

Introduction

There are many elements that contribute to the quality of coffee, ranging from coffee agriculture to coffee preparation. Fundamental for the quality of coffee are the varieties from which coffee blends are prepared. Among the currently cultivated varieties Arabica and Robusta cover about 80% of the world production. Currently, sensory analysis is widely utilised in industries to evaluate the coffee flavour profile and to determine any eventual difference between growing regions. Although based on well determined protocols, practical sensory methods followed by industrial methods are quite varied, this makes often scarcely comparable results obtained by different sensory panels. The application of LibaNose offers the possibility to investigate the coffee headspace in order to determine a sort of objective odour profile of coffee helping industry in mixing different coffee varieties to get a well final product. This work has been aimed at evaluating the differences between coffee coming from different regions, coffee species, and coffee blends. The work has been done in cooperation with one of the most important Italian coffee producer.

LibraNose 2.1

Libra Nose 2.1 is a compact, easy-to-use instrument which has been thought to perform reversible measurements and to distinguish different odours. (Fig.1) This instrument uses a set of eight piezoelectric transducers placed in a measuring chamber. (Fig.2) The surface of each transducer is covered by a different molecular layer (metalloporphyrins) which forms aspecific bindings with the compounds of gas mixtures.

TYPICAL APPLICATIONS:

- Food industry: fish, meat, tomato, wine, milk, fruits...
- Medical applications: Skin odour, Urine, Blood, Breath
- Industrial applications: tobacco, leather industry Industrial process control ...



Fig.1

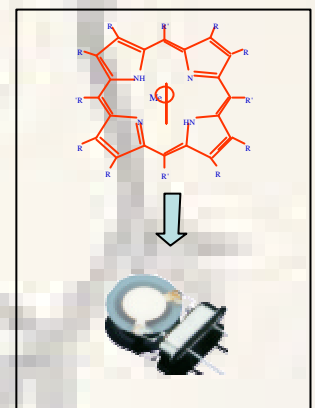


Fig.2

Experimental section

Four coffee varieties:

- Arabica Brazil pure
- Robusta Brazil pure
- Arabica Camerun pure
- Robusta Camerun pure

Two blends of coffee varieties:

- Blend 70% Arabica coming from Brazil - 30% Robusta coming from Brazil
- Blend 30% Arabica coming from Brazil - 70% Robusta coming from Brazil

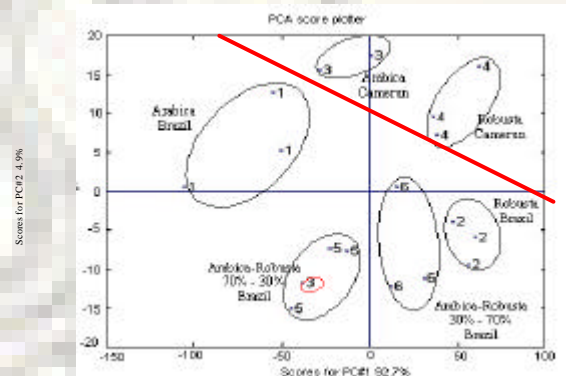


Fig.3

Conclusion.

The previous figure 3 shows results of principal component analysis (PCA) of the data acquired from Libra Nose. It is possible to observe a definite separation of different areas (delimited with red line) of the species from different regions. In particular, it is very interesting to observe that blends are localized close "Arabica area" if the blend is most based on Arabica, i.e. Arabica - Robusta 70% - 30%, or close "Robusta area" if the blend is mostly based on Robusta, i.e. Arabica - Robusta 30% - 70%.

References:

- A.D'Amico, C. Di Natale, R. Paolesse, "Portraits of gasses and liquids by arrays of nonspecific chemical sensors: trends and perspectives", *Sensors and Actuators*, B 68 (2000) 324-330.
 C.Di Natale, A. Macagnano, f. Davide, A. D'Amico, R. Paolesse, T. Boschi, M. Faccio, G. Ferri, "An electronic nose for food analysis", *Sensors and Actuators*, B 44 (1997) 521-526.
 P.C. Jurs, G. A. Bakken, and H. E. McClelland Computational Methods for the Analysis of Chemical Sensor Array Data from Volatile Analytes 2649 *Chem. Rev.* 2000, 100, 2649-2678
 J. W Gardner., Bartlett, P. N. *Electronic Noses. Principles and Applications*; Oxford University Press: Oxford, England, 1999.



