BIODEGRADATION OF DICOFOL IN A DOUBLE CHAMBER MICROBIAL FUEL CELL

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Introduction. Environmental pollution has been a global problem and causes certain dangers to human life. Organochlorine pesticides, dicofol, are well known for their toxicity, widespread occurrence and their bioaccumulative abilities in the environment [1].

Microbial fuel cells (MFC) have recently been used for successful bioremediation of a number of chemicals. An MFC is a device that uses microbes to convert the chemical energy stored in organic or inorganic compounds into electricity, providing a low-cost and low-maintenance energy as well as a process that produces very little sludge. MFC have been used as a method for either reductive transformation contaminants such as nitrate and perchlorate or for producing value-added products [2].

The aim of the present study was to assess the feasability of a two chamber MFC to enhance biodegradation of dicofol.

Methods. Electrodes (4 x 4 cm) were made out of stainless steel and coated with graphite. MFC was made of 6 mm polycarbonate plates (7 x 7 cm), neoprene gaskets were placed between each polycarbonate plate to avoid leakage from the anodic and cathodic chambers (fig 1). Voltage was recorded using a Madgetech Quadvolt datalogger connected to a computer. Mineral medium containing dicofol (40 ppm) and glucose as co-sustrate was added to anodic chamber and sealed, the cathodic chamber was filled with K3[Fe(CN)6] (0.05 M). Anodic and cathodic chamber were separated by a protonic exchange membrane (Ultrex CMI 7000). Dicofol was quantified by GC ECD Varian Star 3400 CX equipped with a column CP-Sil CB for pesticides. Glucose consumption was determined by Chemical oxygen demand (COD) according to APHA standard methods.

Results. MFC with graphite coated electrode showed a better performance compared with the MFC with the stainless steel electrode. In table 1 its shown the biodegradation percentage for both cases, achieving 40.5 % for the case of the coated electrode MFC.

Table 1. Biodegradation of dicofol in a MFC using two types of electrodes in the anodic chamber.

MFC coated electrode	MFC stainless steel electrode
40.5 %	14.5 %

Voltage generation was higher in the case of the MFC with the graphite coated electrode with a maximum potential of 0.627 V. After 154 h potential decreased rapidly due to COD removal in the case of MFC with graphite coated electrode.

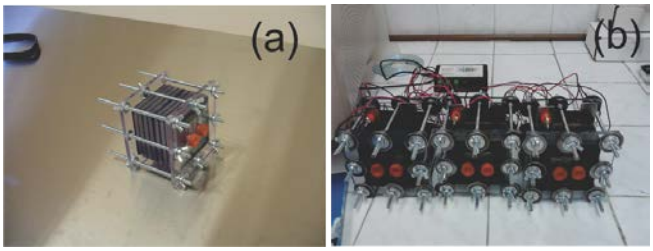

Figure 1. (a) MFC Assembly; (b) MFC used in the present study.

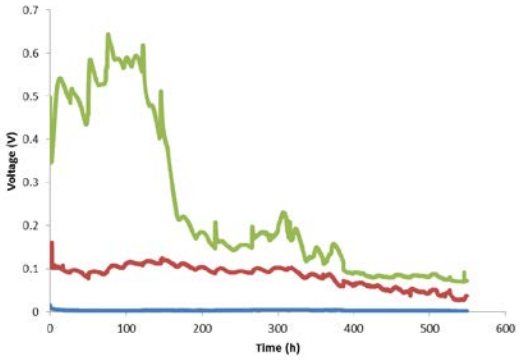

Figure 2. Voltage generation in a double chamber MFC for dicofol biodegradation. Green line MFC graphite coated electrode; red line stainless steel electrode, blue line control.

Conclusions. . The results obtained in the present study demonstrate the potential of MFC to enhance biodegradation of organic pollutant such as pesticides.

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References.

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