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Wastewater Treatment and Bio-Electricity Generation via Microbial Fuel Cell Technology Operating with Starch Proton Exchange Membrane

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Abstract : Biotechnology in recent times has tried to develop a mechanism whereby sustainable electricity can be generated by the activity of microorganisms on waste and renewable biomass (often regarded as “negative value”) in a device called microbial fuel cell, MFC. In this paper, we established how the biocatalytic activities of bacteria on organic matter (substrates) produced some electrons with the associated removal of some water pollution parameters; Biochemical oxygen demand (BOD), chemical oxygen demand (COD) to the tune of 77.2% and 88.3% respectively from a petrochemical sanitary wastewater. The electricity generation was possible by conditioning the bacteria to operate anaerobically in one chamber referred to as the anode while the electrons are transferred to the fully aerated counter chamber containing the cathode. Power densities ranging from 12.83 mW/m² to 966.66 mW/m² were achieved using a dual-chamber starch membrane MFC experimental set-up. The maximum power density obtained in this research shows an improvement in the use of low cost MFC set up to achieve power production. Also, the level of organic matter removal from the sanitary waste water by the operation of this device clearly demonstrates its potential benefit in achieving an improved benign environment. The beauty of the MFCs is their potential utility in areas lacking electrical infrastructures like in most developing countries.

Keywords : bioelectricity, COD, microbial fuel cell, sanitary wastewater, wheat starch
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