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EVALUATION OF BIOELECTROGENIC POTENTIAL OF FOUR INDUSTRIAL EFFLUENTS AS SUBSTRATE FOR LOW COST MICROBIAL FUEL CELLS OPERATION

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Abstract

Microbial Fuel Cells (MFCs), the bioelectrochemical devices for conversion of waste into electricity through bacterial metabolic activity can use substrates with different complexity and strength. Wastewaters with moderate to high organic content can be exploited as MFC substrates. In this study, four different industrial wastewaters (from a chemical company, milk industry, soya-based food and soft-drink company and laundry) with different compositions were used as substrates in identical MFCs. In the design of MFC, carbon cloth was used as anode and low-cost carbon based, non-platinized electrode as air cathode. Anode and cathode were separated by an ion permeable membrane Zirfon®, directly attached on the cathode. After initial operation with 10 mM acetate as substrate, the cells were switched to real industrial wastewaters without pre-treatment. When operational, an electrochemically active biofilm and anode open circuit voltage (OCV) of -500 mV vs. Ag/AgCl. OCV was obtained which recovered after dropping in all cells, showing the ability of anodic bacteria to utilize industrial wastewaters as substrate. A maximum power of 419 mW m^{-2} was obtained with milk industry wastewater, while the electrodes in MFC with chemical industry wastewater were corroded after few days of operation suggesting that every wastewater is not suitable as substrate for electricity production and treatment in MFCs.

Key words: closed loop treatment, coulombic efficiency, industrial wastewater, Microbial Fuel Cell (MFC), treatment efficiency

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