SYNTROPHIC COCULTURES OF *GEOBACTER SULFURREDUCENS* AND *SYNTROPHOBACTER FUMAROXIDANS* GROWING ON PROPIONATE AND FE (III) OR A SOLID ELECTRODE AS ELECTRON ACCEPTORS

MONIR MOLLAEI[1,2] (MONIR.MOLLAEI@WUR.NL),
TOM H.J.A. SLEUTELS[2], ALFONS J.M. STAMS[1,3], CAROLINE M. PLUGGE[1,2]

[1] Laboratory of Microbiology, Wageningen University and Research, Wageningen, The Netherlands
[2] Wetsus, European Centre of Excellence for Sustainable Water Technology, Leeuwarden, The Netherlands
[3] Center of Biological Engineering, University of Minho, Braga, Portugal

A syntrophic coculture of the electroactive bacterium *Geobacter sulfurreducens* and the propionate-oxidising bacterium *Syntrophobacter fumaroxidans* was constructed with propionate as electron donor and Fe (III) as electron acceptor. The Fe (III)-reducing *G. sulfurreducens* use hydrogen, formate and acetate as the electron donor, but is unable to metabolise propionate. *S. fumaroxidans* on the other hand cannot use Fe (III) as electron acceptor. *G. sulfurreducens* was first grown in pure culture with single and different combinations of the electron donors i.e. acetate, formate and hydrogen, the products of propionate conversion by *S. fumaroxidans*. All single electron donors supported growth of *G. sulfurreducens* where 6.44 ± 0.02, 2.43 ± 0.01 and 1.63 ± 0.41 mole of Fe (II) was produced per mole of acetate, formate and hydrogen, respectively. When combinations of electron donors were applied, formate was always the preferred electron donor. Coculture results showed growth of these two bacteria with propionate and Fe (III) in batch cultures, where neither of bacteria was independently capable of such growth. The ratio of Fe (II) produced to propionate consumed was 12:1 on average which is close to the theoretical ratio of 14:1. To prove whether *S. fumaroxidans* and *G. sulfurreducens* can drive current production in a Microbial Electrolysis Cell (MEC), the coculture was applied in a MEC with propionate as substrate and the solid electrode at an anode potential of -300 mV vs Ag/AgCl as electron acceptor. The results confirmed that the coculture was able to oxidize propionate and produce current density of 22 A/m^3, and 35% Coulombic efficiency.