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The modified electrode for the determination of cholesterol

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Cholesterol plays vital role in human's body; it is involved in the synthesis of vitamin D, various steroid hormones. It plays an important role in the nervous and immune systems, besides cholesterol involved in lipid metabolism. It is well-known fact that high concentrations of cholesterol in the blood can lead to cardiovascular diseases. According to statistics from the World Health Organization, 17.5 million people died from cardiovascular diseases in 2012, representing 31% of all global deaths [1]. Therefore, control of cholesterol blood levels and cholesterol food levels is of great importance.

There are several methods of cholesterol determination. The most attractive for this purpose looks electrochemistry, due to its simplicity, rapidness and low costs. Sensors give an opportunity of size minimization and real-time analysis.

Earlier was developed enzymatic sensor [2]. Usage of enzyme helped to improve the selectivity of sensor. Enzymatic sensor was based on hydrogen peroxide detection, which was generated by cholesterol oxidation on Cholesterol Oxidase. This type of determination has disadvantages, such as inaccuracy due to its indirect nature, enzymatic sensitivity to storage conditions.

Voltammetric determination depends on the nature of electrode material, and also depends on the potential at which the electrochemical reaction of analyte takes place. Cholesterol itself doesn't give a selective electrochemical response.

In the present work the working electrode surface was modified with 2,6-diacetyl-2,4,6,8-tetraazabicyclo[3.3.0.]octane-3,7-dione-diphosphonic acid, which was synthesized at Jacobs University Bremen (Bremen, Germany). On the working electrode modifier inflicted electrochemically. Application of the modifier helped to get a response from cholesterol. Cholesterol

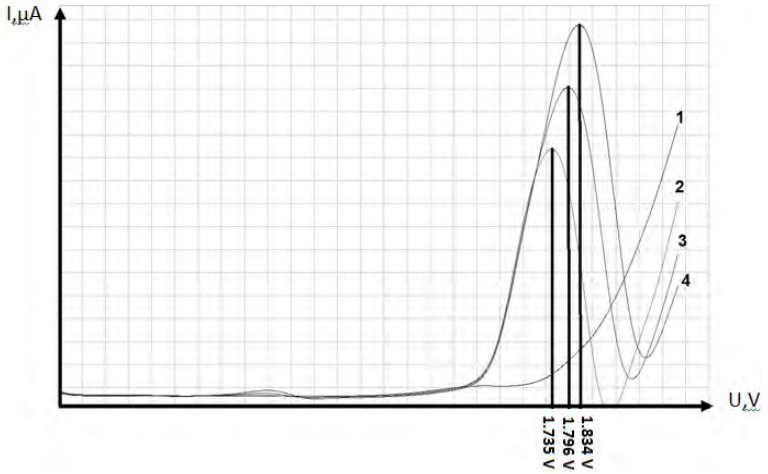

Fig. 1. *Voltammogram without cholesterol (1), with $15 \cdot 10^{-6}$ mg/ml of cholesterol (2), with $30 \cdot 10^{-6}$ mg/ml of cholesterol (3), with $45 \cdot 10^{-6}$ mg/ml of cholesterol (4)*

oxidation peak was observed at 1.7–1.8 V (Fig. 1). The shift of peak potential improves that there is an interaction between cholesterol and modifie . This is an advantage as opposed to the previously used sensor.

As a supporting electrolyte was used $NaClO_4$ in ethanol. Three-electrode cell was used. Modified glassy carbon electrode was used as working electrode. As reference and counter electrodes was used silver-chloride electrodes.

The developed sensor exhibited reliable linear voltammetric responses, high sensitivity, a linear range up to 0.01 $g \cdot dL^{-1}$ and high stability. High-performance along with simple fabrication and low costs makes the fabricated sensor very promising for the detection of total cholesterol in clinical practice and food industry.

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Operational analysis of the installation for olefin production with changing of hydrogen-containing gas flow

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The dehydrogenation process of higher paraffin C9-C14 is used for the production of olefins with normal structure. From a wide range of metals, exactly platinum has the most pronounced dehydrogenation function. High conversion of paraffins into olefins can be achieved us-ing platinum as a catalyst. The platinum content of the catalyst is at a level of 0.82–1.06 % wt., the carrier is aluminum oxide (α, γ-modification), where tin oxide (IV) is used as a promoting additive and content of pure metal does not exceed 0.25 %.

Rapid deactivation of coke is a problem of these catalysts. Demin-eralized water was introduced into a reactor, and also the process car-ried out in a hydrogen-containing gas, or HCG, atmosphere for the con-servation of the catalyst activity at a relatively constant level. The mo-lar ratio of hydrogen / feedstock can be equal in the range of 6–8/1, in case of obtaining the target products – olefins [1]

Catalyst life is increased up to 90 days (it is about 24.0–26.0 % of the catalyst life) with the molar ratio of hydrogen / feedstock equal to 7/1 in the case of the dehydrogenation of higher paraffins, compared with the process conduct with a molar ratio of 6/1 at other equal tech-nological parameters. It should be noted that increasing of feedstock conversion and performance of dehydrogenation reactor are observed at a lower molar ratio of hydrogen / feedstock until 6/1. Excess of demin-eralized water is introduced into the reactor to compensate for the HCG deficienc .

For this purpose, a program simulating process of dehydrogena-tion, has been upgraded. Previously, the program adequately described the operation of the installation only with a molar ratio of hydrogen / feedstock equal to 7/1. The molar ratio decrease by 6/1 generates a need for calculating the optimal flow of water into the reactor at a constant technological parameters. During the program improvement, the water supply dependence on the temperature in the reactor and on the degree of catalyst deactivation by coke with a re-