

BioRECO₂VER

Bio-electrochemistry for CO₂ conversion

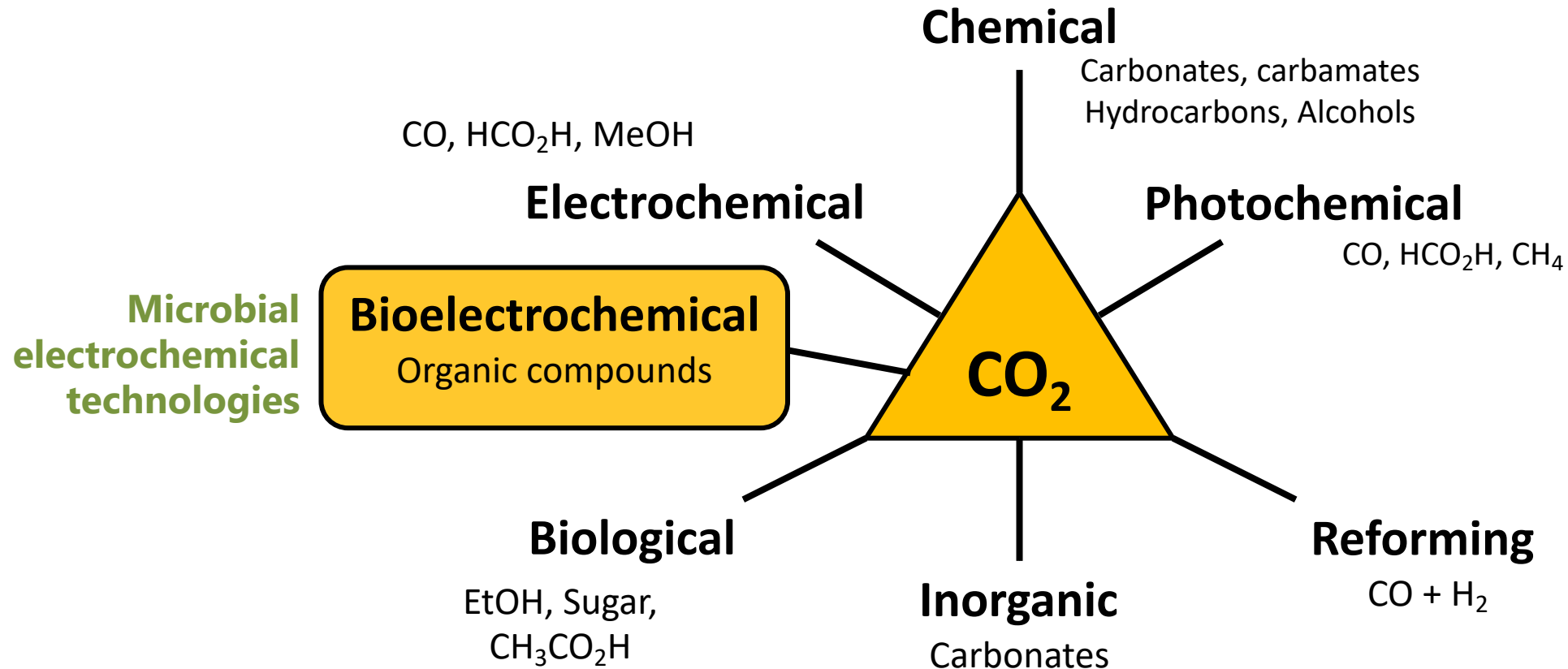
Sebastià Puig, Online webinar, 23 November 2021

