ELECTRONIC TRANSFERENCE ASSESSMENT OF THE REDOX PROCESSES AT CARBON ELECTRODES COATED WITH GEOBACTER SULFUREDUCTENS THAT GROWN AT DIFFERENT TEMPERATURES

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INTRODUCTION

Geobacter sulfurreducens is a bacteria that can transfer electrons directly to the electrode from different external membrane cytochromes. Each cytochrome is associated with a range of redox potentials, being energetically more favourable than some others (Logan and Regan, 2008). Different bacterial growth conditions, such as temperature, may influence the prevalence of certain cytochromes in the external membrane (Peixoto et al. 2011). The aim of this work was to evaluate the effect of the growth temperature on the electrochemical behavior of G. sulfurreducens.

METHODOLOGY

RESULTS AND DISCUSSION

CYCLIC VOLTMETRY

Fig. 1. Voltamograms of carbon Toray with a suspension of G. sulfurreducens that grew at 25 °C and 37 °C (50 mg/L), (results at room temperature).

Fig. 3. Voltamograms of carbon Toray with a suspension of G. sulfurreducens that grew at 25 °C and 37 °C (50 mg/L), after 24 hours stabilized (a), (results at room temperature). Comparison with the result obtained in time 0 h (b).

For Bacteria that growth at different temperatures, the oxidation peaks potentials and current intensities were different;

Higher current intensities were found for bacteria grown at higher temperatures;

the potential of the oxidation peak obtained with bacteria grown at higher temperature was more anodic, thus more energy was required;

At lower sweep rates, it was possible to observe two oxidation processes, that are better defined in bacteria grown at 25 °C;

Comparing the oxidation potential with literature (Richter et al. 2009), it was possible to conclude that different types of cytochromes can be established as responsible for heterogeneous electronic transfer.

PROTEOMICS

Table 2 Normalized intensity of spots in the proteome profile of G. sulfurreducens grown at 25 °C and 37 °C. Protein spots were considered to display significant quantitative differences if they fulfilled the following criteria: p values ≤ 0.05 (t-test); detection threshold, average volume ≥ 20 (n = 3); differential tolerance, fold change ≥ 2.

CONCLUSIONS

The difference observed in voltammetric study can be related to the structural differences in bacteria that grown at different temperatures. Changes in the Geobacter sulfurreducens growth temperature promotes different protein expression that can be responsible for different redox centers.

REFERENCES


Richter, H.; Nevin, K.P.; Daniel, H.J.; Lowy, A.; Lovley, D.R. and Tendler, L.M. 2009. "Cyclic voltammetry of biofilms of wild type and mutant Geobacter sulfurreducens (psuedomonas putida 250)." Proteins that revealed differential expression from bacteria that grow at 25 °C and 37 °C are indicated by their index number given in the Table. Proteins were visualized by silver staining.

PROTEOMICS

About 100 spots discriminated on the different conditions;

Gel analysis of Outer Membrane Proteome at different growth conditions revealed:

Up-regulation of 9 spots at 37 °C;

Down-regulation of just one spot at 37 °C;

The spot picking and protein identification are in progress.

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