

Geobacter sulfurreducens as mediator for redox reactions: cyclic voltammetric study

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Microbial Fuel Cell technology (MFC) is attracting growing interest as an environmentally friendly energy production system. Bacteria can be used in MFCs to generate electricity while accomplishing the biodegradation of organic matters present in different kind of wastewater. In this context, the electrochemical properties of *Geobacter sulfurreducens* are investigated using rigid graphite and carbon Toray electrodes at pH 7. For these experiments, *Geobacter sulfurreducens* (DSM 12127) with a 75 mg/L total protein concentration (Lowry method) [1] was used. Growth medium was prepared under anaerobic conditions [2]. The voltammograms of carbon Toray in growth medium (acetate concentration: 60 mM) with and without bacteria are given in Figure 1.

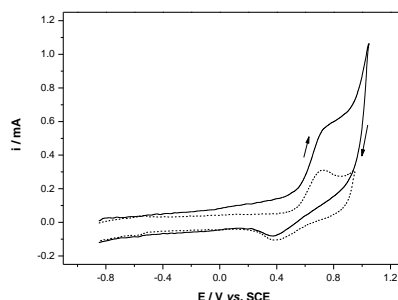


Figure 1. Voltammograms of carbon Toray in growth medium, with (—) and without (---) *Geobacter sulfurreducens* (75mg/L) at 37° C ($v = 50 \text{ mV s}^{-1}$).

An important increase of the current intensities between 0.4 and 1 V vs. SCE is noticed after the addition of bacteria. In order to optimize the conditions for a future application in MFCs, the effect of experimental parameters like pH, electrode material, kind of organic matter and concentration of bacteria, on the oxidation potential and current intensities was investigated. Some kinetic parameters of the reactions were also determined.

[1]. Lowry, O. H.; Rosebrough, N. J.; Farr, A. L.; Randall, R. J. (1951) Protein measurement with the folin phenol reagent. *J. Biol. Chem.* **193**, 265–275.

[2]. Caccavo, F.; Lonergan, D. J.; Lovley, D. R.; Davis, M.; Stolz, J. F.; McInerney, M. J. (1994) *Geobacter sulfurreducens* sp. nov., a hydrogen- and acetateoxidizing dissimilatory metal-reducing microorganism. *Appl. Environ. Microbiol.* 3752–3759.