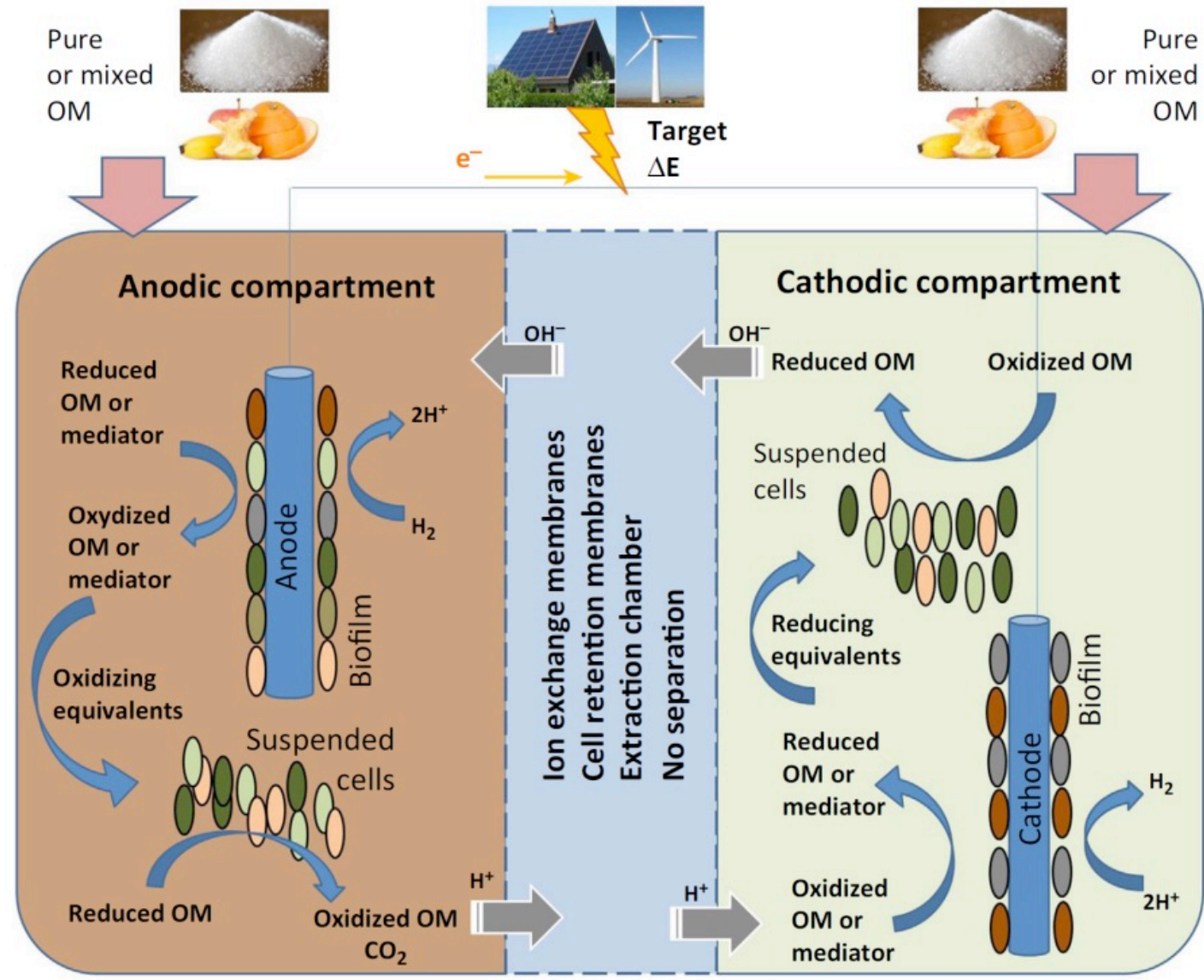


Horizon 2020
European Union Funding
for Research & Innovation

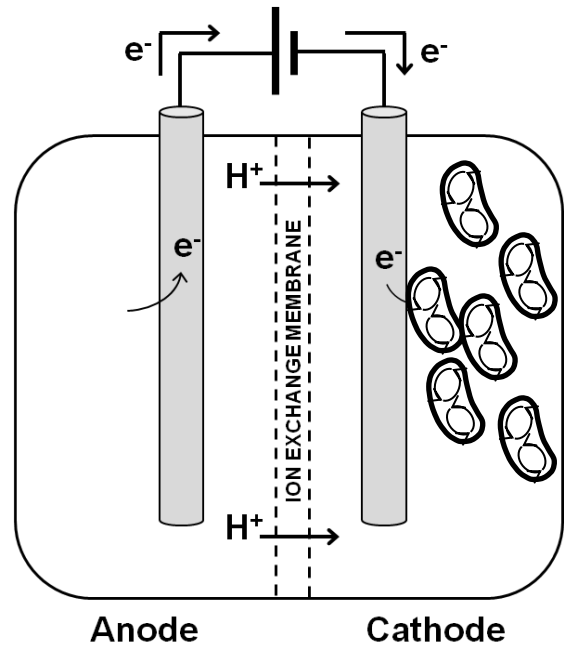
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 760431.

