New Au-based nano/microstructures for the development of a new aptasensor for oxytetracycline

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INTRODUCTION

• Oxytetracycline (OXT) is an important with widespread use antibiotic. Its overdose fuels the rise of the problem of antibiotic resistance. In this context, there is a clear need for the development of new, fast and sensitive analytical methods capable of performing in field analysis, like electrochemical aptasensors [1].
• The aim of our work was the development of an aptasensor for OXT, using as a starting platform carbon-based screen printed electrodes (C-SPE), modified with Au-based nano/microstructures (Au-NSs/Au-µSs).
• Au-NSs/Au-µSs-C-SPE:
  • lower cost compared to Au-based SPE (Au-SPE)
  • test the influence of the architecture of the Au-NSs/Au-µSs
• Thiolated DNA aptamer (APT), ferrocene-labelled (Fc) → HS-APT-Fc

\[ \text{Fc}\text{-GGA-ATT-CGC-Tag-CAC-GTT-GAC-GTG-GCC-CGG-TTG-TGG-TGC-GAG-TGT-TGT-GTG-GAT-CGG-AGC-TCC-AGC-TG\text{-(CH}_3\text{)}_2\text{SH}} \]

Protocols for the electrodeposition of Au-NSs/Au-µSs

<table>
<thead>
<tr>
<th>Platform</th>
<th>Cm (mM)</th>
<th>HAuCl₄</th>
<th>Electrolyte</th>
<th>Electrochemical technique</th>
<th>Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>10</td>
<td>0.1 M KCl</td>
<td>CA</td>
<td>-0.3 V, 1200 s</td>
<td></td>
</tr>
<tr>
<td>P2</td>
<td>10</td>
<td>0.5 M H₂SO₄</td>
<td>CP</td>
<td>-100 µA, 600 s</td>
<td></td>
</tr>
<tr>
<td>P3</td>
<td>5</td>
<td>0.5 M H₂SO₄</td>
<td>CA</td>
<td>-0.4V, 1200 s</td>
<td></td>
</tr>
</tbody>
</table>

CA: Chronopotentiometry; CP: Chronopotentiometry;

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CONCLUSIONS

• The creation and characterization of new Au-NSs/Au-µSs/C-SPE for an aptasensor for OXT was carried out;
• The resulting analytical platforms were selected based on their influence on the immobilization of the aptamer and on the response of the aptasensor to the binding of OXT;
• A more well-organized architecture, with much more uniform NSs favored a better response of the "signal-on" aptasensor.