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Simultaneous treatment of palm oil mill effluent and electricity generation in dual chamber microbial fuel cell

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Abstract

As fossil fuel becomes finite, the growing pressure is on finding and sustaining renewable energy. Renewable energy sources are from solar, wind, hydraulic, biomass and fuel cell. In Malaysia, palm oil mill effluent (POME) is considered as one of the major pollutants. Treatment of wastewater using microbial fuel cell (MFC) seems to be promising technology because it reduces operation energy requirement and shows efficient treatment too. The purpose of this research was to examine the potential of palm oil mill effluent (POME) as a substrate to MFC. Single forward carbon cloth (SFCC) was used as electrode for all the experiments. Various dilutions of raw POME were used to analyze the SFCC-MFC power generation capacity, COD removal efficiency and coulombic efficiency. Anaerobic sludge was used to inoculate the anode of MFC. The major microorganisms responsible for electricity generation were indentified from the biofilm. The microbial community in the biofilm was analyzed by using BIOLOG gene III analysis which consists of *Pseudomonas mendocina, Pseudomonas viridiivida, Acetinobacter schindleri, Actinobacillus capsulatus and Brevibacterium paucivorans* and *Psuedomonas aeroginousa*. This synergistic interaction of fermentative bacteria and electrogenic bacteria plays an important role in electricity production in the MFC. Among the raw POME and different concentrations of POME used, the SFCC with raw POME (undiluted POME) showed the maximum power density and volumetric power density of about 102.50 mW/m^2 and 417.18 mW/m^3 respectively but it showed low coulombic efficiency and low COD removal efficiency of about 0.88 % and 43% respectively, while SFCC with 1:50 dilution showed higher COD removal efficiency and coulombic efficiency of about 63% and 26% but showed low power density and low volumetric power density of 28.48 mW/m^2 and 69.55 mW/m^3 respectively.

Biography

Dr. Khan had completed his Ph.D in chemical engineering from National University Lvivska Polytechnika' in 1997. During his MS and PhD he worked in the field of heterogeneous catalysis and developed multicomponent catalyst system for the conversion of tert.Butyl alcohol to methacrolein. Since 1998 he has been working as a faculty member in Bangladesh and Malaysia. He has published more than 80 papers in reputed journals in the field of catalysis, photocatalysis, fuel cell, biodiesel and nanomaterials. Currently he has been working as an Associate Professor at Universiti Malaysia Pahang, Malaysia.