Microbial electrochemical technologies



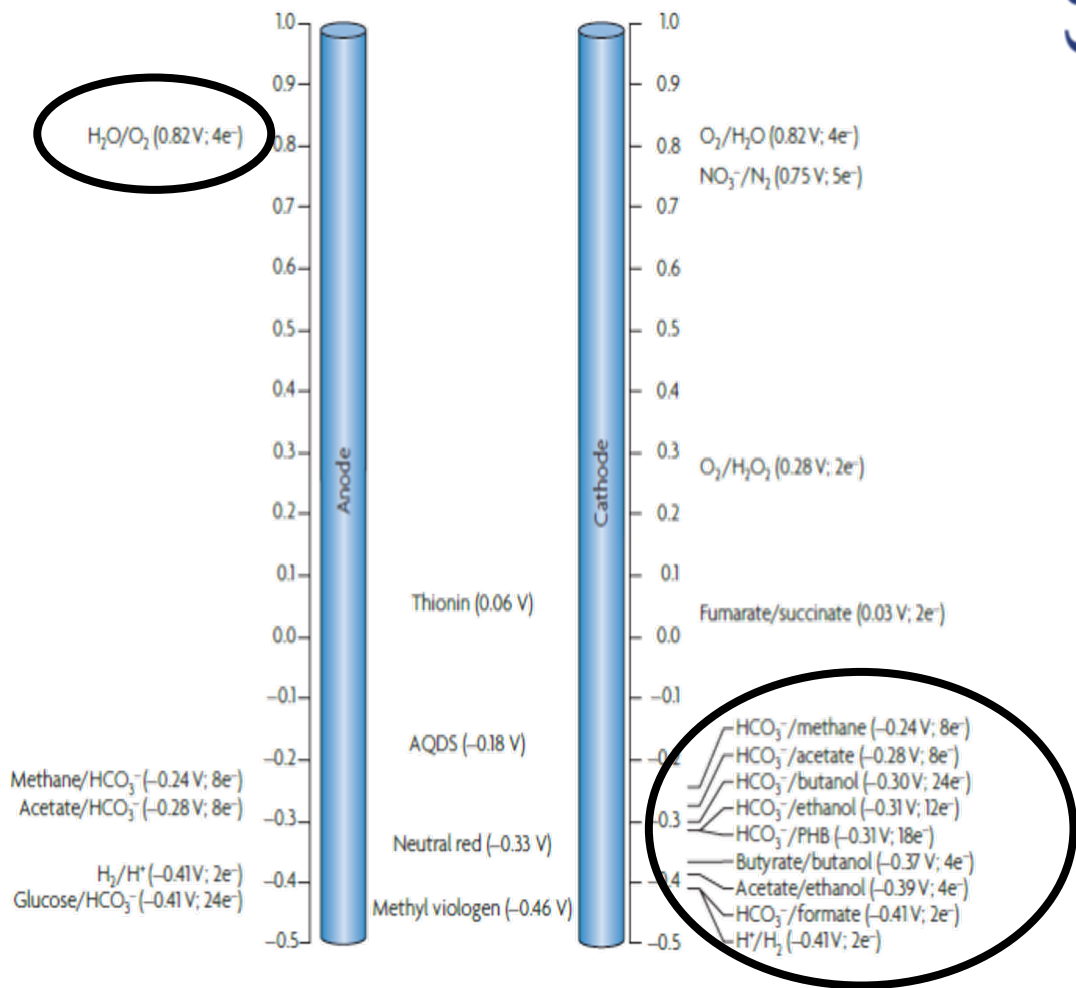


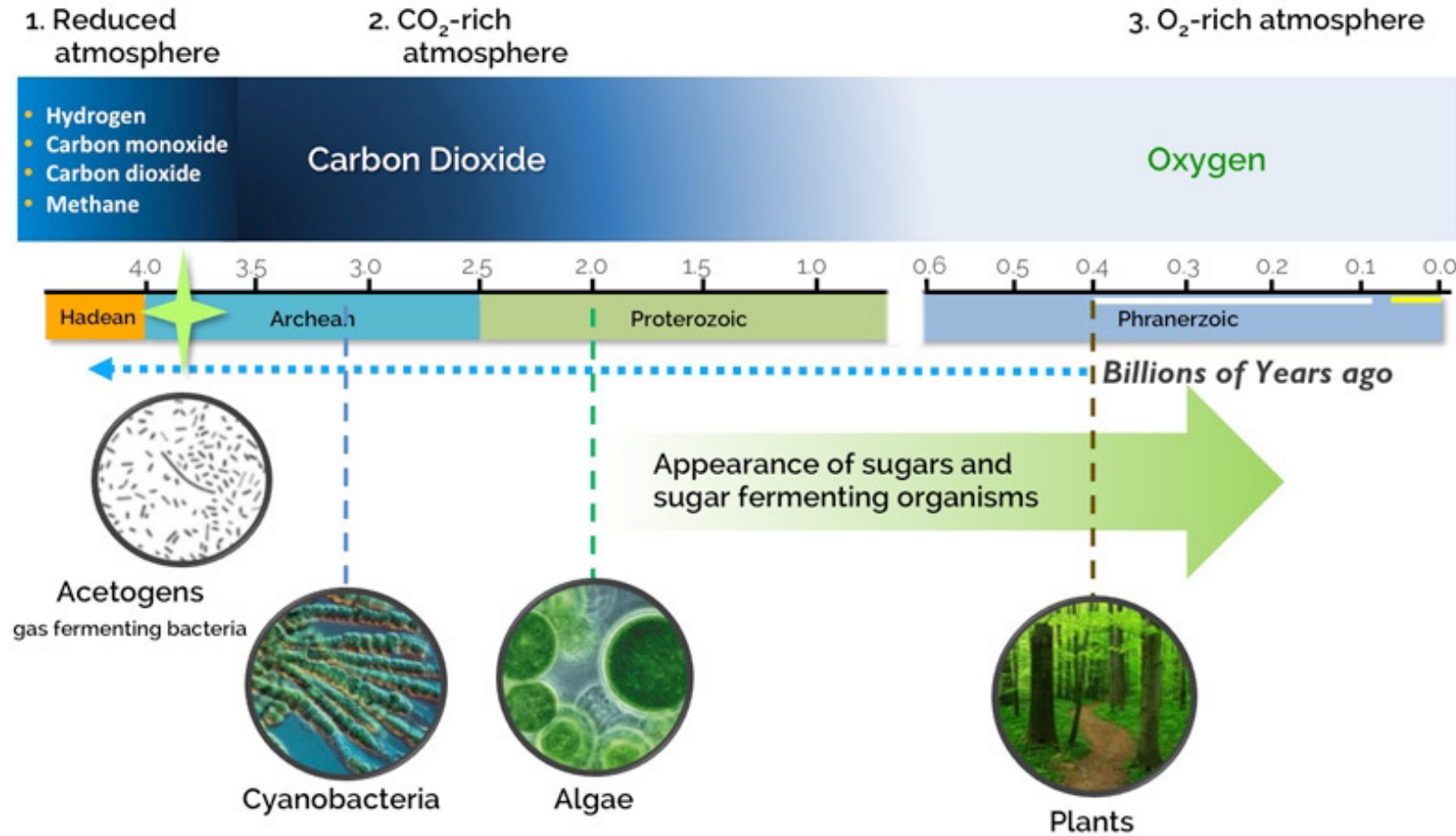
Schievano et al. (2016) *Trends in Biotechnology*



$E_{cell} < 0$
 $\Delta G > 0$
 Non spontaneous

