TUESDAY POSTER SESSION (P2)

P2-01

A COMPARATIVE STUDY OF CARBON PASTE ELECTRODES MODIFIED WITH MANGANESE(IV) OXIDE, RUTHENIUM(IV) OXIDE AND DISPERSED PLATINUM AS AMPEROMETRIC DETECTORS FOR H₂O₂ FOR FLOW INJECTION SYSTEM

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Hydrogen peroxide is a common product of many enzymatic reactions and any sensitive and selective sensor of this molecule can be easily utilized for the construction of biosensors after coupling with the appropriate enzyme. Hydrogen peroxide is an electroactive molecule subjected to both oxidation and reduction electrode reactions. Its amperometric detection through its oxidation reaction is preferable because no interference from dissolved oxygen is expected. Still, overpotentials are often encountered making necessary the application of highly anodic potentials detrimental to both selectivity and sensitivity. Another problem is the reduced sensitivity of the amperometric sensors at pH values around neutrality, where most enzymes are properly functioning.

A comparative study of carbon paste electrodes (CPEs) containing a low percentage of various electrocatalysts, such as Mn(IV) and Ru(IV) oxides and finely dispersed Pt (3% on activated carbon) has been conducted. Fast screening of the electrodes performance at various pH values and applied potentials was conducted in batch mode, whereas the final performance testing was made in a flow-injection system, where the biosensors are going to be used.

So far the best results obtained were those with the electrodes whose carbon paste contained RuO₂. In the FIA-system, typical determination limits for H₂O₂ at pH 7.4 (0.10 M phosphate buffer) were 0.46, 1.9, and 0.94 mg L⁻¹ for CPEs containing RuO₂⁻, MnO₂⁻ and Pt⁻ modified CPEs, respectively. The applied potentials used (vs. Ag/AgCl, 0.1 M KCl electrode) were 0.60, 0.60 and 0.55 volts, and the sampling rate in all cases was 33 h⁻¹. Unmodified CPEs gave no response under these conditions. The RuO₂−CPE was used for monitoring the production of hydrogen peroxide during the oxidation of glucose by oxygen in the presence of glucose oxidase in phosphate buffer of pH 7.4.

The RuO₂−CPE was further examined and its relative response towards common electroactive interferents, such as ascorbic acid and uric acid, was assessed. Preliminary results showed that a short electropolymerization procedure of m-phenylenediamine prior to the measurements improves considerably its selectivity toward the target analyte, whereas an enhancement of its sensitivity was also observed.