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Oral presentation

Evaluation of Glucose Oxidase Catalyzed Reaction Using Scanning Electrochemical Impedance Microscopy

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Abstract
Analysis and diagnostics play a pivotal role in modern medicine. During the COVID-19 worldwide pandemic diagnostic tests are getting more attention from the scientific community. More and more tests use biological compounds as a sensing element. Sensors that use such elements are called biosensors [1].
Electrochemical impedance spectroscopy (EIS) was successfully applied to evaluate biosensors with recognition element immobilized directly onto the electrode [2]. In this case, the diffusion of reaction products towards the electrode is blocked. To solve this problem, the recognition element is immobilized on the chosen surface, and detecting electrode is at some distance from modified surface. In this case, microelectrodes with the positioning possibilities are used. Such system is called scanning electrochemical microscopy (SECM). By combining SECM with EIS (SEIM) it is possible also to perform non-distractive experiments, since EIS has no influence on the system of interest, and measurements can be performed in biological-friendly medium to sustain biological activity during the experiments.
During research, the enzyme – glucose oxidase was immobilized on the dielectric surface. SEIM was applied for the evaluation of glucose oxidase catalyzed reaction. To ensure superior sensitivity, redox competition mode was used. Experimental data showed that charge transfer resistance seems to be the best parameter evaluating the glucose oxidase catalyzed reaction at different glucose concentrations. The glucose concentration can be determined up to 15 mM.
To conclude, scanning electrochemical impedance microscopy is a viable method for glucose biosensor evaluation *in situ*.

Keywords: glucose oxidase, redox-competition mode, scanning electrochemical impedance microscopy, biosensor.

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