Energy required

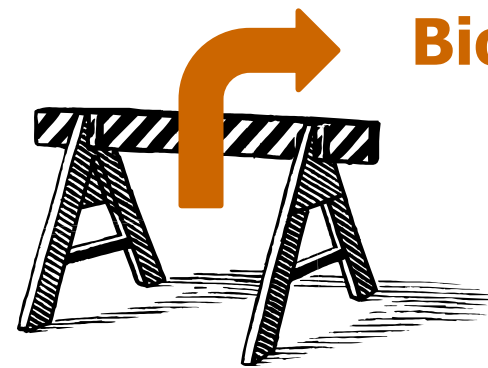
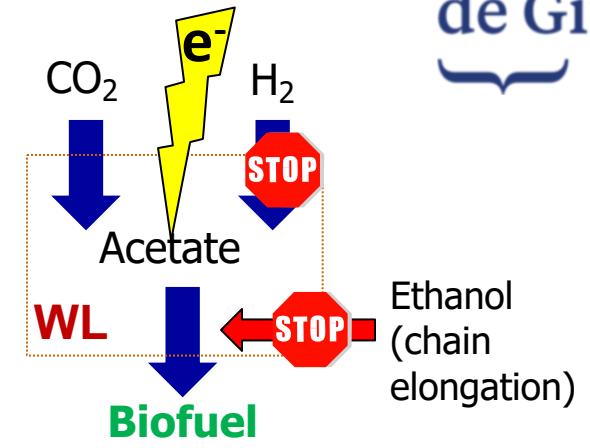




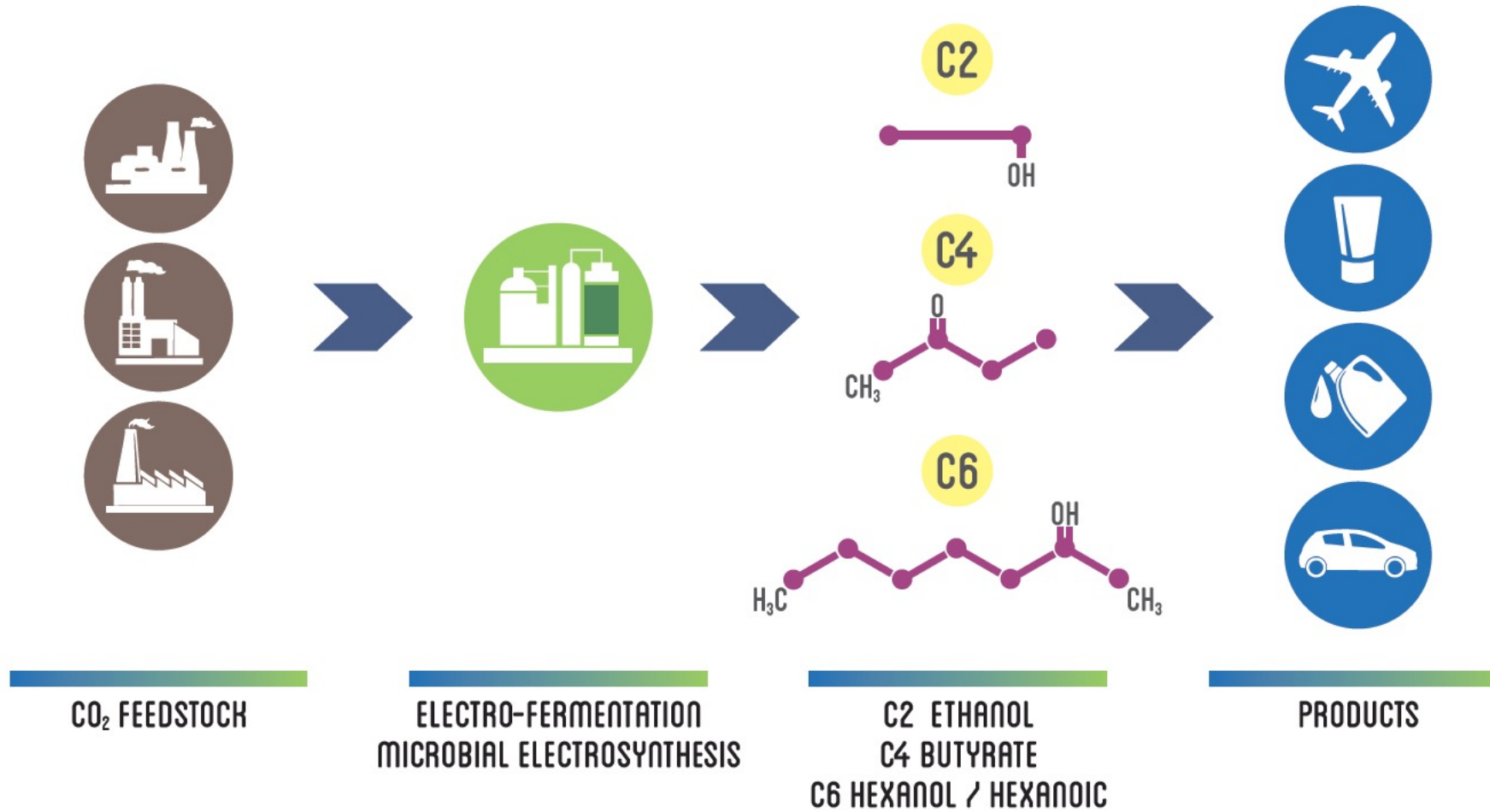
Gases were the only carbon and energy source used by the first life forms.