Metalloporphyrins application, for nano-gravimetric sensors development, for air quality detection in an environment with crude oil distillation derivatives

A. Scarpa, D. Del Turco, L. Fachechi.
 Technobiochip s.c. a r.l.
 Via della Marina 39, 57030 Marciana (LI) Italy
 Phone: +39-0565-901250, 901062
 Fax: +39-0565-901136
 E-mail: antonio@technobiochip.com

Crude oil is oleaginous liquid substance, usually it is mined by oil pool and composed by hydrocarbons mixture. The hydrocarbons are substances composed primarily by carbon, hydrogen and other element as Nitrogen, Sulphur etc. in small concentrations. After extraction, the crude oil undergoes petroleum processing by the extraction column in an oil refinery. The oil refinement process is composed by a series of complicated separation cycles. After the condensation process, a set of useful petroleum liquid components (refined oil, gasoline, diesel fuel, and other aliphatic and aromatic hydrocarbons) and other ordinary compounds (petroleum tar) are obtained. The whole petroleum processing is one of the most important cause of air pollution, it is very damaging for environmental and people, firstly for the professional categories that usually work in the petroleum processing plants and also for people living near the refineries.

Libra-Nose

Libra-Nose 2.1 (Fig.1) Constituted by Eight Thickness Shear Mode Resonators, were the sensitive coating are metalloporphyrins. (Fig.2)

Main current applications:

- ✓ food analysis: fish, meat, tomato, wine, milk, fruits...
- ✓ Industrial applications: air quality, tobacco, leather industry...
- ✓ Medical applications: Skin odour, Urine, Blood, Breath.

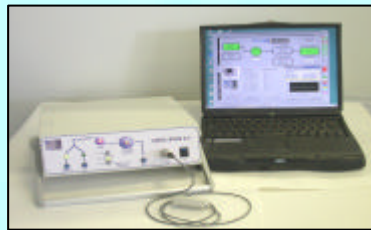


Fig.1

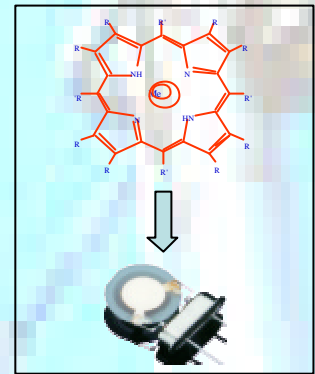
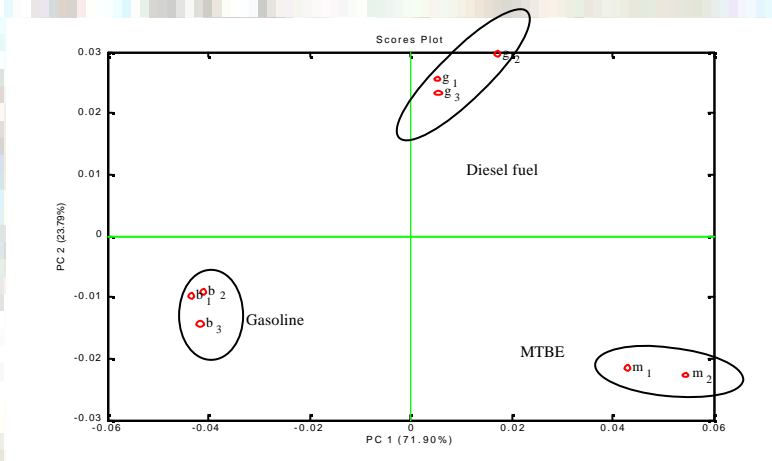


Fig.2

Experimental section

The application of our electronic nose, Libra-nose, where metalloporphyrins are the active matrix of nanogravimetric sensors, allows to test in real time the quality air in order to detect variations on environment conditions. We investigated a series of tests with three petroleum derivate components: gasoline, diesel fuel, MTBE (methyl-tetraabuthylether).

In the next graphics is possible see the Pricipal Component Analisis (PCA) about the electronic nose, Libra-nose discrimination.



CONCLUSION.

In the previous graphs show the Principal Component Analysis (PCA), the Libra-nose distinguishes three analyzed derivatives from crude oil processing. This confirms that it is possible to apply Libra Nose in the crude oil derivate identification or in monitoring area close oil pools, oil refineries, petrol pumps, etc.

References:

- J. W. Gardner; Bartlett, P. N. "Electronic Noses. Principles and Applications" Oxford University Press: Oxford, England, 1999.
- A.D'Amico, C. Di Natale, R. Paolesse, "Portraits of gasses and liquids by arrays of nonspecific chemical sensors: trends and perspectives", Sensors and Actuators, B 68 (2000) 324-330.
- P.C. Jurs, G. A. Bakken, and H. E. McClelland "Computational Methods for the Analysis of Chemical Sensor Array Data from Volatile Analytes" 2649 Chem. Rev. 2000, 100, 2649-2678