

Preparatory Research of Microbial Fuel Cells Capable of Using the Organic waste in the Space Base

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Abstract: In order to explore the way to treat and use the organic waste in the space base, we designed a single chamber microbial fuel cell. Through studying its character, we discussed the facts that influence the power. The Microbial Fuel Cells(MFC) consists of two electrode groups on the opposite sides. Bacteria present in the anaerobic activated sludge were used as biocatalyst, and glucose was tested as substrate. The prototype MFC generated electrical power (maximum of 133mW/m²) while removing up to 88% of Chemical oxygen demand(COD) in 91h. Through analyzing the facts that influence the power, we found that increase of the electrode area could make the voltage and the power increase and the power density increased as available volume per electrode area increased. Power generation was proportional to COD of the influent wastewater within a range of 129-1124 mg/L. The hydraulic retention time had an effect on the power over a range of 3-36h. The power density reached the maximum of 110.8 mW/m² when the hydraulic retention time was 15.5h. When the MFC was operated in the same way with Sequencing Batch Reactor, the power density reached the maximum quickly, but 40 hours later, it decreased as COD decreased. Oppositely, pH decreased quickly to the minimum within first few hours then increased. Process that can generate electricity during domestic and industrial wastewater treatment may provide a new method to offset wastewater treatment plant operating costs, making advanced wastewater treatment more affordable for developing and industrial countries.