Wastewater Treatment and Energy Harvesting Employing Microbial Fuel Cells (MFC)

N. Pathak, S. Vigneswaran

Centre for Technology in Water and Wastewater, School of Civil and Environmental Engineering, University of Technology Sydney, Australia

Email: s.vigneswaran@uts.edu.au

Abstract

Wastewater is recognized as making a major contribution to environmental pollution. Current wastewater treatment technologies have energy- and cost-related limitations and therefore wastewater recovery is difficult to achieve and sustain. Microbial fuel cells (MFCs) have been researched and are now recognized as an innovative technology that offers sustainable solutions for distributed power systems and energy positive wastewater treatment overcoming environmental problems. This is particularly the case in isolated areas that are supplied with biosensors, bio hydrogen production, as well as *in-situ* power sources for bioremediation and wastewater treatment. This study explores the use of a single-chamber air-cathode microbial fuel cell (SCMFC) having a 0.5 mg/cm^2 platinum catalyst cathode treating simulated domestic wastewater. Two similar air-cathode SCMFCs were operated for simultaneous electricity production and wastewater treatment. Operation with a hydraulic residence time (HRT) of 24 h and feed COD concentration of 0.5 g COD/L-day produced the highest current density of 294.4 mA/m^2 and 108.31 mW/m^2 power density. Overall, the COD removal at each HRT was high, between 71 – 85%. It is envisaged that there is scope to develop a novel, cost-effective SCMFC design for achieving simultaneous electricity generation and wastewater treatment.

Keywords: Microbial fuel cell (MFC), air cathode, wastewater treatment, power density