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COMPARATIVE STUDY OF THE PERFORMANCE OF DIFFERENT ANODIC MATERIALS IN A MICROBIAL FUEL CELL INOCULATED WITH *Geobacter sulfurreducens*

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ABSTRACT

Nowadays, sustainable energy production is an important topic that covers innovative technologies for the decentralized production of electricity at a wide range of scales: from micro-production of electricity up to electricity supply for industrial scale facilities. Microbial fuel cell technology (MFC) is a novel approach for the production of electricity using the organic content of wastewater, thus showing considerable potential for small on-site applications [1]. The MFC technology is based on the capacity of some carbon oxidizer microorganisms to transfer electrons directly to an anode, thus generating a current that can be used to produce electricity [2]. The present work aims to assess the performance of different anodic materials to operate a MFC inoculated with *Geobacter sulfurreducens*, (DSMZ at 2.67 mg/L with 590 mg/L acetate as the sole carbon source). Cyclic voltammetry was used to characterize the oxidation-reduction reactions on the different anodic materials (rigid, flexible and felt carbon, nickel and lead) occurring at a defined range of differences of potentials in an unstirred solution of nutrient medium with and without bacteria at a scan rate of 50 mV/s. The anode was the working electrode, the counter electrode was a Platinum/Iridium (90:10) cathode, and the reference electrode was a saturated calomel electrode (SCE) (the cathode chamber solution contains KCl 0.1 M). The potentials ranged between of -850 mV and 750 mV.

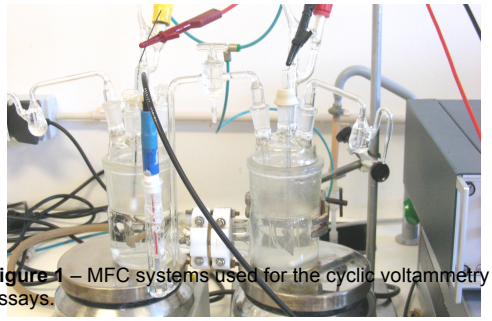

Figure 1 – MFC systems used for the cyclic voltammetry assays.

Several variations in the oxidation peak were obtained when using the different anodic materials. The rigid carbon showed an oxidation peak (in the presence of bacteria) was observed at -445 mV (vs. SCE); during the reverse scan, additional redution peak was found at -640 mV (vs. SCE). These results indicated also that the oxidation-reduction reaction is reversible. Cyclic voltammograms obtained in the medium without bacteria did not show peaks at the values mentioned before, but other,irreversible ones at 490 mV (vs. SCE) and 197 mV (vs. SCE); no reduction peaks were found in reverse scans. It was observed that metallic anodes may be toxic to bacteria. New several anodic materials are currently being tested namely conductive polymers.

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