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Research Paper :

Application of electronic nose in food analysis

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ABSTRACT

Electronic nose is mostly used for different applications in food and beverage industries: identification, quantification, quality control. In each application, the principal goal is that this instrument could discriminate different organoleptic properties of different samples. Those properties could be qualities, origins, defects, and concentration of pollutants. As pattern recognition techniques are widely used to analyse the data obtained from these multisensor arrays, Applications described include identification and classification of flavour and aroma and other measurements of quality using the electronic nose.

Key words : Electronic noses, Biosensor, Food analysis, Pattern recognition, Sensor arrays.

An electronic nose is an instrument, which generally consists of an array of cross-sensitive electronic chemical sensors and an appropriate pattern recognition method (PARC), to automatically detect and discriminate simple or complex odors. Arrays of gas sensors are termed as "electronic noses" while arrays of liquid sensors are referred to as "electronic tongues" (Stetter and Penrose, 2002). The former group are used in quality control and process operations in the food industry while the latter are widely used in taste studies. A chemical sensor is a device which responds to a particular analyte in a selective way by means of a reversible chemical interaction and can be used for the quantitative or qualitative determination of the analyte (Cattrall, 1997). All sensors are composed of two main regions: the first is where the selective chemistry occurs and the second is the transducer. The transducer allows the conversion of one form of energy to another. The chemical reaction produces a signal such as a colour change,vfluorescence, production of heat or a change in the oscillator frequency of a crystal (Cattrall, 1997). Other parts of a sensor include the signal processing electronics and a signal display unit. The major regions of a typical sensor are shown in Fig. 1.

The electronic nose is an instrument that begins to bridge the gap between analytical techniques such as gas chromatography (GC) and sensory analysis. Monitoring the level of retained solvents is the primary method of quality control of packaging after printing. Current quality assurance techniques use sensory analysis, GC, GC-olfactory, and GCmass spectroscopy. Among these, the popular method is the 'sniff test' using trained panel members. While these methods are useful research tools,

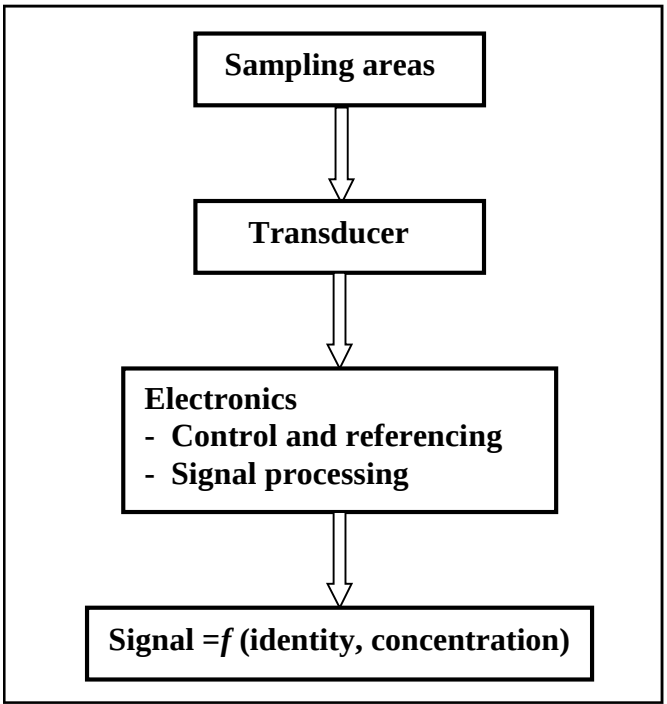

Fig. 1 : The main parts of typical sensor

they require extensive time and preparatory measures, and also expertise in understanding the results. In addition, the analytical methods (GC, GC-MS) analyze the individual volatiles that comprise an aroma, and not the overall aroma itself. If an electronic nose could be demonstrated to be effective in this application, it could become a complementary tool in quality assurance (Van Deventer and Mallikarjunan, 2002).

METHODOLOGY

Several categories of transducers are available and