Electrochemical Behavior of Cocaine on Carbon Paste Electrode Chemically Modified with Cu(II) Trans 3-MeO Salcn Complex

Authors : Alex Soares Castro, Matheus Manoel Teles de Menezes, Larissa Silva de Azevedo, Ana Carolina Caleffi Patelli, Osmair Vital de Oliveira, Aline Thais Bruni, Marcelo Firmino de Oliveira

Abstract : Considering the problem of the seizure of illicit drugs, as well as the development of electrochemical sensors using chemically modified electrodes, this work shows the study of the electrochemical activity of cocaine in carbon paste electrode chemically modified with Cu (II) trans 3-MeO salcn complex. In this context, cyclic voltammetry was performed on 0.1 mol.L⁻¹ KCl supporting electrolyte at a scan speed of 100 mV s⁻¹, using an electrochemical cell composed of three electrodes: Ag /AgCl electrode (filled KCl 3 mol.L⁻¹) from Metrohm® (reference electrode); a platinum spiral electrode, as an auxiliary electrode, and a carbon paste electrode chemically modified with Cu (II) trans 3-MeO complex (as working electrode). Two forms of cocaine were analyzed: cocaine hydrochloride (pH 3) and cocaine free base form (pH 8). The PM7 computational method predicted that the hydrochloride form is more stable than the free base form of cocaine, so with cyclic voltammetry, we found electrochemical signal only for cocaine in the form of hydrochloride, with an anodic peak at 1.10 V, with a linearity range between 2 and 20 µmol L⁻¹ had LD and LQ of 2.39 and 7.26x10-5 mol L⁻¹, respectively. The study also proved that cocaine is adsorbed on the surface of the working electrode, where through an irreversible process, where only anode peaks are observed, we have the oxidation of cocaine, which occurs in the hydrophilic region due to the loss of two electrons. The mechanism of this reaction was confirmed by the ab-inito quantum method.

Keywords : ab-initio computational method, analytical method, cocaine, Schiff base complex, voltammetry

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