Challenges to overcome:

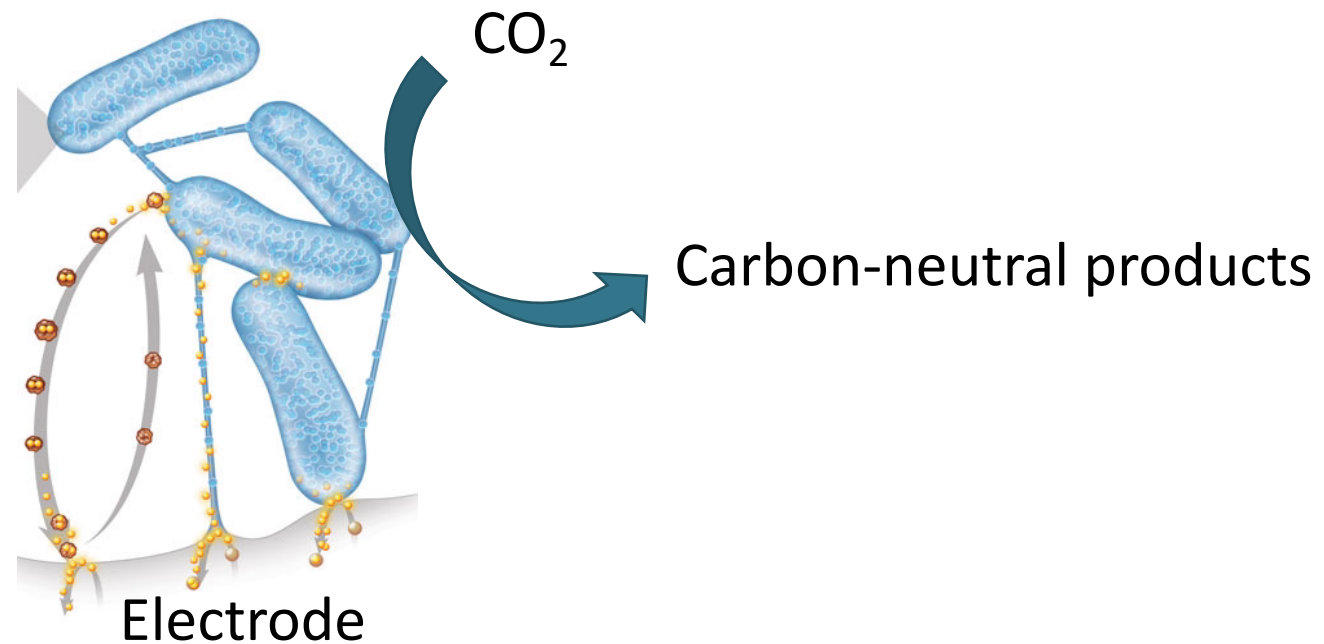
- Limited H₂ **availability** (reducing power).
- Low **solubility** of CO₂ and H₂.
- **Diverse** metabolic routes and products (acids).
- Chemicals needed (ethanol) for carbon chain reactions.

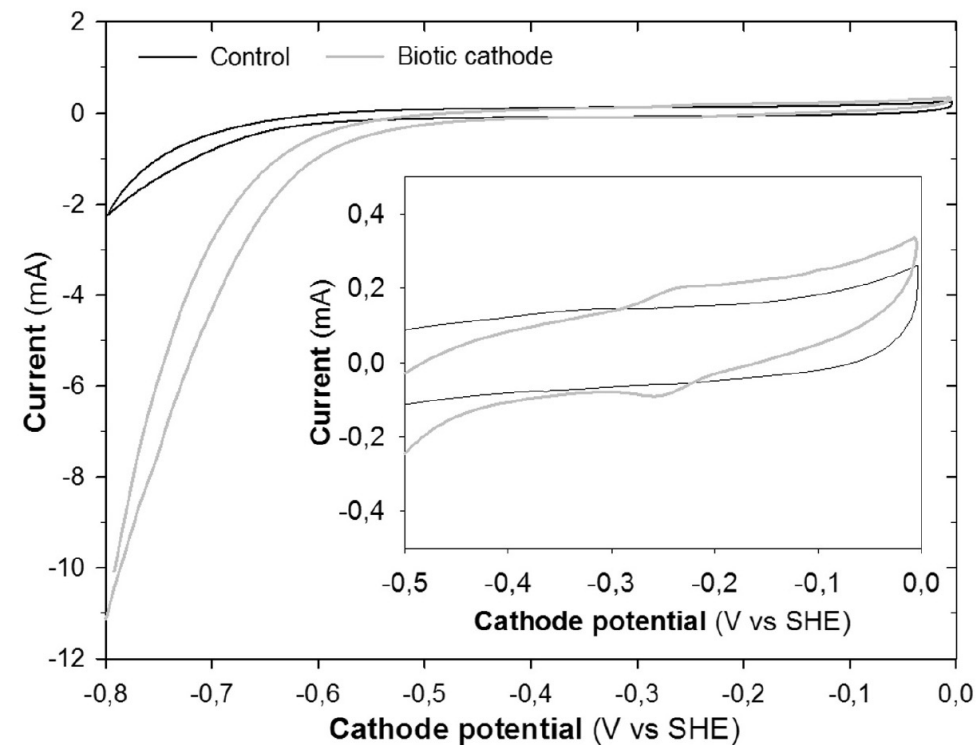
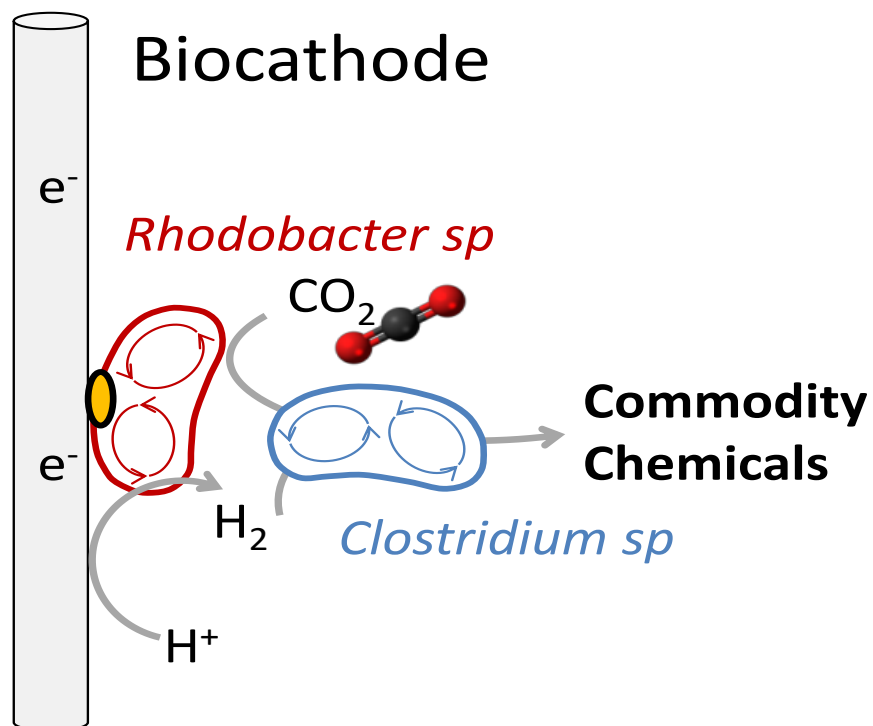


