Evaluation of tin oxide sensor array for on line assessment of odor annoyance

Anne-Claude ROMAIN, Jacques NICOLAS, Jindriska MATERNOVA
Fondation Universitaire Luxembourgeoise,"Environmental Monitoring"
Avenue de Longwy, 185, B 6700 - ARLON, BELGIUM, e-mail : romain@ful.ac.be

For 5 years, the department "Environmental Monitoring" of F.U.L. has been trying to assess the ability of lab-made electronic noses to discriminate some environmental odours, if possible directly in the field, and to monitor them continuously. Such an approach should lead to a better understanding of the odor release, by relating it to the process which caused the emission. But the most interesting task of the continuous monitoring of malodor in the field is the real time control of odour abatement techniques.
However, among the potential application areas for electronic noses, the monitoring of our environment constitutes a real challenge.
In the field of environmental monitoring, the background is an ever-changing chemical mixture against which we want to detect the rise of a particular odor - although the exact profile of that rise is unknown and variable [1].

This paper presents some of our research activities regarding the adaptation of the electronic nose principle to recognise some malodor sources in the environment, if possible directly in the field [2], and to monitor the odor intensity continuously. The last activity concerns the monitoring of indoor air pollution.
Research works in improvement of the portability and the user-friendliness of the instrument, together with testing what kind of signal may be used to monitor the odor.
We have chosen to use tin oxide sensors from the Japanese company Figaro for the field and from the Swiss manufacturer Microsens for the indoor application.
Different measurement systems are used. The ambient air is either sampled around environmental sources (landfill, urban waste composting facilities, …) in Tedlar® bags, directly transferred into the sensor chamber in the field or in static contact with the sensors in the field (without flow delivery system).
Data are processed by two commercial software packages (Statistica and Matlab).
For the odor recognition, the used sensor parameter is Rnor, where Rnor is the normalised resistance of each sensor, i.e. the resistance of the sensor, divided by the square root of the sum of all the sensor resistance values squared. Classical pattern recognition techniques are used (PCA, DFA and BP).
For the assessment of odor intensity, the operator notes his feeling on a 4 level scale. Various regression techniques are applied to predict the intensity of odor (MLR, PCR, PLS) [3]. In spite of the environmental constraints (temperature and humidity influence [4], wind speed effect, odor variation in nature and in concentration, ever changing background air, interference's, maintenance as low as possible,…), the results are very encouraging.

References

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