A

Seminar report

On

WEARABLE BIOSENSOR

Submitted in partial fulfillment of the requirement for the award of degree
Of Electronics

SUBMITTEDTO: **SUBMITTED BY:**

www.studymafia.org www.studymafia.org

Preface

I have made this report file on the topic **WEARABLE BIOSENSOR ;** I have tried my best to elucidate all the relevant detail to the topic to be included in the report. While in the beginning I have tried to give a general view about this topic.

My efforts and wholehearted co-corporation of each and everyone has ended on a successful note. I express my sincere gratitude to …………..who assisting me throughout the preparation of this topic. I thank him for providing me the reinforcement, confidence and most importantly the track for the topic whenever I needed it.

Introduction

Biosensor is the term used for a whole class of sensors that utilize a biochemical reaction to determine a specific compound. Continual measurements of raw materials and products are important for the control of Biochemical processes. Monitoring of important organic pollutants is also required for environmental control. Recently, many biosensors have been developed and provided methods of rapid and continuous measurements of various compounds.

A biosensor is generally an immobilized enzyme or cell that is combined with a transducer to monitor a specific change in the microenvironment. The probe tip is immersed in the liquid phase and is in contact with the process either directly or through a membrane. To date, these instruments have not seen wide spread use because as a class they exibit many disadvantages. These include:

- An inability to be steam sterilized
- They react with the product
- And are oversensitive

Microbial sensors are suitable for the industrial process because they are stable for a long time. Two different types of microbial sensors were developed for measurement of organic compounds.

1.) Microbial sensors consisting of immobilized whole cells and an oxygen probe when used for determination of substrates and products. The concentration of compounds was determined from microbial respiration activity which could be directly measured by an oxygen probe.

2.) Microbial sensor consisting of immobilized microorganisms and an electrode was used for determination of organic compounds. The concentraion of compounds was indirectly determined from electroactive metabolites such as proton, carbon dioxide, hydrogen, formic acid, and reduced co-factors which can be measure by the electrode.

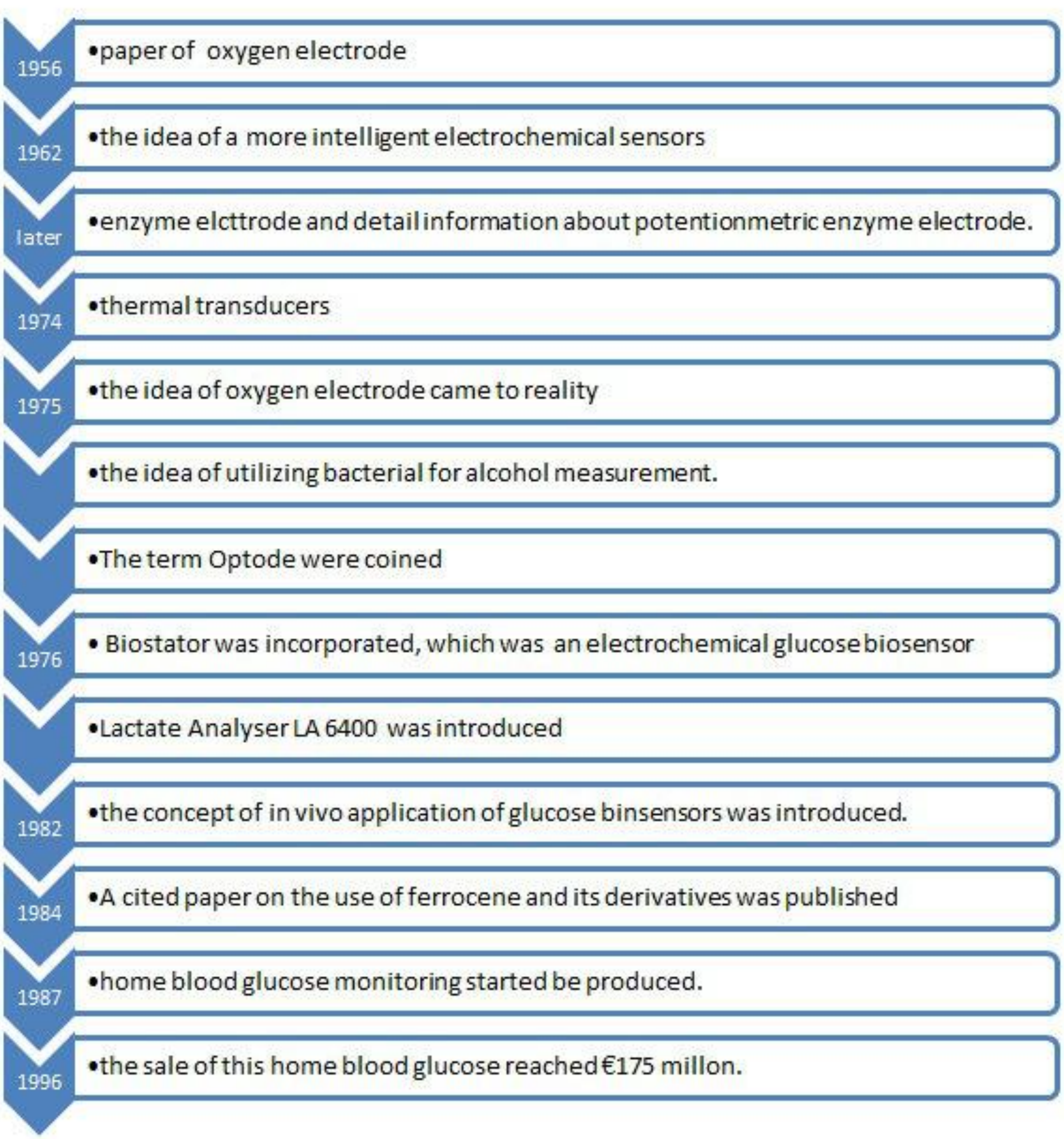
What Are Biosensors?

