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EXPERIMENTAL SETUP OF THE MICROBIAL FUEL CELL

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The objective of the work is to develop a setup of a simple laboratory experiment to evaluate the function of a microbial fuel cell.

Bioelectrochemical systems such as microbial fuel cells use processes occurring in living organisms to obtain electrical energy or hydrogen [1]. The advantage of these systems is primarily the absence of hazardous waste that would pollute the environment, and the possibility of using waste from various enterprises rich in organic substances (for example, wastewater from food processing enterprises) as raw materials. The function of microbes in a fuel cell is to catalyze the reaction that involves the conversion of chemical energy into electrical energy. The metabolic processes of these microorganisms produce electrons by oxidizing a carbon source, which in many applications, is a carbohydrate monomer. The electrons generated at the anode can then be passed through an external circuit to produce power. These electrons enter the cathode to combine with the protons (H^+) that transfer through a PEM and bind with externally provided oxygen to form water (Fig. 1).

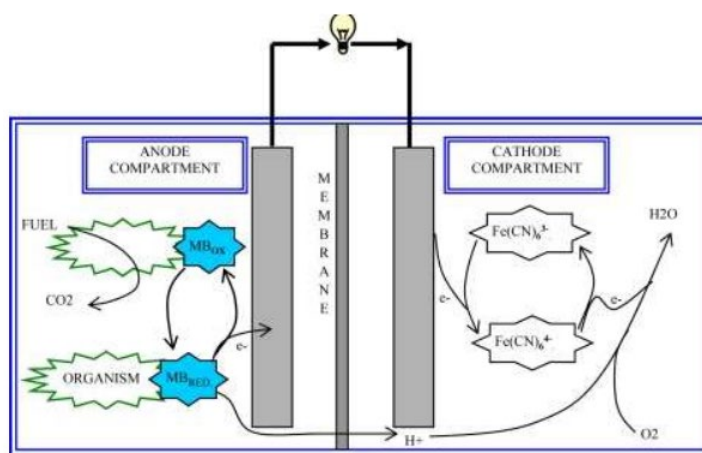


Figure 1 – The functioning of the microbial fuel cell

The scheme of experimental setup of the microbial fuel cell, developed in Duale Hochschule Baden-Württemberg (DBWH) of Baden-Wuerttemberg

Платформа: ЕЛЕКТРОМЕХАНІЧНІ СИСТЕМИ. ЕНЕРГЕТИЧНІ СИСТЕМИ. ВІДНОВЛЮВАЛЬНА ЕНЕРГЕТИКА ТА ЕНЕРГОЗБЕРЕЖЕННЯ

Cooperative State University, is shown in Fig.2. The view of the real experimental setup of the microbial fuel cell is presented in Fig. 3.

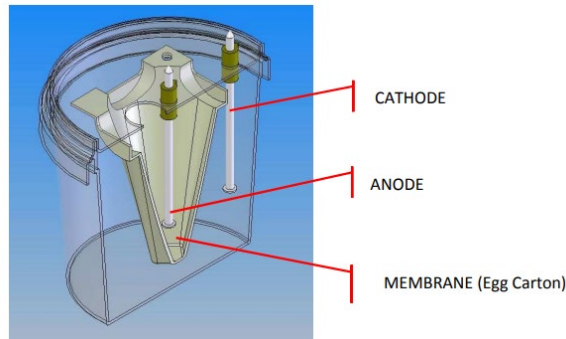


Figure 2 – The scheme of the experimental setup of the microbial fuel cell

The working fluid was prepared: cathode compartment – glucose solution with concentration $w=10\%$; anode compartment – 3g dry yeast was solved in 50ml deionized water until complete dissolution, and 5g of glucose was added. Measurement of the Fuel Cell performance in the open circuit mode is carried out.

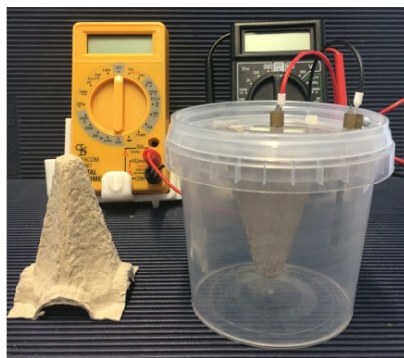


Figure 3 – The view of the real experimental setup

Conclusions. The simple laboratory setup to evaluate the function of a microbial fuel cell is shown. It allows investigation of the open circuit voltage depending on the time.

References

1. Girguis P. R. Fundamentals of benthic microbial fuel cells: theory, development and application / P.R. Girguis, M.E. Nielsen, C.E. Reimers // Bioelectrochemical Systems: From Extracellular Electron Transfer to Biotechnological Application. – IWA Publishing. – 2010. – P. 327-346.