Electrochemical tongue

Identification

Key words
electrochemistry, electrochemical, voltammetry, analytical chemistry, taste, PCA, discrimination, classification, Identification, sensor array, biosensor, amperometry, multicomponent analysis

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How does it work?

Primary objective
Analytical tool

Working principle
The principle behind the electrochemical tongue is based on chemical reactions taking place in a solution at the interface of an electron conductor (a metal or a semiconductor) and an ionic conductor (the electrolyte), and which involve electron transfer between the electrode and the electrolyte or species in solution. An electrochemical tongue consists of an array of voltammetric or amperometric sensors. These sensors are in contact with the electroactive analyte and after applying a varying or constant potential, respectively, to the working electrode the resulting current is measured. Using an array of sensors working at different potentials, and combining multivariate signals with pattern recognition routines, it is possible to resolve between different electroactive compounds. Although the specificity of each individual sensor is low, the combination of several selectivity classes entails a very large information potential.

Images

Additional effects
Not applicable, as this is a non-destructive technique

Important process parameters
pH, ionic strength and electrochemical activity of solvent and analyte (and possible presence of electroactive impurities)

Important product parameters

What can it be used for?

Products
Liquid products

Operations
• Classification/discrimination of tea (3), wines (4,10,14,15), milk (5), oils, honey (13), beer (11) ...
• Determination of end of dishing and cleaning process (detergent detection)
• Detection of microbial growth

Solutions for short comings
• better analysis and controls of suppliers and raw materials
• checking raw materials
• attests for coffee
What can it NOT be used for?

<table>
<thead>
<tr>
<th>Products</th>
<th>Solid product, unless it can be completely dissolved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operations</td>
<td>No restrictions</td>
</tr>
</tbody>
</table>
| Other limitations | • Electrodes need to be cleaned or need to be self-cleaning  
| | • Complicated data analysis |
| Risks or hazards | No information |

Implementation

<table>
<thead>
<tr>
<th>Maturity</th>
<th>Pilot scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modularity</td>
<td>Can be inserted in a process line.</td>
</tr>
<tr>
<td>Consumer aspects</td>
<td>No information – no problems expected</td>
</tr>
<tr>
<td>Legal aspects</td>
<td>No information – no problems expected</td>
</tr>
<tr>
<td>Environmental aspects</td>
<td>No information – no problems expected</td>
</tr>
</tbody>
</table>

Facilities that might be interesting for you

Further Information

<table>
<thead>
<tr>
<th>Institutes</th>
<th>DiCTFA, CSIC - IATA, Masaryk University Biochemistry, UNIMORE DipSAA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Companies</td>
<td>Alpha M.O.S.</td>
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3. He, W. et al. (2009) Evaluation of Chinese tea by the electronic tongue: Correlation with sensory properties and classification according to geographical origin and grade level. Food Research International 42, 1462-1467.