

A Novel Polyaniline Modified Fluorine Doped Tin Oxide Anode for Microbial Fuel Cells

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Microbial fuel cells are increasingly interest in the scientific community as a potential solution towards worldwide energy related problems and waste water purification. Microbial fuel cells harness the metabolism of microorganisms and utilize the organic matter to generate electric energy. The research method used in the study is cheap, easily manufactured and environmentally friendly compared to the other microbial fuel cells. A dual chamber microbial fuel cell, divided by a ceramic septum was used to separate anodic and cathodic compartments in the cell. Synthetic waste water was used as a fuel with *Saccharomyces cerevisiae* as a biocatalyst and methylene blue as a mediator in anaerobic anodic chamber. Distilled water was used for aerobic cathodic chamber with platinum electrode as a cathode. Five different electrodes (i) Expanded graphite coated titanium plate (ii) Activated charcoal coated titanium plate (iii) Bare fluorine doped tin oxide glass (iv) Polyaniline deposited fluorine doped tin oxideglass (v) Polyaniline – activated charcoal composite coated fluorine doped tin oxide glass were used as the anode material at constant operating conditions. FT-IR spectrum was used to characterize the polyaniline-activated charcoal composite. Open circuit voltage, short circuit current and voltage through series of external resistances were measured. Electrical performance of microbial fuel cells were characterized using open circuit voltage-time curves, polarization curves, power curves, current-time curves and maximum power densities of each microbial fuel cell. The highest maximum open circuit voltage of 967 mV was shown by Polyaniline-activated charcoal composite coated fluorine doped tin oxide glass electrode. The highest maximum power densities were recorded in both expanded graphite coated titanium plate and polyaniline – activated charcoal composite coated fluorine doped tin oxide glass electrode which were $2.68 \times 10^{-3} \text{ mWm}^{-3}$ and $2.66 \times 10^{-3} \text{ mWm}^{-3}$ respectively. It is suggested that, polyaniline-activated charcoal composite coated fluorine doped tin oxide glass is a promising anode material for microbial fuel cells.

Keywords: Microbial Fuel Cell; polyaniline; *Saccharomyces cerevisiae*; Fluorine doped tin oxide glass