Bio-electro CO₂ recycling

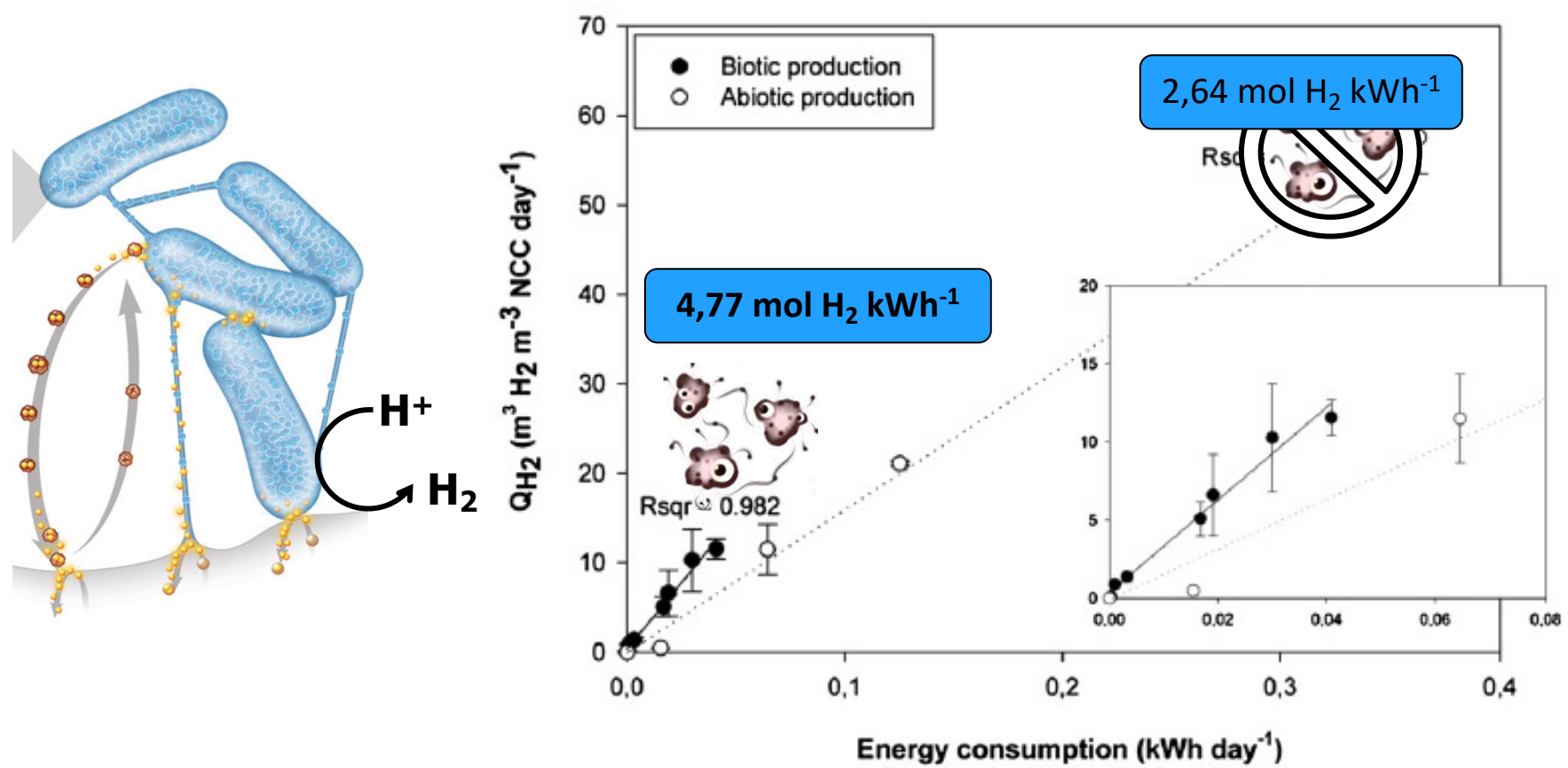


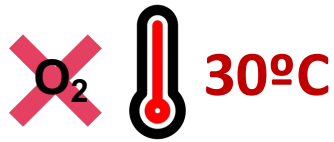
An **electrotroph** is a microorganism which can receive electrons necessary for its growth from an electrode (power supply) terminal.



