Abstract

The microbial fuel cell developed for the research work are evaluated and optimized for higher energy production as much as possible. The microbial fuel cell was constructed and designed from locally available market materials which could be applicable at domestic level. The vegetable waste and molasses were used as substrate. The microbial flora isolated from a sewage water was subjected to different levels of pH in microbial fuel cell ranging from pH 3.6 to pH 7.5. The higher production of the bioelectricity was obtained from the lower pH especially at pH 4.5 with the power density of 70. 5 W/m^2 at 279.8 mA/m^2 current density.

The salt treatment helped in giving the ionic strength to the substrate used in the microbial fuel cell up to a particular concentration. The ionic strength was also already maintained by the used of phosphate buffer and by the provision of lower pH but the NaCl concentration also contributed to increase the ionic level of the substrate. The concentration of 50 mM NaCl gave significant results in term of the power density and current density i.e. 88.98 W/m^2 and 314.4 mA/m^2 respectively. Higher concentrations of salts reduced the power output and lower concentration gave the power density near but lesser to the readings recorded at 50 mM.

Two electrodes, the graphite rods and stainless steel rods, were analyzed for the possibility to be used at domestic level. It was found that the graphite rods are potentially important in giving quickly response to the energy production while the stainless steel are slow responsive but once the biofilm are fully developed the steel can give higher power density and current density due to its higher conductance.

The vegetable waste extract and molasses were compared in the optimized conditions in the microbial fuel cells in which both showed to be significant at some level. The vegetable waste extract gave higher voltage but lower power density then the molasses whose power density was higher but the voltage was lower due to its higher volumetric resistance. The vegetable waste extract when used in higher volume, i.e. 600 ml, the actual voltage was less than the theoretically estimated value from the results of previously tested 200 ml substrate. This gives the idea about the volume resistance and previously it was explained by Clauwaert *et al,* (2008).