

Electronic Noses: State of the Art and Implications for the Coffee Industries

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ABSTRACT

There is an increasing interest in a gas sensors to analyze complex gas mixtures and odors. The required performance in most applications can only be archived by increasing the amount of chemically “orthogonal” information deduced from a sensor system. The evident need to increase the information requires to increase the number of independently determined features in such sensor systems. This can be accomplished by building a large sensor feature space by three different concepts, i.e.,

- several sensor material/one transducer approach,
- several transducers/one sensor materials approach, and
- modulated parameter approach.

Subsequently, the pattern recognition has to be optimized to characterize the feature space. These concepts are described briefly. To make use of these concepts in a commercial instrument suitable for a broad spectrum of applications, modularity is of key importance. In this context, a new most flexible design of a modular sensor system (“MOSES”) is introduced which includes all these options by extending the feature space a large as needed for specific practical applications of gas or odor analyses. The choice of a sufficiently large number of features which in the final feature extraction and pattern recognition yields orthogonal chemical-(or odor)-relevant parameters.

Results of analysis with MOSES may either be referenced to parameters obtained from classical tools of analytical chemistry (such as GC/MS couplings) or from human odor panels. Examples from the food industry and quality control (and, in particular from first applications in the coffee industries) demonstrate, than even complex gas mixtures and complex odors may be analyzed with this modular system.