Nanochemistry and biotechnology

Development of conductometric biosensor for lactose determination with improved characteristics

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Biosensors for quantitative lactose determination in liquids were developed using three types of enzyme immobilization (glutaraldehyde (GA) cross-linking, adsorption on silicalite modified electrodes, and combination of previous two). Silicalite was chosen in this work due to its hydrophobic properties, which can enhance adsorption of enzymes on the surface of electrodes and improve the analytical characteristics of biosensors subsequently. To create lactose biosensor we used three enzymes - glucose oxidase, mutarotase and beta-galactosidase that were mixed with glycerol in phosphate buffer solution and immobilized on the surface of conductometric transducer. As a conductometric transducers we used two identical pairs of steel, gold or platinum electrodes made with vacuum evaporation of metal onto pyroceramic or glass substrate (0.5 x 2,75 см^2). One of these pairs was covered with enzyme membrane, while the other one was covered with bovine serum albumin membrane and served as reference.

The characteristics (sensitivity, reproducibility and selectivity) of biosensors based on different types of immobilization were studied and compared. The enzyme biosensors with the most appropriate characteristics were used for measurement of lactose in milk samples. The results of lactose determination in milk samples obtained with developed biosensors had good correlation with results of high performance liquid chromatography.

So, these biosensors can be used in future for rapid, accurate and inexpensive determination of lactose in different liquid samples.

The authors gratefully acknowledge the financial support of this study by Project European IRSES-NANODEVICE. This study was partly supported by National Academy of Sciences of Ukraine in the frame of program “Sensor devices for medical-ecological and industrial purposes: metrology and trial performance”.