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Electrochemical determination of different amines using VO_2/GO for forensic application

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Some drugs or pharmaceuticals are known as alkaloids due to their basicity and because they have amines as the main organic group. These drugs can be mixed with a wide variety of adulterants. Therefore, identification of these drug mixtures is normally performed using colorimetric test kits, but they can produce false-positive or false-negative results [1,2]. Therefore, this work aims to develop a VO_2/GO-based sensor for detecting primary, secondary and tertiary amines similar to the drugs. For this purpose, ethylamine, diphenylamine and triethylamine were used as analyte. Vanadium dioxide (VO_2) was obtained by hydrothermal synthesis. The reduced graphene oxide (GO) used was purchased commercially. For the electrochemical study, the following were used: gold working electrode covered with VO_2/GO, platinum counter electrode, Ag/AgCl reference electrode. To prepare the supporting electrolyte, a solution was prepared containing 15 mL of ultrapure water, 0.1 $mol.L^{-1}$ of KCl and 0.05 mL of the different amines. The different concentrations of amine were used: 1.0, 2.0, 3.0, 4.0, 5.0 $mg.mL^{-1}$. The electrochemical study was carried out between a potential of 0.8 V to 1.6 V, with 20 $mV.s^{-1}$. Through the cyclic voltammetry (CV) obtained, it was possible to verify that there was the presence of two anodic (1.3 and 1.5V) and two cathodic peaks (0.75 and 0.47V) fo ethylamine. CV for diphenylamine presented one peak anodic in 1.2V and one cathodic peak in 0.6V. For triethylamine, the CV present one anodic (1.37V) and one cathodic (0.55V) peak. Then, the voltammetric profile as well as peak current changed depending on each amine present in the medium. Besides, the peak current increased as a function of the increase of concentration for all amines used. Therefore, the variation of potential as well as increase of peak current with different amines and concentration can be an indicative that the electrode was sensitive and selective to changes in the medium. These amines have the same organic groups when compared to illicit drugs and, based on the results obtained, the electrode based on VO_2/GO will be used for testing in the presence of illicit drugs in the future.

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