Development of electronic tongues for study of complex mixtures and bacteria

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Today, novel analytical tools providing rapid and reliable analysis are increasingly demanded in diverse domains such as food and beverage industries. Recently, electronic tongues have emerged as a promising alternative to traditional analytical methods. At INAC, an original electronic tongue was developed based on combinatorial cross-reactive receptors and surface plasmon resonance imaging. It is able to generate vivid 3D images as fingerprints for analytes.
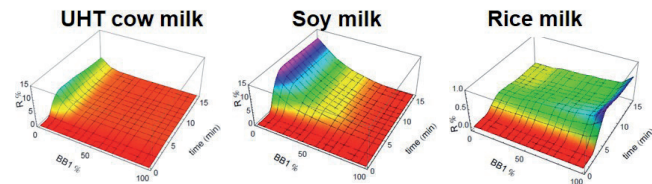

Fig. 1: 3D images of complex mixtures as fingerprints generated by the electronic tongue.

In this PhD thesis, we have explored the potential applications of such a device for the analysis of complex mixtures (milk samples) and bacteria. We have demonstrated that the electronic tongue is able not only to discriminate and classify different milk samples (Fig. 1), but also to monitor the deterioration of milk, thus offering a great potential for quality control. Furthermore, the electronic tongue is efficient for the differentiation of different bacteria according to their genus, species and strains based on 3D images, thus promising for food safety applications.

OUTCOMES

[1] A versatile electronic tongue based on surface plasmon resonance imaging and cross-reactive sensor arrays- a mini-review, Sensors 17, 1046 (2017).

[2] Complex mixtures analysis by landscape imaging based electronic tongue, Talanta 130, 49 (2014).

[3] Electronic tongue generating continuous recognition patterns for protein analysis, JoVE, e51901 (2014).

[4] Landscapes of taste by a novel electronic tongue for the analysis of complex mixtures, Sensor Letters 12, 1059 (2014).

Oral presentation: 2nd International Symposium on Profiling, Portugal, 2015 (invited talk); 16th ISOEN, Dijon, 2015; 2nd ERC Biomim, Grenoble, 2015; 15th ISOEN, South Korea, 2013.

Patent: SPrAM Patent "Capteurs de nez ou de langue électronique" (FR 12 51579), licensed to Aryballe Tech. in 2014.

Start-up: Aryballe Technologies created in 2014 based on our licensed patent.

Collaboration: Prof. David Bonnaffé, Université Paris-Sud, David Eon (NEEL), Roberto Calemczuk, Arnaud Buhot and Thierry Livache (INAC)