BIOSENSORS IN RAPID ANALYSIS FOR FOOD QUALITY

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Abstract: *The need of manufacturers to efficiently control the production processes prompts the development of online and at line methods for quality control. Product quality cannot be sufficiently controlled only by recipes because it is not possible to check every single unit of a batch.*

Keywords: *biosensor and enzymatic reaction, on-line methods for analysis, biosensor for estimate of glucose content, biosensor for estimate monosodium glutamate acid content*

The international standart of quality ISO 9000 was apply in 1990 and reprezent a point of transition from data quality control to whole systems of guality assurance.

In the aim of optimize tehnology processes are created computer driven manufacturing sectors, which interceptes sensor signals from sensors.mounted in technological line. Then are accumulated a whead spread of dates response is transmeeted to setting mechanisms. Such technologies are called **sensories technologies** [8,9,12], and permit to provide measurements of process parameters automatically, in real time, which presents a significant opportunity in food production.

The area of using of sensors included: measure of moisture (40%), fat (23%), protein 14%, dry substances (6%), acidity (3%), other determination (14%)[1,7,10,12].

Recently, new type of sensors, biological sensors have be used (Fig.2). The difference from amperimetrical, lectrochimical and other sensor is that biological sensor include same biological material (enzymes, antibodies, tissuies in growth)

Construction of the biological sensor include 2 chef elements: a sensitive biological background, immobilized on a support, which may recognize a target substance despite of the presence of multicomponent environment. When the molecules are absorbed on the coated layer on the quartz cristal surface, the frequency of oscilation changes in the proportion to the amount of mass absorbed and the resulting change in current may be measured. The second element is a traductors, which firstly are capturing the changes in bioreceptors, then translate them into a electronical or a optical signal. A schematic presentation of an electronic sensor is shown in Fig. 1[7].

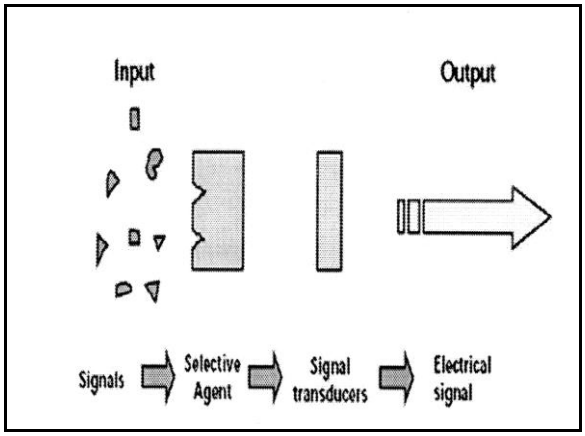


Fig. 1. *Schematic presentation of electronic sensor*

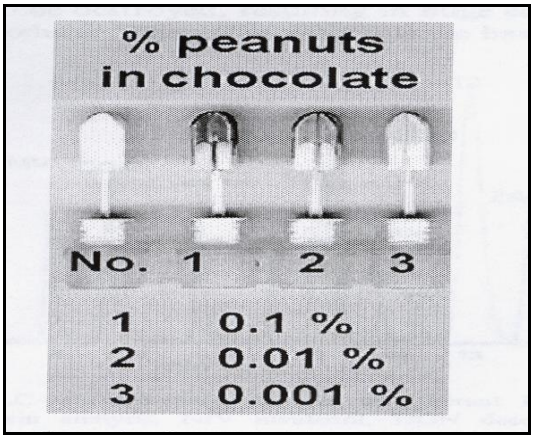


Fig. 2. *Biosensor ELISA for determination of trace amounts of peanuts in protein extracts in a dip stick format suitable for production control.*

Sensor determination of glucose content The first biosensor for estimate the glucose content was invented in 1962 by K.Clarc. It was for measure of electrochemical response in

changes in concentration of O_2/H_2O_2, the results oroducts of enzymatic reaction, which takes in the presence of enzyme glucozeoxidase (Fig.3a)[]. The avantage of this electrod consist in the working membrane that includes co immobilized enzyme glucosoxidase. A layer of inert cellulose acetat will be used for separation the prebe from enyimatic membrane.

The membrans of the electrode allowed the transition of H_2O_2, obtained as a final product of reaction enzyme&target substances.The second, external membrane are permeable for glucose and oxidase form of glucose gluconic acid. Electrod is polarized at +0,6 V&ag&AgCl. Interference substances is

ascorbic acid, which must oxidase on the Pt lay. The effect of ascorbic acid may be eliminate by using a membrane not oermiable for ascorbic acid and permeable for H_2O_2. (Fig. 3b).

