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ANALYTICAL ASPECTS OF A SINGLE-CHAMBER SYSTEM OF MICROBIAL FUEL CELLS (MFC)

Kristina Joksimović[1], Katarina Slomo[2], Jelena Avdalović[3], Aleksandra Žeradjanin[3], Srdjan Miletić[3], Danijela Randjelović[3], Vladimir Beškoski[2]

[1]Innovation center of the Faculty of Chemistry, Belgrade, Serbia

[2]Faculty of Chemistry, University of Belgrade, Belgrade, Serbia

[3]Institute of Chemistry, Technology and Metallurgy, University of Belgrade, Serbia

Introduction: Microbial fuel cells (MFCs) are a type of biological fuel cell, systems that convert chemical energy into electricity using catalysts such as microorganisms. These systems can be of different designs, so there are single-chamber, two-chamber and complex MFCs.

Various materials can be used to create MFC components, which must meet certain conditions in order for the cell itself to achieve the highest possible efficiency in its work. Also, microorganisms used in MFC as well as substrates, which these microorganisms process in various chemical processes for obtaining energy, can be of different origin and have different characteristics. MFCs are good alternative energy sources that can found their use as biosensors, systems for the production of hydrogen or electricity and as a part of the facility for wasterwater .

Objectives: In this paper, a description of single-chamber MFC, its construction and operation, processing and analysis of experimental measurement results in laboratory conditions is given. A single-chamber MFC system was used for the work, where a sample of sediment was used as a source of microorganisms and their substrates. This sediment was sampled at the confluence of the Sava River into the Danube. The aim of this work was to design, build, characterize and monitor the efficiency of single-chamber MFC and its optimization.

Methods: A single-chamber MFC was designed and built, consisting of two electrodes, cathode and anode. Between them was placed a composite of sediment from Usce. Since the formation of MFC, change in voltage was measured on a series of resistors continuously for 15 days. At the same time, the amount of current being generated, as well as the activity of the MFC system, was monitored.

Results: On the basis of the obtained results, it was noted that with the increase in resistance, the voltage increases. The voltage has the highest values for a resistance of 10 MΩ and was 454.2 mV, which was the value obtained at the measurement of the fifth day. Practically identical values were obtained during the measurement of the fourth and eleventh day on all resistors. When measured on the first day, the maximum value for the voltage was measured on a resistor of 10 MΩ, although this value was slightly smaller than the other measurements, and was 179.6 mV.

Conclusion: The single-chamber MFC was successfully designed and built. In laboratory conditions, maximum efficiency was demonstrated during the fifth day of work. In a series of tests and measurements, a set of resistors is optimized, which will be used in further studies. At that time, the highest values for strength and strength were obtained.