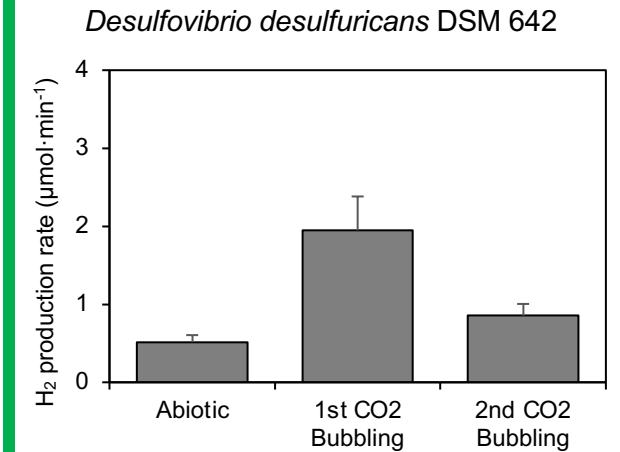
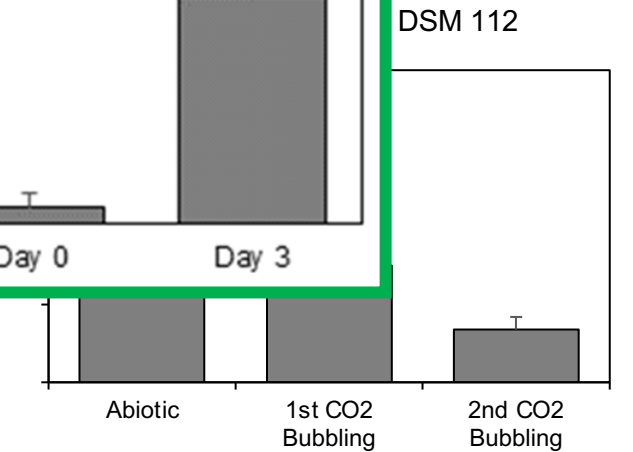
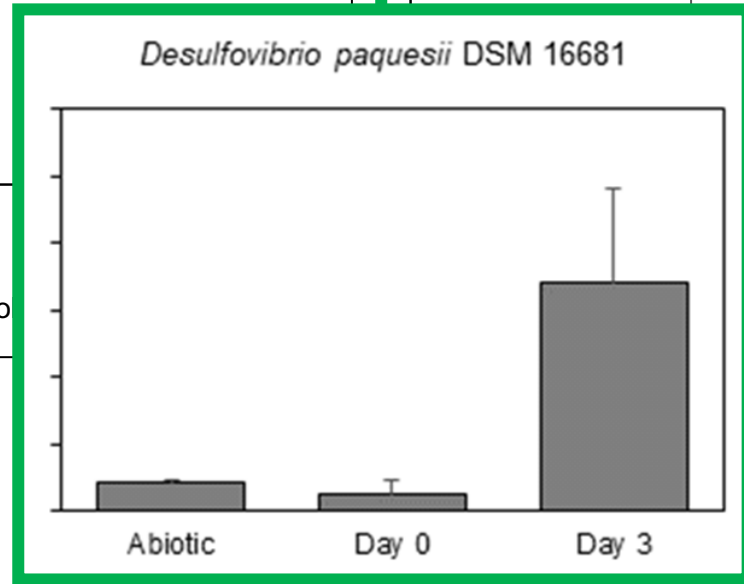
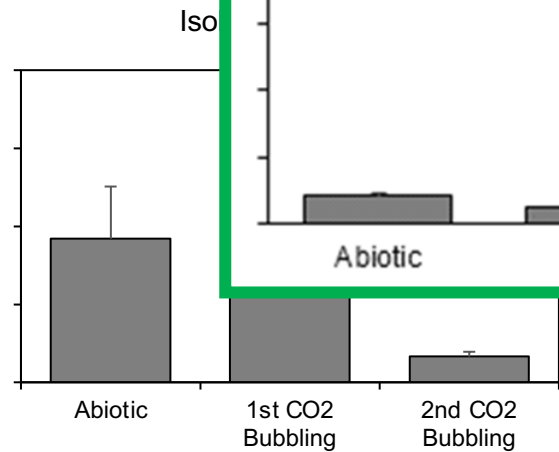
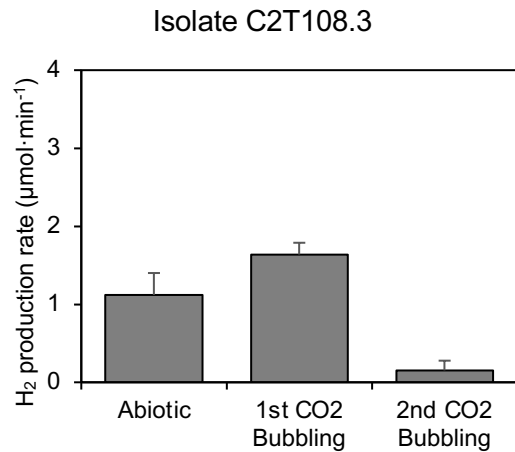
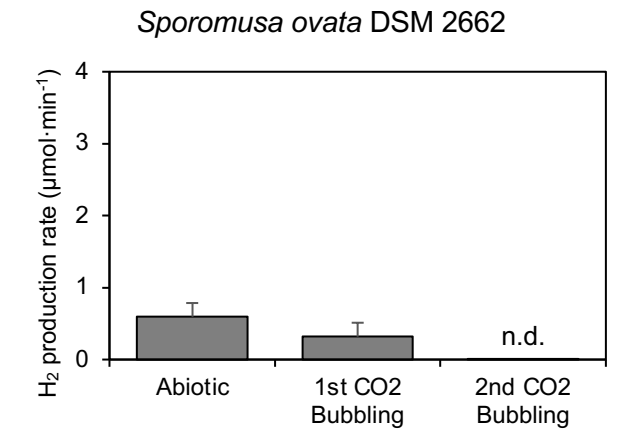
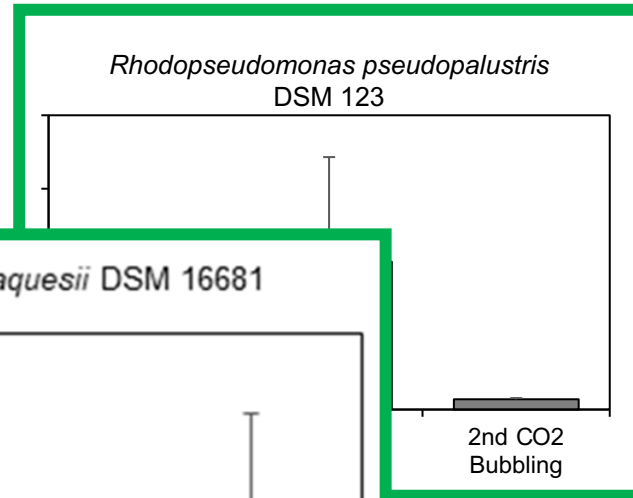
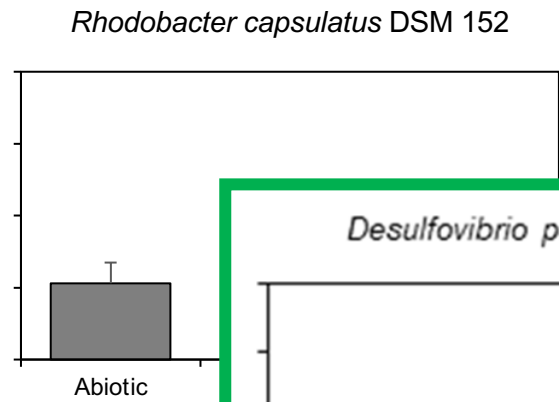
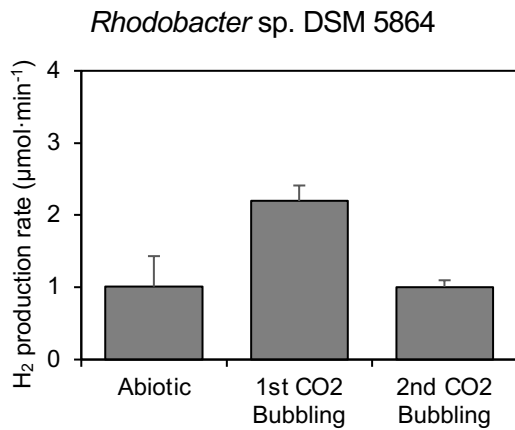


