Bio Energy from Metabolic Activity of Bacteria in Plant and Soil Using Novel Microbial Fuel Cells

Authors : B. Samuel Raj, Solomon R. D. Jebakumar

Abstract : Microbial fuel cells (MFCs) are an emerging and promising method for achieving sustainable energy since they can remove contaminated organic matter and simultaneously generate electricity. Our approach was driven in three different ways like Bacterial fuel cell, Soil Microbial fuel cell (Soil MFC) and Plant Microbial fuel cell (Plant MFC). Bacterial MFC: Sulphate reducing bacteria (SRB) were isolated and identified as the efficient electricigens which is able to produce $\pm 2.5V$ (689mW/m2) and it has sustainable activity for 120 days. Experimental data with different MFC revealed that high electricity production harvested continuously for 90 days 1.45V (381mW/m2), 1.98V (456mW/m2) respectively. Biofilm formation was confirmed on the surface of the anode by high content screening (HCS) and scanning electron Microscopic analysis (SEM). Soil MFC: Soil MFC was constructed with low cost and standard Mudwatt soil MFC was purchased from keegotech (USA). Vermicompost soil (V1) produce high energy (\pm 3.5V for \pm 400 days) compared to Agricultural soil (A1) (\pm 2V for \pm 150 days). Biofilm formation was confirmed by HCS and SEM analysis. This finding provides a method for extracting energy from organic matter, but also suggests a strategy for promoting the bioremediation of organic contaminants in subsurface environments. Our Soil MFC were able to run successfully a 3.5V fan and three LED continuously for 150 days. Plant MFC: Amaranthus candatus (P1) and Triticum aestivium (P2) were used in Plant MFC to confirm the electricity production from plant associated microbes, four uniform size of Plant MFC were constructed and checked for energy production. P2 produce high energy (± 3.2V for 40 days) with harvesting interval of two times and P1 produces moderate energy without harvesting interval ($\pm 1.5V$ for 24 days). P2 is able run 3.5V fan continuously for 10days whereas P1 needs optimization of growth conditions to produce high energy.

Keywords : microbial fuel cell, biofilm, soil microbial fuel cell, plant microbial fuel cell

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