THE REVIEW OF PHYSICAL TRANSFORMERS TO CREATE TOXICITY BIOSENSORS

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Abstract – *There are proposed to solve the task of improving noise immunity biosensor systems and simultaneous determination of several toxic substances proposed to solve through the use of two or more individuals converters (transducers), which is measured simultaneously change multiple parameters of information caused by various physical and chemical effects. Obtained, that to create the biosensor system that can measure the toxicity immediately after several informative parameters offered to pick up such biological signal converters that were manufactured to be modern microelectronic technology, and therefore:− would be able to miniaturization; have high sensitivity, reliability, stability, reproducibility of measurement; used a small number of samples (max 0,1 ml); characterized by low cost; could be part of an integrated circuit, which also includes analog-to-digital converter and a microprocessor for measurement and calculation of the analytical signal analysis results. It shows that the ceria is not a classical semiconductor material for biosensors.*

Keywords – *biosensor, metal-dielectric-semiconductor, bioluminescent, multisensor***.**

STUDIU PRIVIND UTILIZAREA TRANSFORMATOARELOR FIZICE LA CREAREA SENZORILOR DE TOXICITATE

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Rezumat – *În lucrare este propusă soluţia problemei perfecţionării sistemelor cu biosenzori a fonului imunal şi determinarea simultană a mai multor substanţe toxice prin utilizarea a două sau mai multe convertoare (traductori), care măsoară schimbarea simultană a mai multor parametri informaţionali, cauzaţi de diferite efecte fizice şi chimice. S-a reuşit crearea sistemelor de biosenzori care permit măsurarea toxicităţii imediat după ce mai mulţi parametri informativi au oferit posibilitatea de a culege semnalele biologice în convertori realizaţi după tehnologiile microelectronicii moderne, şi de aceea, permit un nivel sporit de miniaturizare; sensibilitate înaltă; fiabilitate; stabilitate; reproductibilitate la măsurători; utilizează un volum mai mic de probă (max 0,1 ml), caracterizate de cost redus; posibilitate de a fi parte dintr-un circuit integrat, care la fel, include convertor analogic-digital şi microprocesor pentru măsurători şi calcul a semnalului analogic cu analiza rezultatelor. Studiul a arătat că Ceriul nu este un semiconductor clasic pentru biosenzori.*

Cuvinte cheie – *biosenzor, metal-dielectric-semiconductor, bioluminiscent, multisenzor.*

ИССЛЕДОВАНИЕ ФИЗИЧЕСКИХ ТРАНСФОРМАТОРОВ ДЛЯ СОЗДАНИЯ БИОСЕНСОРОВ ТОКСИЧНОСТИ

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Реферат – *В работе предложено решение проблемы усовершенствования систем биосенсоров иммунного фона и одновременное определение нескольких токсичных веществ использованием двух или более конверторов (датчиков), которые измеряют изменение нескольких информационных параметров одновременно, будучи обусловлены различными физическими и химическими эффектами. Удалось создать системы биосенсоров, которые позволяют измерение токсичности сразу после того как несколько информативных параметров предоставили возможность зафиксировать био сигналы в конверторах, изготовленных по современным технологиям микроэлектроники, и поэтому, позволяют получить повышенный уровень миниатюризации; высокую чувствительность; надежность; устойчивость; репродуктивность в измерениях; используют меньший объем для проб (макс 0,1 мл); пониженную цену; возможность стать частью интегральной схемы, который также включает аналогово-цифровой преобразователь и микропроцессор для измерений и расчётов аналогового сигнала с анализом результатов. Исследования показали, что Церий не является классическим полупроводником для био сенсоров.*

Ключевые слова – *биосенсор, металл-диэлектрик-полупроводник, биолюминисцентный, мультисенсор.*

Universal portable biosensor that can determine the toxicity of various substances at the same time and with sufficient precision and to monitor the environment today is commercially untenable and exist as laboratory models.

Existing commercial sensors today have limited ability to identify a wide range of toxic substances. The reason is, on the one hand, the lack of selectivity due to side effects of many factors on the other - the limitations in defining the entire array of specified toxic substances.

