammograms of the aqueous solution containing 0.1 M KCl, ascorbic acid, dopamine, and uric acid on a bare GC electrode (a; red dashed curve) and the p-ATet modified GC electrode (b; blue solid curve) at a scan rate of 50 mV s^{-1}. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)



Scheme 2. Illustration of the catalytic oxidation of dopamine by p-ATet.

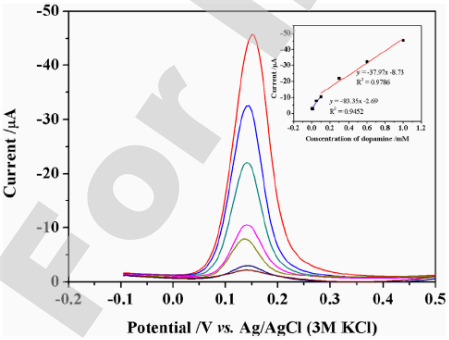
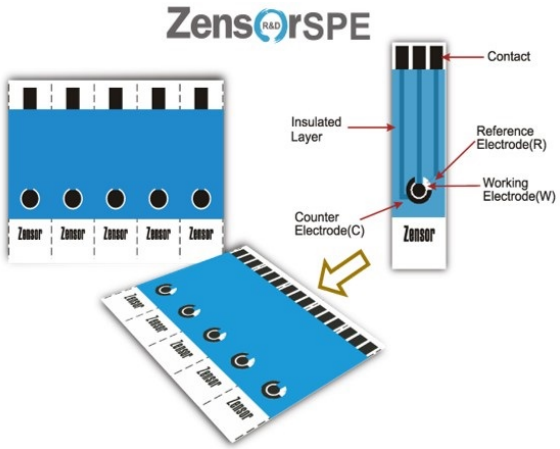


Fig. 9. DPV of the p-ATet modified GC electrode scanned under various concentrations of dopamine: 5 μM, 10 μM, 50 μM, 100 μM, 300 μM, 600 μM, and 1.0 mM. The dependence of the resulted current against the concentration of dopamine is shown in the inset plot.



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Highly active nanostructured water oxidation catalyst electrodeposited from Co(cyclam) complex

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ABSTRACT

The water soluble molecular complex $[Co(cyclam)(ClO_4)]ClO_4$ (cyclam = 1,4,8,11-tetraazacyclotetradecane) is utilized as a precursor for deposition of highly active cobalt based nanostructured material on the electrode surface upon electrooxidation. The electrolysis of the complex at +1.1 V vs Ag/AgCl in 0.1 M potassium phosphate at pH 12 leads to the formation of a nanoporous Co(II) hydroxide/phosphate thin film on the printed carbon electrode. The deposited surface was characterized by scanning electron microscopy (SEM), energy-dispersive X-ray analysis (EDX), and X-ray photoelectron spectroscopy (XPS). The modified electrode (Co-PCE-12) is stable for more than 34 h during the continuous electrolysis. The modified electrode exhibits a high water oxidation catalytic activity of 6.5 mA cm^{-2} at an overpotential of 580 mV (0.9 V vs Ag/AgCl (3 M KCl) at pH 12) with 98% Faradaic yield.