Supplementary Material

**Spotlight on the energy harvest of electroactive microorganisms: The impact of the applied anode potential**

**Benjamin Korth\* and Falk Harnisch\***

Department of Environmental Microbiology, Helmholtz Centre for Environmental Research - UFZ, Leipzig, Germany

Corresponding authors: benjamin.korth@ufz.de; falk.harnisch@ufz.de

# Supplementary Table S1

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter description** | **Symbol** | **Value** | **Unit** |
| Concentration NAD+/NADH | $$C\_{NAD+/NADH}$$ | 0.003 | mol L−1 |
| Concentration oxidized/reduced redox centers[[1]](#footnote-1) | $$C\_{Rox/Rred}$$ | 0.150 | mol L−1 |
| Initial biofilm thickness | $$L\_{Biofilm,0}$$ | 0.01 | µm |
| Temperature | $$T$$ | 308.15 | K |
| Forward rate for the intracellular electron transfer from NADH to redox centers | $$k\_{f,m}$$ | 250 | m9 mol−3 s−1 |
| Reverse rate constant for the intracellular electron transfer from redox centers to NAD+ | $$k\_{r,m}$$ | 1$×$10−10 | m6 mol−2 s−1 |

# Supplementary Figure S2



Figure S2 Model results for *Geobacter* spp. biofilm growing on an anode set to −0.1 V (black line), 0 V (red line), 0.1 V (blue line), 0.2 V (green line), 0.4 V (purple line), and 0.6 V (yellow line) **(A)** NAD+/NADH ratio. **(B)** Ratio of oxidized redox centers and reduced redox centers. Concentration values of NAD+/NADH and oxidized/reduced redox centers were integrated over the whole biofilm thickness. During the simulation, the ratio of oxidized/reduced redox centers decrease according to catabolic activity and increase again as acetate is depleted. The backlog of electrons is transmitted to the NAD+/NADH pool. With *E*A ≤ 0.1 V, the NAD+/NADH ratio decreases, resulting in a poorer exploitation of the thermodynamic frame. During simulations with *E*A ≥ 0.2 V, higher NAD+/NADH ratios, and thus full exploitation of the thermodynamic frame are maintained.

1. The term “cytochrome” describes a protein moiety containing one or several hemes as redox-active cofactors and each heme can receive or donate one electron at the same time. The term “redox center” as it is used in the model designates a moiety that can receive and donate one electron at the time. Thus a redox center can represent a heme group of a cytochrome, whereas, *e.g.*, a menaquinone is represented by two redox centers, as it is able to bind two electrons. Thus, “redox center” and “cytochrome” are strictly speaking interchangeable terms. For *Geobacter* spp. the main redox centers are cytochromes and hence for a better understanding only the terminus cytochrome is used in the main manuscript and the term redox center is used in the SI when referring specifically to the model. [↑](#footnote-ref-1)