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## Electricity Generation from Organic Matters in Biocatalyst-Based Microbial Fuel Cells (MFCs)

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### Abstract

Microbial fuel cells (MFCs) are a novel technology for converting organic matter directly to electricity via biocatalytic reactions by microorganisms. MFCs can also be used for wastewater treatment by the oxidations of organic pollutants during the electricity generation. Several factors for optimum power generation in MFC have been investigated at previous studies. A submersible microbial fuel cell (SMFC), which is a novel configuration, was developed by immersing an anode electrode and a cathode chamber in an anaerobic reactor. Domestic wastewater without any amendments was used as the medium and the inoculum in the experiments. The SMFC could successfully generate a stable voltage of  $0.428 \pm 0.003$  V with a fixed  $470 \Omega$  resistor from acetate. From the polarization test, the maximum power density of  $204 \text{ mW m}^{-2}$  was obtained at current density of  $595 \text{ mA m}^{-2}$  (external resistance =  $180 \Omega$ ). The power generation showed a saturation-type relationship as a function of wastewater strength, with a maximum power density ( $P_{\text{max}}$ ) of  $218 \text{ mW m}^{-2}$  and a saturation constant ( $K_s$ ) of  $244 \text{ mg L}^{-1}$ . We also achieved a successful power generation ( $123 \text{ mW m}^{-2}$ ) from wheat straw hydrolysate in a two chamber microbial fuel cells (MFCs). These results demonstrate that MFC has a great potential for a sustainable power generation and wastewater treatment with a better understanding and optimization of microbial electricity generation.