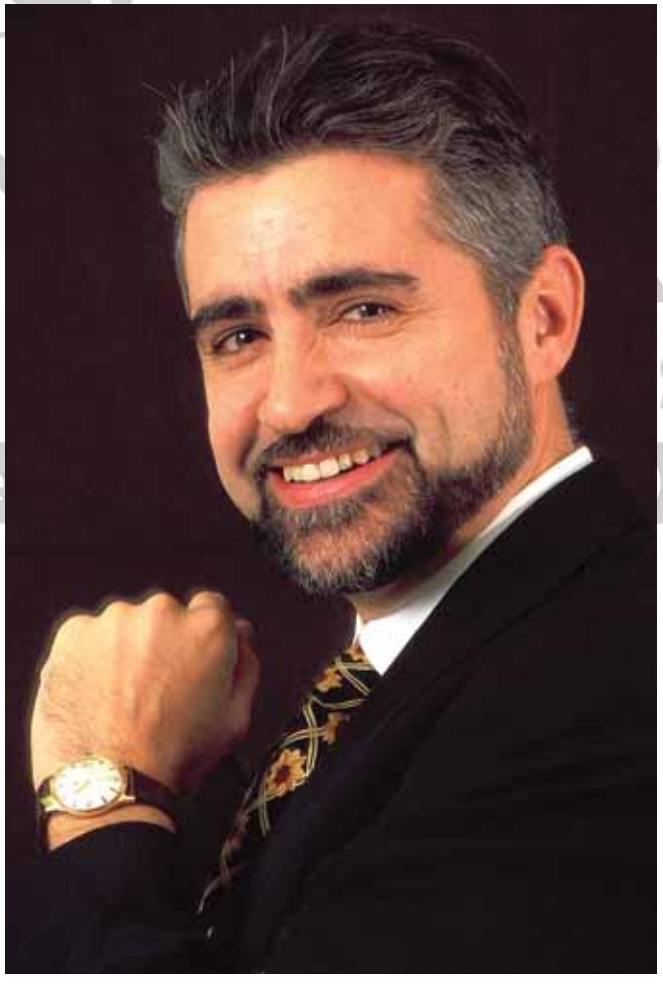
The Taste and Smell of Success

A range of instruments that act like electronic noses and tongues to identify minute quantities of the analytes detected in organoleptic analysis has been developed. The Column spoke to Jean-Christophe Mifsud, CEO of Alpha MOS, about these novel techniques?

Can you tell me a bit about your company?
Alpha MOS is a publicly traded company that specializes in objective sensory measurements using "electronic noses" and "electronic tongues". The company has a wide range of instruments for R&D, at-line/on-line processing and quality control (QC) monitoring, and covers diverse market places, such as food and beverage, packaging, cosmetic and personal care, polymers and environmental applications.



What particular problems are associated with organoleptic analysis?
Organoleptic measurement can be extremely subjective, expensive, cumbersome and the expertise is very difficult to transfer from one production site to another, or from a buyer to a vendor. Therefore, one can only improve what can be measured and this is why Alpha MOS develops analytical instruments that provide fast, reliable and sensitive smell and taste fingerprints using sensor array systems combined with artificial intelligence.

What sort of detection limits are we talking about?
The detection limits of the human being ranks from ppt to ppm depending on the molecule. The electronic noses are around the ppb to ppm level. The human tongue detection limits are around 10^{-4} to 10^{-2} M whereas the electronic tongue provides a 10^{-6} M sensitivity. After initial training, those instruments deliver very simple fingerprints correlated with human perception.

Both the electronic noses and the electronic tongues are equipped with a set of sensors. Each sensor is different from another and is cross-selective (as are the human taste and smell receptors), which means they react specifically to molecules responsible for taste or smell. During the analysis, instruments

measure the response of each sensor. The fingerprint consists of a unique combination of each sensor response, which is specific to one sample.

Can you say more about the products you have recently introduced?
We have recently introduced several new products. One is a new type of electronic tongue used with a solid form dissolution analyser (SFDA) system that mimics the dissolution process that takes place in the mouth. It can analyse solid oral pharmaceutical formulations.

How does it do this and what are the benefits?
This system allows the analyst to follow the evolution of a medicine's taste in the mouth while dissolving. The instrument measures and stores the successive fingerprints of the medicine over time (up to one measure every second) whereas existing techniques quantify the amount of active principles, which are often linked to a bitter taste. The fingerprints are compared with a target one with a good taste. It is a very useful tool that can help optimize oral formulation in terms of taste to ensure it is acceptable for patients.

Any other new products?
The RQBox is a small wireless electronic nose for detecting 24/7 olfactive nuisances and fenceline monitoring for air quality control and air safety. This instrument can detect and recognize target chemical compounds, such as aldehydes or ammonia, which are famous for their "bad" smell.

This allows the analyst to measure a smell level, whereas existing systems are dedicated to toxic compounds detection. This device was developed to check the emissions from chemical and waste treatment stations where smell is an issue.

Another new product is an electronic nose based on a new technology: the ultra-flash gas chromatograph that can analyse a chain of 20 carbons in less than 40 seconds. With conventional gas chromatography, detecting this chain length would usually take more than 30 minutes.

The Alpha MOS data processing will also read the whole chromatogram as a signature. This means that the chromatographer can go back to the chromatogram and search for the peaks responsible for differences or abnormalities.

This gives a high level of detail, allowing the analyst to notice which peak of the chromatograph is different, and therefore identify the component responsible for the differences. This instrument is particularly suitable for the analysis of liquid matrices and trace components in the drinks industries.

Anything else you would like to add?
These analytical instruments do not compete with separation techniques but are complementary and help sensory evaluation most of the time at a quality control (QA) level.

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