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Novel Microbial Fuel Cell Design for Real Time High Organic Load Waste Water Treatment

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ABSTRACT

Microbial fuel cells (MFCs) provide new prospects for a sustainable production of energy from organic waste water. Most of the results obtained so far from the field of MFCs research can be exploited to design MFCs. From this context, we proposed novel simplified MFC. The graphite rod (4.2 cm) could act as anode besides submerged with wooden portion (4.2 cm) into the waste water, remained wooden portion (4.2 cm) bound with Pt/Carbon cloth (Cathode) exposed to air. Proton can migrate up with the culture liquid on the wood and react with oxygen in the air, to generate water as final by-product. Up to now there is limited information available about the use of real time high concentrated waste water (41.38 ± 9.6 g/L) as source in MFC application. In this frame work, real wastewater collected from a Universidad Politécnica de Aguascalientes (UPA) was used. Waste waters were used both as inoculum to form electrochemically active biofilm on graphite based anode and also as the medium to be treated. Above mentioned configuration of novel MFC was produced maximum power density of 0.028 mW/m^3. Later we performed the overnight treatment of wooden portion with distilled water and sulfuric acid. Interestingly, maximum power density was higher for sulfuric acid treated wooden material (200.98 mW/m^3) than the distilled water treated wooden material (1.52 mW/m^3). Such enhancements might be attributed to the anchored sulfonyl group on wood material which would enhance the proton mobility, as confirmed by pre-luminary power density curve. To the best of our knowledge, this is the first times that successfully demonstrate wooden material exhibit the capillary migration of proton transfer exploited in MFC for high concentrated real time waste water application.

Keywords: Microbial fuel cells; Capilary migration; Waste water.