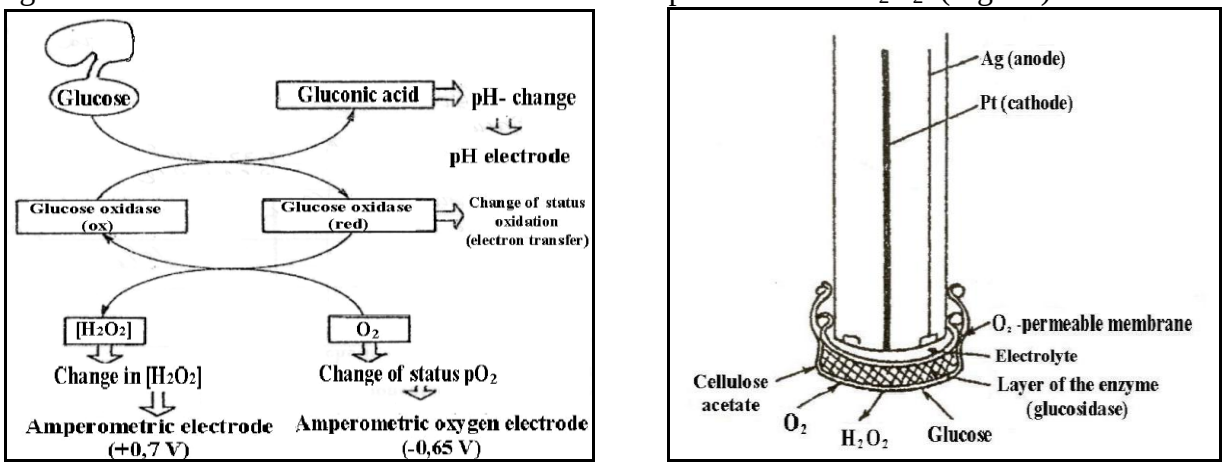


Fig. 3. Sensor determination of glucose: ***a)*** *indentification of measurable parameters for glucose determination based on biocatalytic oxidation reaction catalyzed by glucozoxidaza;* ***b)*** *Schematic construction of biosensor for glucose[4];*

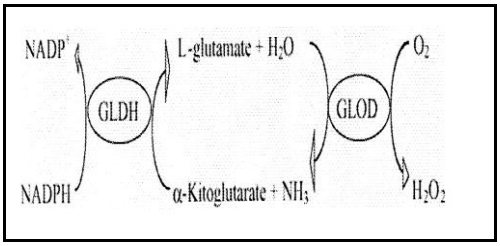
Sensor determination of monosodium glutamate (MSG). Amino acid L-glutamate is reported to be a important neuroexcitatory factor involved in several behavior patterns. Also it has widespread use as a flavor enhancing food additive. Thus, the determination of L-glutamate is of importance in both food and clinical samples. Glutamate concentration have been routinely assayed by chromatographic and potentiometric titration, but these methods are time consuming and require technical hand.

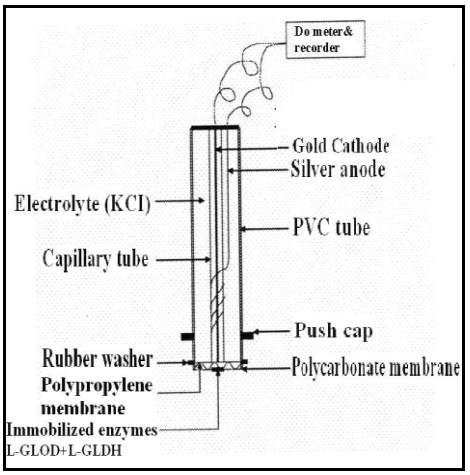
For the rapid estimation, several types of amperometric biosensor have be used. More recently, a biosensor made by co immobilized L-glutamate oxidaze (L-GLOD) and L-glutamate dehydrogenase (L-GLDH) as the bio-component that ware incorporated into a modified electrode have be used for rapid estimation of monosodium glutamate (MSG).

Membrans of the electrod ware prepared by bounding in cross linking enzymes on the polycarbonate substrate. In the presens of MSG, L-GLOD works as a cofactor and MSG is converted in kiloglutarate (Fig. 4a). Consumtion of the O_2 during the enzymatic reaction is registred by a oxygen recorder. Substrate recycling is continuu due to avaibility of 2 mM NADPH and 10 mM of ammonium ion in the system.

The electrod (1 cm in diameter) have 0,1M KCl solution as electrolyte, a silver anode and a gold catode (whith a sensitive end of 1,5 mm diameter). As shown in Fig. 4b the oxygen electrod was covered by one layer of enzymatic film on polycarbonate membrane (pore size 0,4 μm) and was attached to the electrod by push cap system. Assays were performed in a 12 ml air-scaled experimental chamber, the solution beihg stirred constantly by a magnetic stirrer.

A.Basu, 2006 stadied the value of MSG in real food samples (soy sauce, tomato sauce etc). This experimental data were compared with spectrofotometric data. A regression equation y=1,0642x-0,2289,R2=0,998 was obtained by the values of MSG found in food samples by spectrofotometric method versus sensor method.





a) ***b)***

Fig. 4. Determination of monosodium glutamate: ***a)*** *the MSG converted to α-kitoglutarate in enzymatic reaction;* ***b)*** *Schematic diagram of the MSG biosensor Assembly for O_2 consumption (ppm/min)[2];*

Conclusion

1.Were created two generation of biosensors for determination of glucose content, but the apply is restricted ***in vitro***, because biological materials included catalaza, an enzyme, which interference active aby redusing exces of H_2O_2.

2. A recycling electrode for determinatiuon of MSG may estimates probes whith detection limits 0,02 mg MSG/L. The sensor had a half-life of over 60 days, with about 50 assays.

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