In the study of ten commercially available biosensors toxicity from enzymes and cells of vertebrates none of the individual sensor does not react to distilled water and only one sensor gave a response to the heavy water [1]. No one reacted sensor not more than six chemicals in a given range response. In addition, none of the presented sensor is not identified with the desired nicotine sensitivity.

However, a combination of three selected sensors (bioluminescent, fluorescent and impedansomesurement (conductometric) gave the best results. The battery of the above biosensors responding properly to nine of the twelve chemicals. Adding a fourth sensor based on neural cells and matrix of microelectrodes to test batteries with three sensors enables the registration of two additional chemicals (aldikarb and metamidofos). In [2] describes attempts to solve the problem of simultaneous determination of several toxic substances by creating a multisensor system based on different enzymes, selective to certain substances. Famous cases of different enzymes. However, the creation of multisensors is a very difficult task, since all enzymes are used to operate simultaneously on the same conditions. In addition, there is the problem of stability of each individual enzyme. The task of improving noise immunity biosensor systems and simultaneous determination of several toxic substances proposed to solve through the use of two or more physical transducers that measure simultaneously change multiple parameters of information caused by various physical and chemical effects. If the ratio parameters of such effects is known, and the simultaneous presence of comparable noise for each component informative integrated sensor output is unlikely, then using correlation processing of these components can significantly increase noise immunity biosensor system [3]. To create the biosensor system that can measure the toxicity immediately after several informative parameters offered to pick up such biological signal converters that were manufactured to be modern microelectronic technology, and therefore: − would be able to miniaturization;

- Have high sensitivity, reliability, stability, reproducibility of measurement;
- Used a small number of samples (max 0,1 ml);
- Characterized by low cost;
- could be part of an integrated circuit, which also includes analog-to-digital converter and a microprocessor for measurement and calculation of the analytical signal analysis results.Patent information analysis system determining toxicity biosensor showed that promising biohemilyuminestsentni and potentiometric sensors.

bioluminescent sensors are usually based on measuring changes in intensity bioluminescent using photovoltaic or avalanche photodiodes. Potentiometer sensors determine the change in charge state solution directly ion-sensitive avalanche photodiodes -Metal-Dielektrik-Semiconductor (MDS) -structure (ion-selective field-effect transistors and field-varaktory). Thus, analysis of existing major development toxicity biosensors based bioluminescent shown that such sensors are generally used for registration bioluminescence avalanche photodiodes, photomultiplier tubes and - charge-coupled camera (CCD) - camera with CCD. However, despite the fact that the avalanche photodiodes provide the possibility of registration of single photons, they have trouble stabilizing the voltage, the probability of uncontrolled breakdown and they also have low sensitivity to short-wave spectrum, which is the registration process fluorescence.

Photomultiplier tubes, characterized by high photosensitivity and the possibility of registration of small streams of light, but they have a limited dynamic range, high cost, high-demand supply [4]. All this limits the area of their application. Means for recording fluorescent signals that are equipped with video cameras or on the basis cooled CCD and computer characterized by high cost and cumbersome, which limits their using.

This necessitates the development of new types of photodetectors to record bioluminescent signal with high photosensitivity, low noise, low operating voltage, stable and micro. Solving this problem requires the development of new highly sensitive photodetectors film with maximum sensitivity in the visible short-wave range, typical biohemilyumins radiation.

Such film photodetectors we offer to develop using nanocrystalline ceria (cerium compounds and chemical oxygen with the formula CeO2, formed by annealing oxalate or cerium hydroxide.

Experience with ceria showed that while its effect on the bacteria Escherichia coli strain TG1, the intensity of bioluminescence is correlated with the enzymatic activity of these bacteria, ceria is not toxic in relation to the test cultures even at maximum concentration in the aqueous suspension (20,000 mg / l).

In [5] demonstrated that mesoporous cerium dioxide film consisting of crystallite diameter of 5 nm, can be used as a working component of solar panels.

This material, unlike krupnodyspersnoho cerium dioxide, characterized by a significant lifetime photoinduced carriers exceeding the value for nanocrystalline titanium dioxide [6].

Thus, ceria, which is not a classic semiconductor can be used as an active material for biosensor transducers.

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