A Biosensor is a device that is made up of a bioreceptor and a trans-ducer and is used to convert a biological response into an electrical signal.

This device enables one to measure the target analyte without using reagents and also to determine the concentration of substances and other parameters of biological interest even where they do not utilise a biological system directly.

This device is normally used in glucose monitoring in diabetes patients, detection of pesticides and river water contaminants and Detection of toxic metabolites such as mycotoxins among others.

History of biosensor



In 1956, Professor Leland C Clack published a paper about oxygen electrode, which

In 1962, he came up with the idea of more intelligent electrochemical sensors by adding enzyme transducers as membrane enclosed sandwiches.

Later, Clark and Lyons coined the term enzyme electrode, which expanded on the experimental detail to build functional enzyme electrodes for glucose. Guibault and Montalvo first detail a potentionmetric enzyme electrode.

In 1974, thermal transducers such as thermal enzyme probes and enzyme thermistors were proposed.

In 1975, the idea of Clark came to reality. Glucose analyser that was lunch by Yeellow Springs Instrument company, it is based on the amperometric detection of hydrogen peroxide. First laboratory model to become commercial.

In 1975,Divis suggested that bacteria could be harnessed as the biological element in microbial electrodes for the measurement of alcohol.

In 1975, Lubbers and Opitz coined the term optode, which was a fibre-optic sensor with immobilized indicator to measure carbon dioxide or oxygen. , the concept of an optical biosensor for alcohol was mentioned.

In 1976, Clemens incorporated an electrochemical glucose biosensor. In a bedside artificial pancreas , which was marketed with the name of Biostator.

In 1976, the same year, La Roche introduced the Lactate Analyser LA 640 in which the soluble mediator, hexacyanoferrate. This was used to shuttle electrons from lactate dehydrogenase to an electrode. This is an important forerunner for lactate analysers for sports and clinical application.

In 1982, Shichiri et al. reported in vivo application of glucose biosensors, which is the first needle-type enzyme electrode for subcutaneous implantation.

In 1984, A cited paper on the use of ferrocene and its derivatives as an immobilised mediator for use with oxidoreductases was published.

In 1987, a pen-sized meter for home blood glucose monitoring was launched by MediSense.

In 1996, the sale of this home blood glucose monitoring reached 175 million dollars.

