

Innovation and quality for food and beverage ingredients with the Electronic Nose technology



The WILD Group is a global company with over 70 years' experience in the production of high quality natural ingredients for the food and beverage industry. WILD produces flavors, flavor systems, juice concentrates and tea-extracts for the beverage industry.

Taste and odour

Sensory is a widely used word. The final qualification of food quality is a sensory measurement. It may

be supplemented by other analytical techniques, but in the end

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everything must correlate to sensory. Sensory methods have been difficult to automate. Sensory scientists were the first to apply multivariate statistics

There are several models to describe the perceptions of taste and smell. It is generally agreed that taste is 80 percent smell with modification by the taste buds. Odor perception is

processed by the emotion centers of the brain which make it highly subjective and difficult to quantify without specific language. Nearly two percent of our human genetic material reserved for encoding receptor proteins – the largest single function identified thus far (R. Axel, Columbia University). By staining the nerve endings of nose receptor proteins, Dr. Richard Axel from the Columbia University was able to show that human beings have thousands of receptor types distributed throughout the nose, however, all receptors of the same type converge to the same neuron (Glomeruli) in the Olfactory bulb.

Just as with taste, there are standards that have been developed. However, in comparison to taste, odor standards need to be much more specific, tied to a controlled vocabulary, and will differ according to the application.

Wild Flavors



Activity

Production of flavors, colors, additives, beverage and food products

Context

Need to check that the sensory features of flavors are not modified upon process scale-up

Equipment

FOX Electronic Nose

Users contact

Rob Tyszkiewicz,
Analytical Chemist

Website

<http://www.wildflavors.com/>

What technologies are used for electronic nose?

SAW (surface acoustic wave) and QMB (quartz micro balances piezo crystals) both utilize common GC stationary phases to absorb odorant molecules. Both suffer from a lack of sensitivity. CP (conducting polymers) can be very specific but are very sensitive to moisture, which makes them difficult to use in food and beverage analysis. MOS (metal oxide sensors) are the most sensitive and stable of the sensor technologies applied. They have emerged as the bench mark of stable reproducible instruments.

What are the common characteristics of E-nose instruments?



Automation is necessary to provide multiple and reproducible sample introduction for the software engine to operate on. WILD Flavors is using a FOX4000 from ALPHA MOS SA. It is based on 18 metal oxide sensors in arrays. There can be compared individual sensor responses, where can be seen both a

magnitude difference and ratio difference between two samples. While this is useful for gauging day to day response and instrument performance, much more information is obtained from the statistical and pattern recognition software. E-nose is a headspace technique. As the organic vapours pass over the sensor array each sensor responds with a certain selectivity. These patterns need to be further processed.

Electronic Nose Technology (ENT) is the combination of sensor arrays linked with advanced statistical and neural network software that provides a visual image of an odor, or how an odor relates to other odors. This relationship could represent “good – bad”, “pass – fail”, “new – old”, or the system can be trained to recognize attributes such as green, fruity, floral or spoiled.

ENT correlates exceedingly well with both sensory and tradition analytical techniques and ENT can combine both elements in a single analysis.

Finished spray powder

A finished spray dried powder for example will vary in flavor depending on the type and size of drier used to produce it.

WILD Flavors was able to modify a small sample (lab) drier by adding more powder for heating. WILD was also able to produce a product more similar to the larger production dryer. Other data shows that during spraying the first, middle and final portions will vary in flavor. These are typically blended, however e-nose could be used to select and grade specific fractions if necessary.

Rob Tyszkiewicz, Analytical Chemist at WILD Flavors, Inc. concludes: «We are collecting a lot of data from the e-nose and so far, the data has been telling us what we wanted to know. »