Voltametric detection of β-lactam antibiotics based on modified nanocomposite carbon paste electrode

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Abstract

β-Lactams, a group of widely prescribed antibiotics, are often detected in wastewater effluent and in the natural aquatic environment. In this work, a simple voltammetric sensor was developed for the sensitive detection of the β-lactam antibiotic penicillin, using nanocomposite electrodes modified with rutile natural mineral (CPE-TiO_2). The electrochemical behavior of penicillin at modified nanocomposite sensors CPE-TiO_2 was investigated using voltammetric techniques SWV in acetate buffer solution pH=4. The effect of nanomodifiers at CPES response was estimated by comparing the electroanalytical signal of modified sensor with the bare electrode. The enhanced oxidation peak current of penicillin at modified sensors can be attributed to the catalytic effect of rutile natural mineral incorporated into carbon paste electrode. Under optimize condition, a good linear calibration curve, were obtained ranging from 0.18 mM to 0.65 mM, with detection limits of 4.28 µM. The nanocomposite modified sensor showed good reproducibility (RSD 3.6 %), and high sensitivity for the detection of penicillin with a very high stability in its electrochemical response. The proposed method was successfully applied in real samples, pharmaceutical formulations.

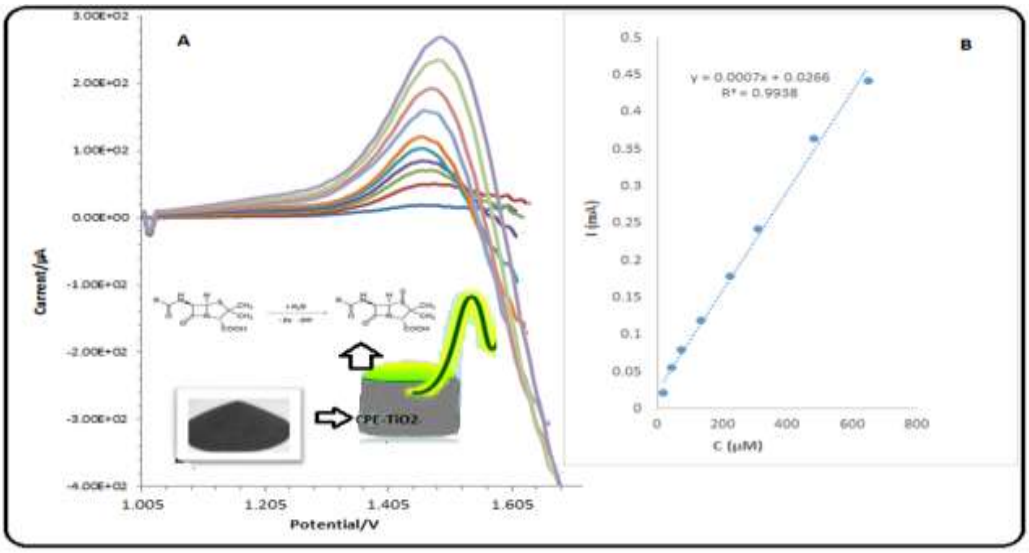

Figure 1. A) Square wave voltammograms for CPE-TiO_2 Sensor for different concentration of penicillin. Frequency 30 HZ, amplitude 50 mV and step potential 5 mV.B) Corresponding Calibration curves.

References

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