

Application of Electrochemically Prepared PPy/MWCNT:MnO₂ Nano-Composite Film in Microbial Fuel Cells for Sustainable Power Generation

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Abstract : Nano-composite of polypyrrole/multiwalled carbon nanotubes:manganese oxide (PPy/MWCNT:MnO₂) was electrochemically deposited on the surface of carbon cloth (CC). The nano-composite was structurally characterized by FTIR, SEM, TEM and UV-Vis studies. Nano-composite was also characterized by cyclic voltammetry (CV), current voltage measurements (I-V) and the optical band gaps of film were evaluated from UV-Vis absorption studies. The PPy/MWCNT:MnO₂ nano-composite was used as anode in microbial fuel cell (MFC) for sewage waste water treatment, power and coulombic efficiency measurement. The prepared electrode showed good electrical conductivity (0.1185 S m⁻¹). This was also supported by band gap measurements (direct 0.8 eV, indirect 1.3 eV). The obtained maximum power density was 1125.4 mW m⁻², highest chemical oxygen demand (COD) removal efficiency was 93% and the maximum coulombic efficiency was 59%. For the first time PPy/MWCNT:MnO₂ nano-composite for MFC prepared from nano-composite electrode having the potential for the use in MFC with good stability and better adhesion of microbes is being reported. The SEM images confirm the growth and development of microbe's colony.

Keywords : carbon cloth, electro-polymerization, functionalization, microbial fuel cells, multi walled carbon nanotubes, polypyrrole

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