

Biosensor for Electrochemical Detection of Amphetamine in Street Samples Using an innovative nanoMIPs-based Sensor



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Introduction

- Amphetamine is the 2nd most used illicit drug in EU;
- 1.4 million young adults (15-34) used amphetamines during the last year;
- NanoMIPs, sometimes called "plastic antibodies", are nanostructured polymer particles capable of selectively recognizing their target;
- The technology presented herein could potentially help to rapidly determine AMP from confiscated street samples using nanoMIPs;
- For the immobilization of nanoMIPs onto the surface of graphite SPEs different approaches were tried.

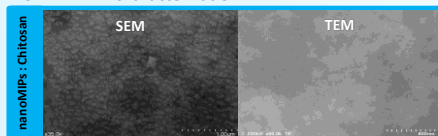


Methodology

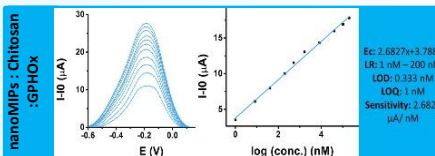
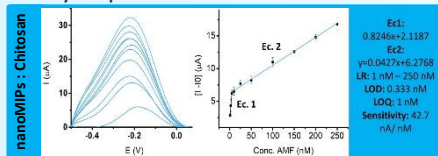
Experimental conditions	SPE with nanoMIPs:chitosan=2:1	SPE with nanoMIPs:chitosan=2:1 and 1mg/mL GPHOx
Step 1: Deposition	10 μ L Chitosan 2% + nanoMIPs (1:2)	10 μ L Chitosan 2% + nanoMIPs + GPHOx 1mg/mL(1:2:1)
Step 2: Conditioning	Dried	Dried + Reduction (CV 10 cycles from -1.4 V to 0.5 V, 0.5 V/s)
Step 3: Testing	DPV (-0.9 – 0.4 V, 0,033 V/s) in PBS pH 7.4	

Results

I. SEM + TEM characterization



II. Analytical parameters

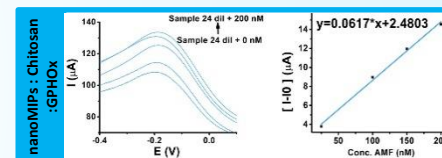
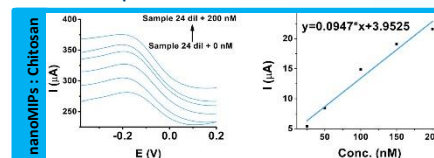


Results

III. Interferences

100 nM Amphetamine	SPE with nanoMIPs:chitosan=2:1	SPE with nanoMIPs:chitosan=2:1 and 1mg/mL GPHOx
+100 nM Cocaine	106.83 %	100.17%
+100 nM MDMA	92.85%	100.65%
+100 nM Metamphetamine	95.71%	96.94%

IV. Real samples



Sample/Platform	Dilution	AMF conc. nanoMIPs (μ g/mL)	AMF conc. UPLC-MS (μ g/mL)	Recovery (%)
S21 nanoMIPs:chitosan	150 000	1334.93	1378.42	96.84%
S24 nanoMIPs:chitosan		1390.84		100.9%
S21 nanoMIPs:chitosan:GPHOx	50 000	564.23	505.34	111.65%
S24 nanoMIPs:chitosan:GPHOx		543.53		107.55%

Conclusion

- The addition of the GPHOx in the suspension used for the generation of the composite film on the electrode along with nanoMIPs and chitosan determined an increase in the sensitivity for amphetamine detection
- Using this approach, the amphetamine was successfully detected from the real street samples.

Acknowledgements

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