

Hybrid system up-flow constructed wetland integrated with microbial fuel cell for simultaneous wastewater treatment and electricity generation

Abstract

An innovative design of upflow constructed wetland-microbial fuel cell (UFCW-MFC) planted with cattail was used for simultaneous wastewater treatment and electricity generation. The electrodes material employed in the study was carbon felt. The main aim of this study is to assess the performance of the UFCW coupling with MFC in term of ability to treat wastewater and the capability to generate bioelectricity. The oxidation reduction potential (ORP) and dissolved oxygen (DO) profile showed that the anaerobic and aerobic regions were well developed in the lower and upper bed, respectively, of UFCW-MFC. Biodegradation of organic matter, nitrification and denitrification was investigated and the removal efficiencies of COD, NO₃⁻, NH₄⁺ were 100%, 40%, and 91%, respectively. The maximum power density of 6.12mWm⁻² and coulombic efficiency of 8.6% were achieved at electrode spacing of anode 1 (A1) and cathode (15cm).

Keywords

Carbon felt as electrode; Membrane-less; Microbial fuel cell; Power output; Up-flow constructed wetland