INVESTIGATION OF MODIFIED SACCHAROMYCES CEREVISIAE USING AMPEROMETRIC AND IMPEDANCE SPECTROSCOPY METHODS

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Enzymes, antibodies, and whole cells can be employed in sensing and electrical current generating devices. Electrochemical systems utilizing biological components have some advantages compared to purely physical and chemical ones i.e. certain biological materials possess high binding specificity, can self-replicate, regenerate, self-assemble, etc., which are desirable characteristics when designing sensitive, long-lasting devices.

Saccharomyces cerevisiae (*S. cerevisiae*) is a species of single-celled fungi (yeast) that has great importance in science and the food industry, as it is one of the most studied eukaryotic model organisms and is instrumental in winemaking, brewing, and baking. Traits like fast replication, simple growth requirements, and high metabolic activity make *S. cerevisiae* a suitable candidate for bioelectrochemical research and applications.

However, bioelectrochemical systems have drawbacks, such as low efficiency, the need for electron transfer mediating substances, instability and sensitivity to changes in storage and operation conditions that prevent or complicate their practical use. Possible solutions to these problems are biological and/or electrical component modification and immobilization techniques e.g. conductive matrices.

In our study, we focused on yeast cell modification with an in situ polymerized polypyrrole [1], which is acknowledged for its conductivity and biocompatibility, and its effect on the system's electrochemical activity and impedance [2]. The polymer forms in proximity to the cell's membrane and in the cell's wall, which affects the cell's mechanical and electrical properties.

We used scanning electrochemical microscopy [3] to perform localized amperometric and electrochemical impedance spectrometric measurements of differently modified (varying pyrrole concentrations) *S. cerevisiae* cells using a dual electron transfer mediator system.

The variations in the mediator's reduced form in the suspension gave a measurable electronic signal from which electrochemical parameters could be calculated. This in turn demonstrated that there were changes in the electron transduction pathway due to the modification of the system/cells.

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