Influence of the Temperature ithe electronic transfer mechanism of *Geobacter sulfurreducens*

L. Peixoto[1], A.F.S. Santos[1], I. Machado[1], A.M. Sousa[1], A.G. Brito[1], P. Parpot[2], M.O. Pereira[1], R. Nogueira[1]

[1]*IBB-Institute for Biotechnology and Bioengineering, Centre of Biological Engineering, University of Minho, Campus de Gualtar, 4710-057 Braga, Portugal.*

[2]*Centre of Chemistry, University of Minho, Campus de Gualtar, 4710-057 Braga, Portugal.*

E-mail presenting author: luciana.peixoto@deb.uminho.pt

Geobacter species are important in the reduction of metals (e.g. Fe, Mn) in soils and sediments and constitute one of the most effective microorganisms known to use electrodes as the sole electron acceptor in microbial fuel cells to generate electricity.

G. sulfurreducens transfers electrons directly to the electrode from different external membrane cytochromes. Each cytochrome is associated with a range of electrical potentials, being energetically more favourable than some others. Different growth conditions of the bacteria, such as temperature, may influence the prevalence of certain cytochromes in the external membrane. The aim of this work was to evaluate the difference in the electronic transfer mechanisms in *G. sulfurreducens* that growth at different temperatures (25 ºC and 37 ºC).

The cyclic voltammetry is an electrochemical technique that can be used to assess the redox reactions between bacteria and electrode and was used to compare different cultures of *G. sulfurreducens* (Figure 1). With these studies it can be concluded that at different temperatures the oxidation peaks potentials and current intensities were different. The current intensity increased in bacteria that growth at higher temperatures but the potential of the oxidation peak was more anodic, thus more energy was required. The oxidation reaction was limited by diffusion. An irreversible electronic transfer is noticed. At 25ºC the kinetic of the reaction had a mixed control and charge transfer was reversible for lower sweep scan rates.

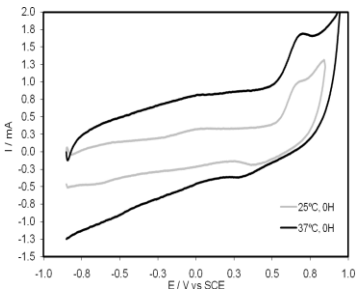
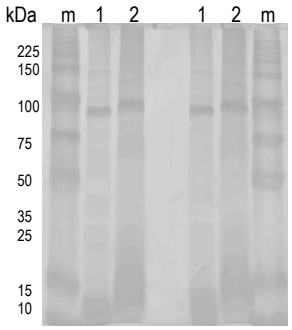


Figure 1 - Voltammograms of carbon Toray with a suspension of *G. sulfurreducens* at 25ºC and 37ºC (50 mVs-1)



SDS-Page was used to characterize the membrane protein complexes. The membrane proteins extracted from bacteria that growth at different temperatures migrated differently in the gel, revealing proteins of different molecular weights. *G. sulfurreducens* may provide an interesting model for structural comparison of proteins since the two samples revealed different profiles. The separation of the membrane proteins was obtained from sucrose gradient centrifugation and 2D electrophoresis. The complete proteins characterization is already being developed in our laboratories.

Figure 2 - 12% SDS-PAGE of *G. sulfurreducens* proteins (1.6 μg), that grown at 25 ºC (1) and at 37 ºC (2); Molecular weight markers (m).