Present Applications of Biosensors

- Medical Care (both clinical and laboratory use)
- The determination of food quality
- The detection of environmental pollutants
- Industrial Process Control
- Biosensors in process control will be able to measure materials in the process flow of temperature, pressure and the acidity readings.
- The development of biosensors in industry can improve manufacturing techniques, which would allow for a wider range of sensing molecules to be produced at a cheaper rate.
- In the field of medicine, tumor cells are used as a biosensor to monitor chemotherapeutic drug susceptibilities.
- Biosensors also play a role in the manufacturing of pharmaceuticals and replacement organs such as an artificial pancreas for diabetics.

Need for Biosensor

- **Diagnostic Market**

The current climate of prevention the need for detection at increasingly lower limits is increasing in many diverse areas

- **Clinical Testing**

clinical testing is one of the biggest diagnostic markets
clinical testing products market in excess of 4000 million US$ in the 1990s

- **Other Markets**

The medical arena (Technical Insights Inc.) with veterinary and agricultural applications

- **Specificity**

With biosensors, it is possible to measure specific analytes with great accuracy.

- **Speed**

analyte tracers or catalytic products can be directly and instantaneously measured

- **Simplicity**

receptor and transducer are integrated into one single sensor& the measurement of target analytes without using reagents is possible

- **Continuous monitoring capability**

Biosensors regenerate and reuse the immobilized biological recognition element

Scope

The journal covers all aspects of biosensing. The scope includes but is not limited to the following:

Sensors incorporating:

- enzymes
- antibodies
- nucleic acids
- whole cells
- tissues and organelles
- other biological or biologically inspired components

These biological recognition elements should be retained in close spatial contact with transducers including those based on the following principles:

- electrochemical
- optical
- piezoelectric
- thermal
- magnetic
- micromechanical

The journal will include a variety of subjects, including:

- DNA chips
- lab-on-a-chip technology
- microfluidic devices
- nanobiosensors and nanotechnology used in biosensors
- biosensor fabrication
- biomaterials
- biosensor interfaces and membrane technology
- *in vitro* and *in vivo* applications
- instrumentation, signal treatment and uncertainty estimation in biosensors

The scope will encompass biosensors for applications in:

- medicine
- biomedical research
- environment
- security and defence
- food
- process industries
- drug discovery

Features of good biosensors

1) During the analysis, the biocatalyst must be highly definite and the temperature and other conditions should be normal. It should show good results over a large number of assays.
2) It should be taken care during the reaction that physical constraints should not effect the reaction like pH, stirring and other such constraints.
3) During the reaction, if the response of the reaction is accurate, precise and can be reproduced easily, that reaction is considered best and useful.
4) Antigenic effects or toxins should not be able to make any changes in the reaction during the clinical situations. If the probe is tiny, it is considered suitable for the reaction.
5) If the biosensors are used during the process of fermentation then they should be able to sterilize. As it is known that fermentation process needs severe heat for example autoclave is used for heating. Then it is impossible for biosensors to bear this much heat, and the fermentation process through biosensors can also be effected.
6) It is in the favor of biosensors if they have low price and small and they can be used by the persons who are not well trained.

Future development

Since the development of the glucose sensor by Clark and Lyons in 1962, generally recognized as the first biosensor, many types of sensors have been developed in which a physical or chemical transducer is provided with a layer containing a biological sensing element.

The resulting device is called a biosensor, aimed to produce an electronic signal as a function of the concentration of a chemical or biochemical constituent of a liquid, not necessarily of biological origin.

Among the many proposed concepts, the integration of biologically active materials with a silicon chip is one of the most intriguing approaches, because it seems the most comprehensive integration between biology and electronics.

In this paper the resulting biochips, mainly based on the field-effect principle as the coupling mechanism between the two domains, will be described and discussed with an outlook on the future.

CONCLUSION

Biosensors consist of bio-recognition systems, typically enzymes or binding proteins, such as antibodies, immobilized onto the surface of physico-chemical transducers
Disadvantages

- They cannot be steam sterilized
- They react with the product
- And are oversensitive

References

www.studymafia.org
www.google.com
www.wikipedia.com