A POWER GENERATION THROUGH DOUBLE CHAMBER MFC OPERATION FROM INDUSTRIAL WASTE WATER

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ABSTRACT

The main view of our project has been established that voltage generated in a microbial fuel cell (MFC) decreases with respect to time. The application of MFC in generating electricity using textile waste water from local small scale industry. Our project "A POWER GENERATION THROUGH DOUBLE CHAMBER MFC OPERATION FROM INDUSTRIAL WASTE WATER" has paved the way for improved knowledge in the process of filtration of water. A small scale, composting, MFC system was constructed that used cow manure, glucose and sugar as the reduced carbon energy source. The system was a double chamber, air cathode MFC with a reactor, resistance box and data processing unit. A moisture content of greater than 80% is suitable for generation of current in the composting MFC. MFC can be best defined as a fuel cell where microbes act as catalyst in degrading the organic content to produce electricity. It is a device that straight away converts microbial metabolic or enzyme catalytic energy into electricity by using usual electrochemical technology. Biological treatment is applied to that waste water. The advanced biological treatment MFC (Microbial fuel cell) is adopted. The maximum current, voltage, BOD, COD and pH are generated with respect to time.

Keywords : MFC, Cow manure, Sugar, Glucose, Fuel cell, Electro-chemical, Microbes, resistance box.

1. INTRODUCTION

The increase in urbanization results in growth of industries causing increase in pollution of environment. The waste water released from the industries are discharged directly into water sources leading to higher pollution rate. The effluent from textile industries is a big question mark which has created environmental problems around the world. The textile industries use dyes and pigments to colour their products. These are the main source of waste water generated during dyeing and finishing stages. When these coloured effluents enter rivers or any surface water system they upset biological activity, aquatic ecosystem, agricultural growth. The waste water is of great chemical complexity and diversity which cannot be treated by conventional waste water treatment plant. Hence the land irrigated with textile effluent acts as sink for heavy metals and other chemicals consequently reduces soil fertility. A number of technique has been put practise to get solution for textile waste water. One new promising method for treating waste water is use of MFC.The conventional water treatment process such as coagulation, membrane separation, and electrochemical, reverse osmosis suffers from one or more limitations for complete removal of dye. Now-a-days special attention has been focussed on the rise of natural adsorbents based on environmental and economic point of view.

This project aims at the generation of electricity from the textile waste water.MFC is a unique device that utilize micro-organisms as catalyst for convert it into electricity.MFC is used to treat various kinds of waste water such as domestic, sugar, paper, etc,. It is potential for reducing solid protection compared to aerobic process. MFC produces electricity from organic matter. It is a device which converts chemical energy to electric energy by catalytic reaction of micro-organisms.

2. Objectives

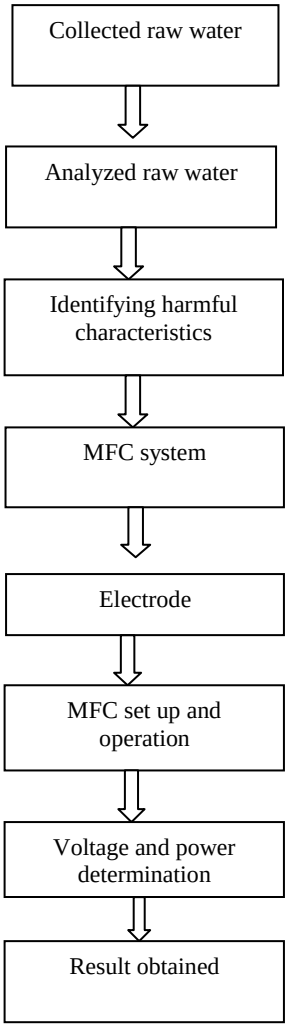
- To provide the twin advantage of providing electricity and improving the water quality simultaneously.
- To remove colour, odour, turbidity from the waste water.
- To evaluate the rate of change of the generated voltage with respect to time.
- To observe whether a mixer of biowaste does actually react in higher voltage.
- To provide cost effective technique for generating electricity.

3. Effects of Textile Effluent on Environment

- The colloidal matter present along with the colours and oily scum increases the turbidity, gives foul smell.
- High levels of toxicity due to the presence of nickel, mercury, cadmium, etc,.
- These show allergic reactions.
- Increased turbidity affects the levels of photosynthesis.

4. METHODOLOGY

The following are the methodologies for the generation of electricity using MFC.



4.1. MATERIAL

4.1.1 Electrode

Carbon electrode was used at both the ends of cathode and anode and tightly fixed with the containers containing medium, culture and buffer.

4.1.2 Cathodic chamber

The cathode chamber of the MFC was made up of 2 liters plastic bottle.

4.1.3 Anodic Chamber

The 2 liters sterilized plastic bottle is used for this purpose.

4.1.4 Salt bridge

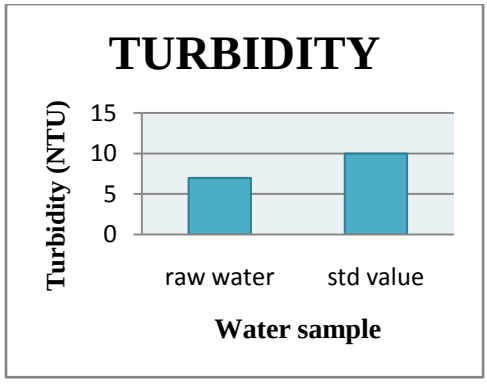
The salt bridge was prepared by dissolving 3% agar in 1M KCl. The mixture was boiled for 2 minutes and casted in the PVC pipe. The salt bridge was properly sealed.

