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Microbial Fuel Cells: Electricity Generation from Sludge and Mud using H₂O₂ and Sugar as a Catalyst

Energy crisis and increasing CO₂ emission from fossil fuel consumption promoted great interests in microbial fuel cells (MFCs) to produce electric power from wastewater streams without contributing net carbon emission. MFCs harvest electric energy from wastewater by breakdown of organic matters in the presence of microorganisms. In this study, MFCs with two vessels were constructed designated as aerobic and anaerobic chambers, where one filled with water and aerated, and other filled with sludge or mud samples and sealed air-tight. The chambers were connected with proton exchange membrane or salt bridge. Aluminum and copper wire mesh were used as electrodes. Different mud and sludge samples collected from nearby university wastewater streams were tested on electricity generation without and with varied concentration of sugar and hydrogen peroxide (H₂O₂), used as catalyst. The highest electricity generation of 638 mvolt/m (0.638 volt/m) resulted of using 10 Kg of sludge sample with H₂O₂ catalyst. The mud sample results in lower electricity generation of 490 mvolt/m (0.490 volt/m) compared to sludge samples of 510-638 mvolt/m (0.510-0.638 volt/m). The results of this study suggests that sludge samples collected from wastewater streams resulted in higher electricity generation due to the presence of higher amount of organic matter present. The potential to develop series of MFCs for small local community to treat wastewater and produce electricity needs to be explored in future work.

Keywords: MFCs, sludge, mud, sugar, H₂O₂, electricity generation

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