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PREPARATION OF MULTI-WALLED CARBON NANOTUBES FILM AND IMMOBILIZATION OF GLUCOSE OXIDASE FOR FABRICATION OF ENZYME ELECTRODE

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This study describes the enzyme electrode fabricated with multi walled carbon nanotube (MWCNT) films for glucose biofuel cells. The MWCNT film was prepared by vacuum filtration method, in which different amount of MWCNTs were dispersed in solvent with different concentration of dimethylformamide (DMF) and films were dried at different temperatures. Tensile strength and electro-conductivity of the prepared MWCNT films were measured and their surface properties were characterized by SEM, TGA, Raman spectroscopy. Glucose oxidase (GOD) was immobilized on the film by layer-by-layer and gold nanoparticles (GNPs) were also deposited between the GOD layers to enhance the electron transfer properties of the electrode. The electrochemical performances of GOD-film electrodes were evaluated using cyclic voltammetry and impedance analysis. Immobilization of glucose oxidase (GOD) on MWCNT films increased their electron transfer resistance, which could be mitigated by introducing GNP layers between GOD layers. The highest current was generated by films with sequential three layers of immobilized GOD and GNPs. The assembled biofuel cells comprised the GOD-immobilized films (anode), laccase-immobilized gold electrode (cathode) and reference electrode. The electrodes were placed in 30 mM of glucose solution. The maximum power density was 1.02+0.03 μW/cm^2 at 0.51+0.01 V of cell voltage.

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