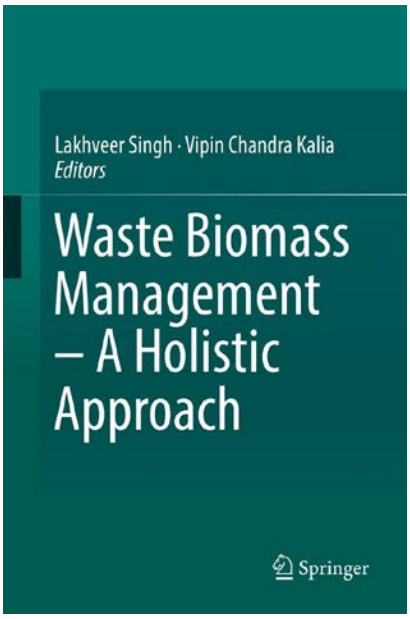

Waste Biomass Management – A Holistic Approach

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Microbial Fuel Cells: Types and Applications

Ravinder Kumar, Lakhveer Singh, and A.W. Zularisam

Abstract Microbial fuel cells (MFCs) are bioelectrochemical devices that convert the chemical energy present in organic or inorganic compounds into electric current by using microorganisms as the catalysts. MFCs are of different types; however, the basic designs used in the laboratories for its applications include double-chamber MFC, single-chamber MFC, upflow MFC and stacked MFC. Moreover, some other designs have also been used for the studies. The type of electrode materials and proton exchange membrane (PEM) used in MFCs has most significant role for its outcomes for different applications such as bioelectricity generation, wastewater treatment, bioremediation of toxic compounds, biohydrogen production and biosensors. Furthermore, MFCs are operated at the optimized parameters such as thermophilic temperatures, neutral pH, etc. to obtain more significant results for respective application. This chapter explores the various types of MFCs, the operational parameters to improve its performance and the most studied applications of the MFCs.

Keywords Microbial fuel cells • Catalysts • Wastewater treatment • Bioelectricity generation • Biosensors • Proton exchange membrane

1 Introduction

The microbial fuel cell (MFC) technology is one of the most attractive technologies at present for renewable energy production and simultaneous wastewater treatment. MFCs are the bioelectrochemical devices that utilize microorganisms as the biocatalysts to convert the chemical energy present in organic or inorganic compounds into electric current (Aelterman et al. 2006; Bermek et al. 2014; Kumar et al. 2016). A typical double-chamber MFC is made up of two chambers, i.e. the anode and the cathode. Usually a proton exchange membrane (PEM) is placed between these two chambers that allows the protons produced at the anode to pass

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