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Development of conductometric biosensor array for simultaneous determination of maltose, lactose, sucrose and glucose

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The aim of this work was to develop an array of biosensors for simultaneous determination of four carbohydrates in solution. Several enzyme systems selective to lactose, maltose, sucrose and glucose were immobilised on the surface of four conductometric transducers and served as bio-recognition elements of the biosensor array. Direct enzyme analysis carried out by the developed biosensors was highly sensitive to the corresponding substrates. The analysis lasted 2 min. The dynamic range of substrate determination extended from 0.001 mM to 1.0 - 3.0 mM, and strongly depended on the enzyme system used. An effect of the solution pH, ionic strength and buffer capacity on the biosensors responses was investigated; the conditions of simultaneous operation of all biosensors were optimised. The data on cross-impact of the substrates of all biosensors were obtained; the biosensor selectivity towards possible interfering carbohydrates was tested. The developed biosensor array showed good signal reproducibility and storage stability. The biosensor array is suited for simultaneous, quick, simple, and selective determination of maltose, lactose, sucrose and glucose.

Keywords: conductometric transducer; biosensor array; sucrose; glucose; maltose; lactose.

Introduction

Reliable control of mono- and disaccharides is of great importance in food processing, agriculture, pharmacy, etc. In agriculture, the sucrose content in sugar beet at all stages, from

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