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IMCS 2012
The 14th International Meeting on Chemical Sensors

The 14th International Meeting on Chemical Sensors (IMCS-14) is the world's largest interdisciplinary forum on all aspects of chemical sensors encompassing physics, chemistry, materials science and engineering disciplines including biomedical engineering.

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Department of Functional Materials
University of Bayreuth

Venue: NürnbergMesse

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Booklet

IMCS 2012 – The 14th International Meeting on Chemical Sensors

This volume covers the proceedings of the IMCS 2012 – The 14th International Meeting on Chemical Sensors.
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Express Biosensor control of maize plants under different agrotechnical procedures

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It was used the developed portable optical biosensor „Floratest" for the express control of state of the maiz plants at the different agrotechnical procedures. The induction of fluorescence of chlorophyl was served as the main registered index. It was revealed the differences in the photosynthetic activities of plants in depending on soil preparation and nutrition by the fertilizer outside of root system.

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Performance Study of a Potentiometric Sensor Array for Lactic Proteins Analysis

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Lactic proteins are complex biomolecules, possessing different molecular weights (from 19 kDa up to 66 kDa), which can be used as biomarkers for detecting food adulterations. This study reports for the first time the evaluation of two potentiometric sensor arrays, one electronic tongue (ET) using only cross-sensitivity chemical sensors and a hybrid-ET containing ionic-selective and cross-sensitivity chemical sensors. Although both devices could detect and distinguish soluble and insoluble lactic proteins, namely bovine serum albumin and three main casein fractions (alpha-, beta- and kappa-), the inclusion of ionic-selective sensors increased the device performance (100% of correct leave-oneout cross-validation classification for hybrid-ET against 94% for the ET) and reduced the number of sensors needed (5 for the hybrid-ET instead of 9 sensors used by the ET device). Finally, the results showed that with the hybrid-ET a second-order polynomial equation could be derived relating the measured potential of the aqueous solution and the logarithmic of the total casein concentration, with satisfactory determination coefficients (R^2>0.99).

Performance study of a potentiometric sensor array for lactic proteins analysis

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SUMMARY

Evaluation of a potentiometric chemical sensor array using: Ion-selective and cross-sensibility sensors

↓

1 - Detect and distinguish soluble and insoluble lactic proteins (bovine serum albumin and α-, β- and κ-caseins). Different molecular weights (from 19 kDa up to 66 kDa)

↓

2 - Evaluation of the response of the device versus increased total casein concentrations in aqueous solutions

METHODOLOGY

40 ionic-selective and cross-sensibility chemical sensors applied to a potentiometric sensor array, constructed using a screen-printed technique (Fig. 1).

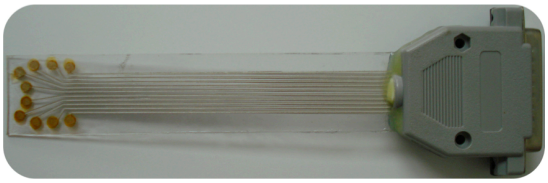
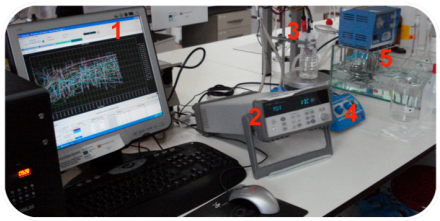


Fig. 1 – Potentiometric sensor array

Scheme of the analytical multi-sensor system used for analysis with the potentiometric sensor array (Fig. 2).

Fig. 2 Multi-sensor system



Multi-sensor system:
1- PC for data acquisition;
2- DataLogger Agilent;
3- E-tongue device in a double glass cell thermostatized;
4- Magnetic stirrer;
5- Thermostatic bath.

Synthetic standard solutions (25ºC):
- Individual standards of bovine serum albumin and α-, β- and κ-caseins (10^{-6}-10^{-5} g/L).
- Standard solution of total casein (20 g/L)

Data treatment: Linear discriminant analysis (LDA)

RESULTS

1 - QUALITATIVE ANALYSIS

4 different lactic proteins (bovine serum albumin (BSA), α-, β- and κ-caseins)

↓

Sensor signals profile (40 sensors)

↓

Stepwise – LDA

↓

5 Sensors selected

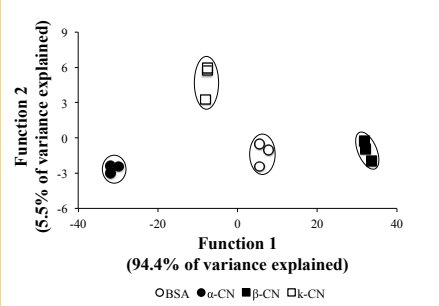
↓

99.8% of total variance explained (2 statistically significant discriminant functions)

↓

100% of correct classification of samples (Fig.3, leave-one-out cross-validation)

Fig. 3 Discriminant analysis obtained for standard aqueous solutions of lactic proteins.



2 - QUANTITATIVE ANALYSIS

Sensors' signal to additions of increasing amounts of total casein (0.04-2.0 g/L)

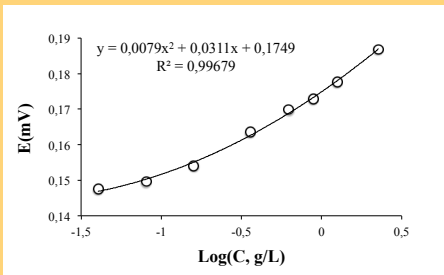
↓

2nd order polynomial response (Fig. 4)

↓

R^2>0.99 (for several ion-selective and cross-sensibility sensors)

Fig. 4 Typical sensor response of the potentiometric device to increasing concentrations of total casein in aqueous solutions.



CONCLUSIONS:

Preliminary results indicate that the potentiometric sensor array used has good analytical prospects within the protein analysis and may be used to detect biomarkers for evaluating food adulterations.

MULTI-SENSOR DEVICE ADVANTAGE – No extraction or dilution/dissolution step was required.

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