REGATA

REDE GALEGA DE TECNOLOXÍAS AMBIENTAIS

Research Stays 2017

Development of an electrochemical sensor based on MIP-QDs for assessing cocaine and metabolites

September 4th, 2017 | December 1st, 2017

Objectives

Synthesis of molecularly imprinted polymer (MIP) for cocaine, Mn-doped-ZnS quantum dots (QDs), and MIP-QDs and characterization by different techniques as optical spectroscopy or electronic microscopy.

Create a sensor with this nanoparticules anchored onto electrode surface. This sensor will then be tested using a potentiostat from METROHM AUTOLAB in different electrochemical techniques such as CV, SWV, DPV and EIS. Finally, study of the sensor response to the presence of cocaine and metabolites and application to the analysis of environmental water samples.

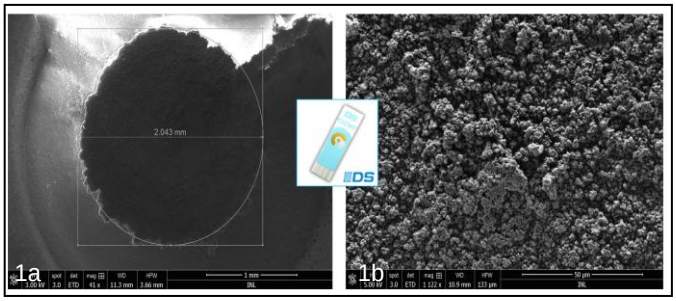
Methodology

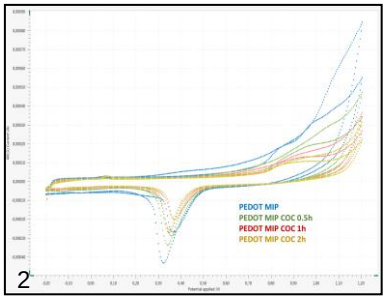
DS C223AT Gold electrode was funcionalizated using 3,4-ethylenedioxythiophene (EDOT) as support polymer to improve the MIPs anchorage onto electrode surface.

0.01 M EDOT was dissolved in 0.1M $LiClO_4$ in ACN. 0.1 mg of MIP are added in the mixture and place onto electrode surface applying immediately Cyclic Voltammetry: -0.88 to 1.5 V, 5 scans 0.1 V/s . Electrode was cleaned with 2-propanol, MilliQ Water and dried with N_2 stream.

Results

Scanning Electron Microscopy (SEM) images (Figure 1) of electrode surface (1a) and polymeric material fixed on that surface (1b) with homogeneous size and regular shape.





Cocaine detection in PEDOT-MIP gold electrode using cyclic voltammetry (Figure 2): -0.4 to 1.3 V, 5 scans 0.1 V/s and 0.1 M KCL as eletrolite in electrode. Differents times of interaction MIP-Cocaine are used. Cocaine concentration increase generates a decrease in electrical signal and its displacement throughout the interaction time.

Highlights

Development, characterization and application of molecular imprinted polymers coupled to a functionalized gold electrode for the determination of cocaine in environmental water samples.

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