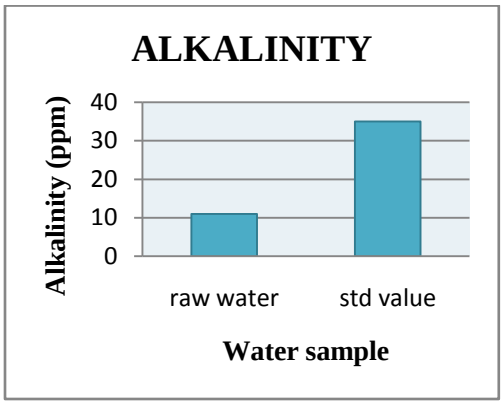
4.2 MFC Operation

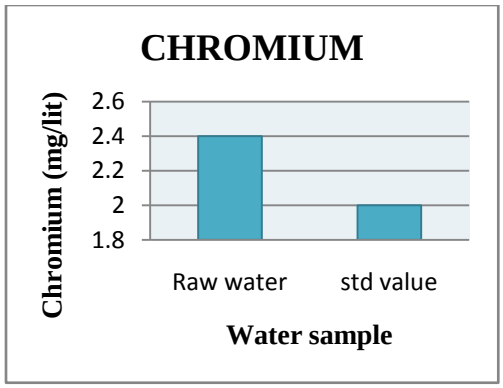
This research intends to utilize the waste water to generate electricity in Double chamber Microbial Fuel Cell system. The bacteria will convert sugar components in the waste water into Carbon dioxide, where in the intermediate process will be released electron generating electricity in MFC system. All the components of MFC are connected via salt bridge internally and externally with wires to the multimeter. The substrates (waste water) mixed with slurry was added in the anodic chamber. The anodic chamber was completely sealed to maintain anaerobic condition. The voltage generation was recorded at daily basis for bacterial isolate in presence of mediator. The MFC set up was kept at static conditions.

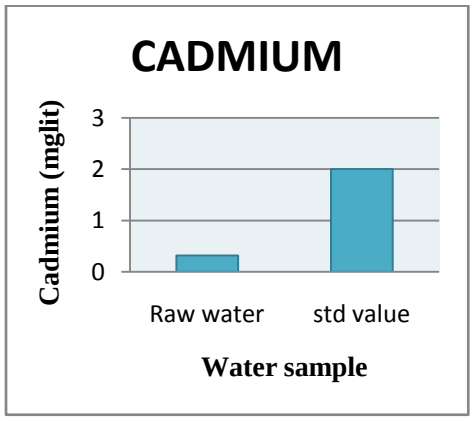
Fig.no.1 MFC set up

5. TEST RESULT OF WATER SAMPLE









6. RESULT DISCUSSION

The voltage generation was recorded per day throughout the week for the waste water sample of dying factory. There was a definite increase in the voltage till 20min. It was observed that for a whole week, the maximum potential 385mV to generate electricity at day five and minimum potential 325mV at day one.

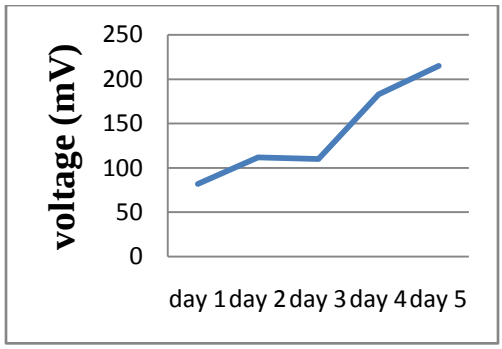


Fig. No.2 Comparison graph of Electricity by adding cow dung

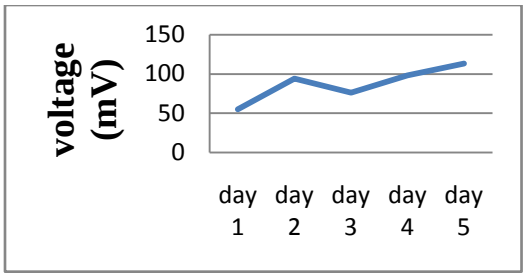


Fig. No.3 Comparison graph of Electricity by adding sugar

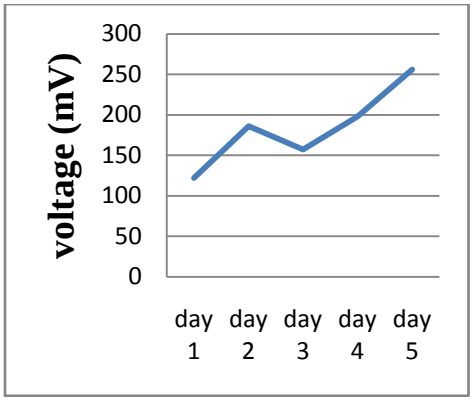


Fig. No.4 Comparison graph of Electricity by adding glucose

7. CONCLUSION

Due to the increase in urbanization around the natural water sources it leads to contamination of water. In future there will be increasing requirements of water for purposes such as domestic, agricultural practices and so on. It has shown considerable reduction of turbidity, pH, alkalinity, chromium, potassium etc.These parameters are also compared with the standards for discharge of industrial effluent. So far, MFC systems have been applied in several fields, including for the treatment of purposes such as domestic, agricultural practices and so on. It has shown considerable reduction of turbidity, pH, alkalinity, chromium, potassium etc.These parameters are also compared with the standards for discharge of industrial effluent. So far, MFC systems have been applied in several fields, including for the treatment of waste water and producing electricity, biosensors, and the production of secondary fuels. MFC technology is attractive for waste treatment because it allows the system to extract energy from waste for electricity production. MFC substrate contains a growth promoter

that can increase bioelectrychemical microbial growth during the waste processing. MFC can be used for produce secondary fuels like hydrogen as an alternative electricity power.

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