6th International Conference of Multidisciplinary Approaches (iCMA), 2019
Faculty of Graduate Studies,
University of Sri Jayewardenepura,
Sri Lanka

ISSN: 2386 – 1509

DEVELOPMENT OF A THIRD GENERATION BIOFUEL SOURCE USING CYANOBACTERIA AND LANDFILL LEACHATE

Imanthi KPA, Idroos FS* and Manage PM

Centre for Water Quality and Algae Research, Department of Zoology,
Faculty of Applied Sciences, University of Sri Jayewardenepura, Sri Lanka
idroos@sjp.ac.lk

Abstract

Microbial Fuel Cell (MFC) represents a standard and upcoming technology where catalytic reactions of microorganisms at the anode result in electric power generation from waste with renewable biomass as an electron acceptor at the cathode. The present study records the use of a laboratory scale MFC to treat wastewater from landfill leachate and was conducted to evaluate the effect of electrodes on power generation. Zinc (4 × 4) cm^2 and graphite rod (2 × 4) cm^2 were used as electrodes with different potential values. Anolyte was 1 L of landfill leachate from Karadiyana dumping site, and catholyte was 1 L of cyanobacteria mix culture from Beira Lake (*Microcystis* sp., *Spirulina* sp. and *Chroococcus* sp.). Control set up was maintained by adding sterilized water as catholyte. The voltage generated at each sampling time was recorded in both setups and current, power density, current density were calculated. In addition, physico-chemical parameters such as Orthophosphate, Nitrate, Nitrite and Chemical Oxygen Demand (COD) of the leachate sample were measured continuously for 6 hours at 1-hour interval. Among two types of setups, one with the graphite rod electrodes indicated higher voltage value and water treatment efficiency than zinc electrodes. The maximum voltage generated by the MFC with graphite electrodes was 434 mV with a current of 1.31 A. The maximum power density recorded was 381.60 mW m^{-2} while the maximum current density was 883.33 mAm^{-2}. Water treatment efficiencies were recorded as Reduction of COD by 32.8%, N-Nitrate by 17.3%, N-Nitrite by 15.3% and Orthophosphate by 16.5%. The optical density of cathode increased by 6.1%. The findings of the present study reveal that MFC are promising source of bioelectricity generation and wastewater treatment.

Keywords: microbial fuel cell, landfill leachate, wastewater treatment, electricity generation