Multienzyme Amperometric Gluconic Acid Biosensor Based on Nanocomposite Planar Electrodes for Analysis in Musts and Wines

Miroslav Stredansky^{1,2*}, Jose Manuel Ochoa Martínez³, Matus Stredansky², Ján Labuda^{1*}

¹ Institute of Analytical Chemistry, Faculty of Chemical and Food Technology, Slovak University of Technology in Bratislava, Radlinskeho 9, 81237 Bratislava, Slovakia

² Biorealis s.r.o., Radlinskeho 9, 81107 Bratislava, Slovakia

³ Sensara, Once de Junio 3-2°C, 26001 Logroño, La Rioja, Spain

*E-mail: miroslav.stredansky@stuba.sk, jan.labuda@stuba.sk

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An amperometric biosensor utilizing multi-enzyme cascade consisting of gluconate kinase, creatine kinase, creatinase, sarcosine oxidase and peroxidase for the determination of gluconic acid has been developed. The enzymes were immobilized between chitosan layers onto the surface of planar nanocomposite electrodes containing multi-walled carbon nanotubes. A measuring medium contained adenosine triphosphate, creatine phosphate and hexacyanoferrate(II) as the redox mediator and the current response was measured at constant potential of -50 mV vs. Ag/AgCl reference electrode. The biosensor shows linearity over the range 4 to 620 μM with the detection limit of 2.6 μM , sensitivity of 45.3 nA $\mu\text{M}^{-1} \text{cm}^{-2}$ and response time of 70 s, a satisfactory operational stability with no loss of the sensitivity after 30 consecutive measurements and a response ability above 90 % after 3 day of use. Its storage stability is given by about 90% of the initial sensitivity after 12 months (stored at room temperature). The results of the determination of gluconic acid in musts and wines correspond well with those achieved by HPLC as the reference method.

Keywords: gluconic acid; amperometric multi-enzyme biosensor; nanocomposite electrode; wine; must

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