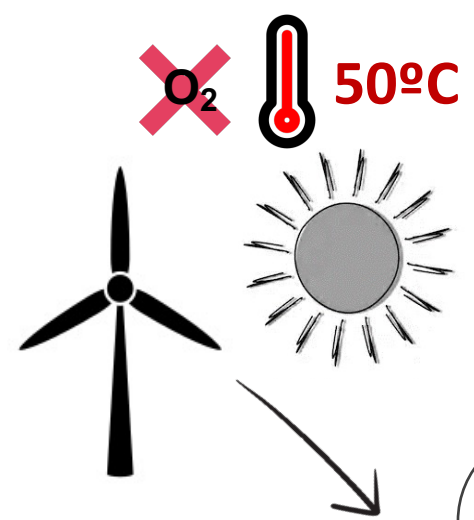
Abiotic vs. **Biotic** mediated H₂ production



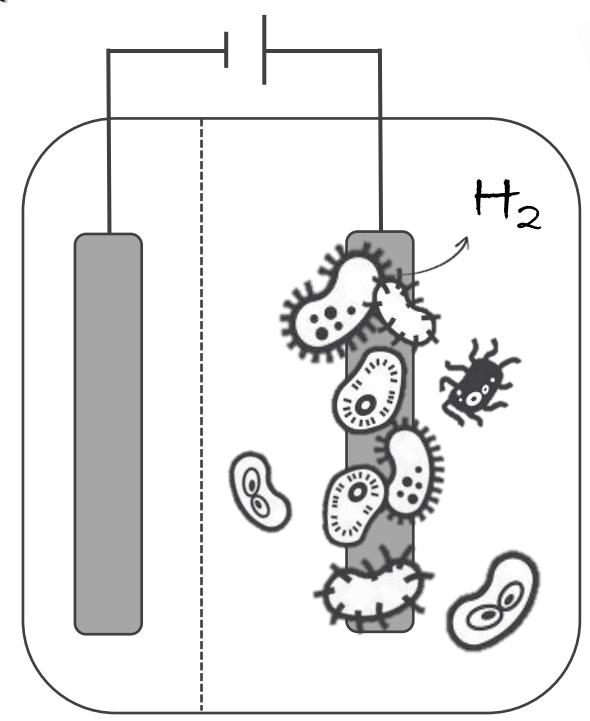


Maximize *in situ* H₂ production

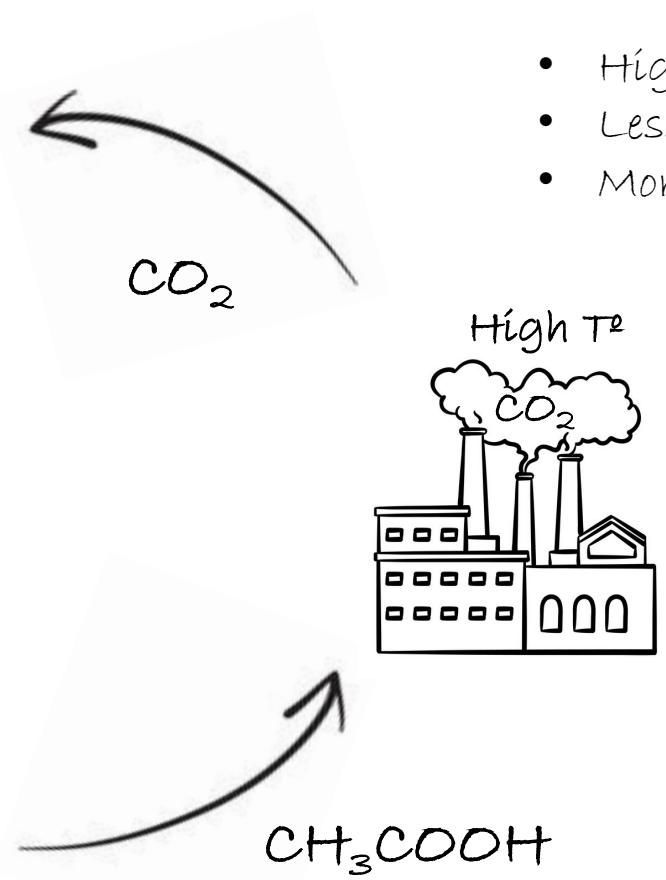




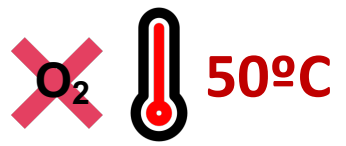
Thermophilic process



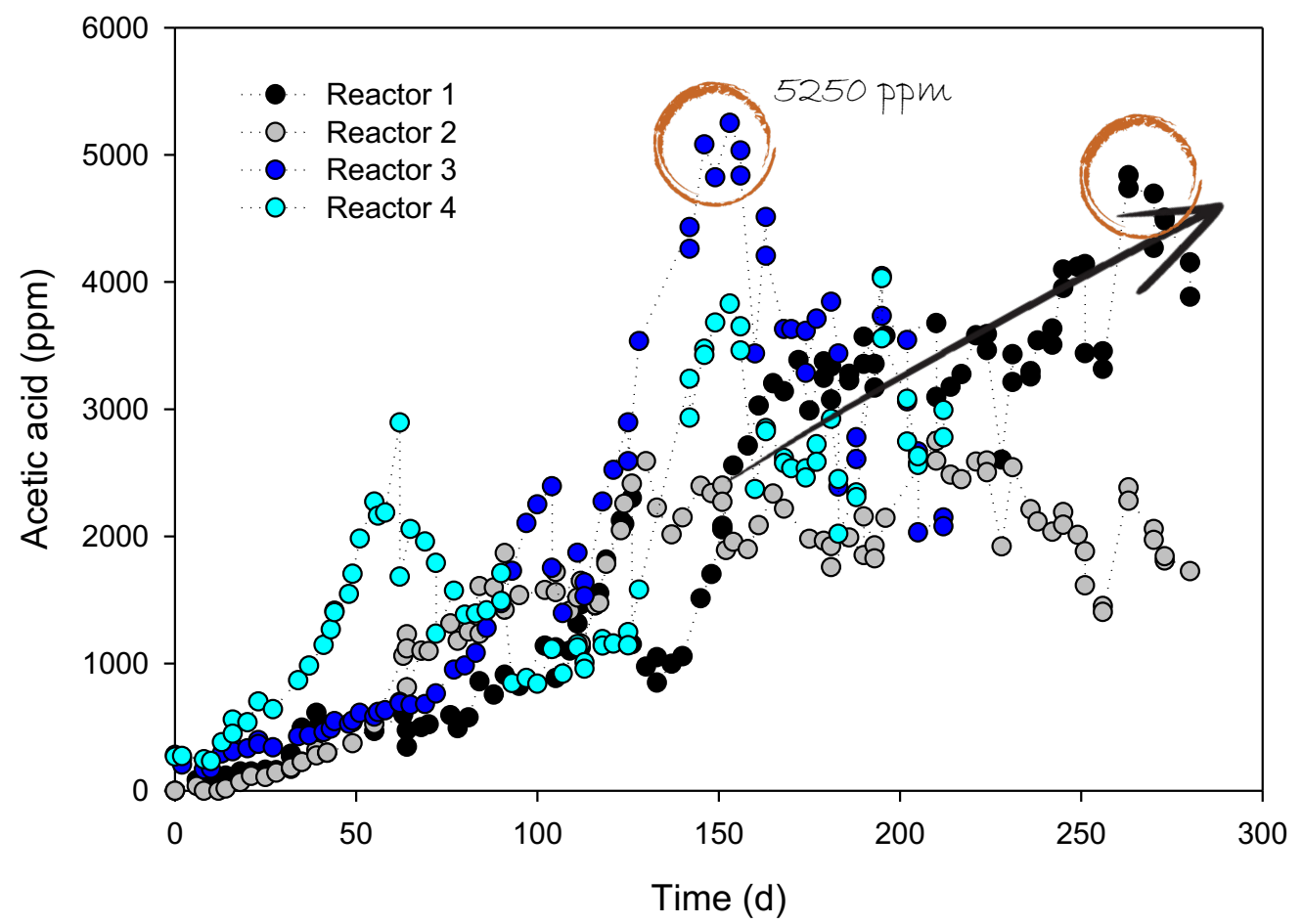
Thermophilic MEC



- Higher reaction rates
- Less risk of contamination
- More product specificity



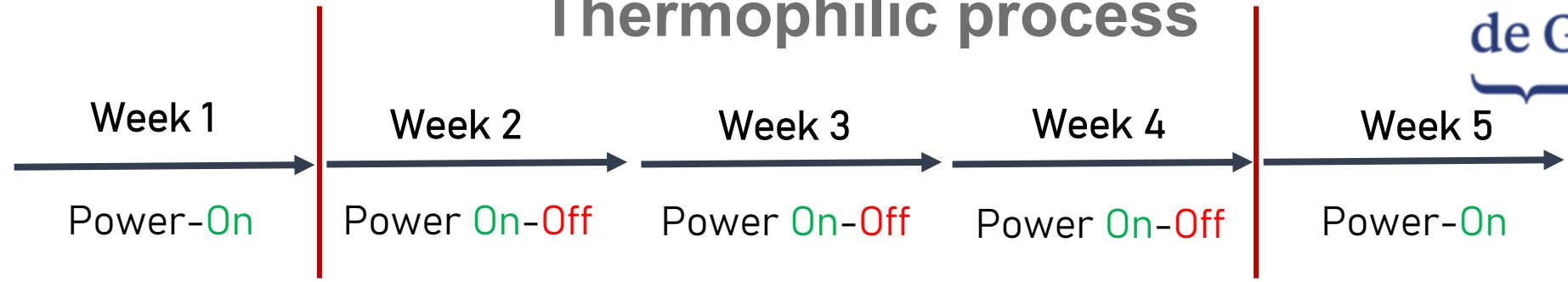
Thermophilic process



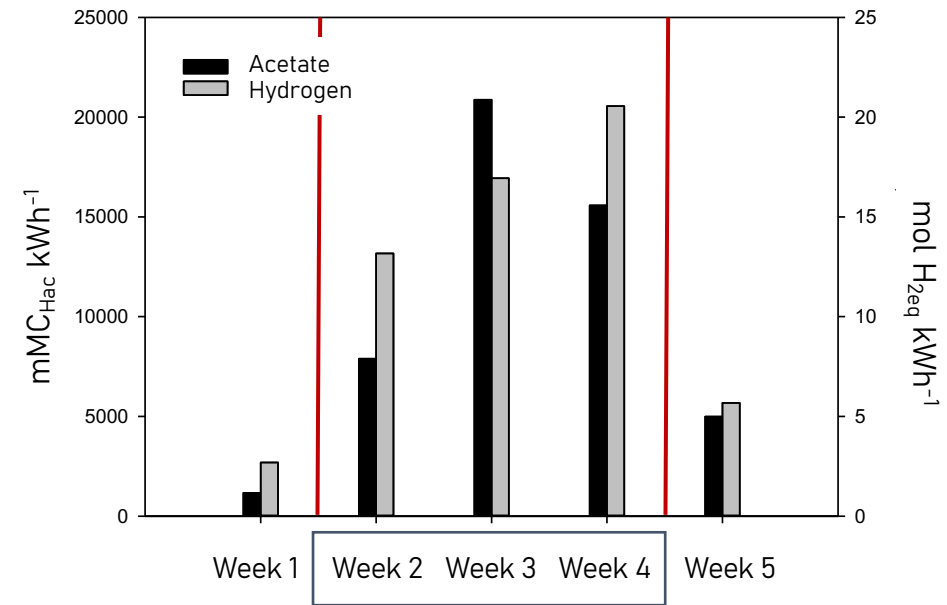
Max production rate
468 mmol acetate m⁻² d⁻¹

Coulombic efficiency
80-90%

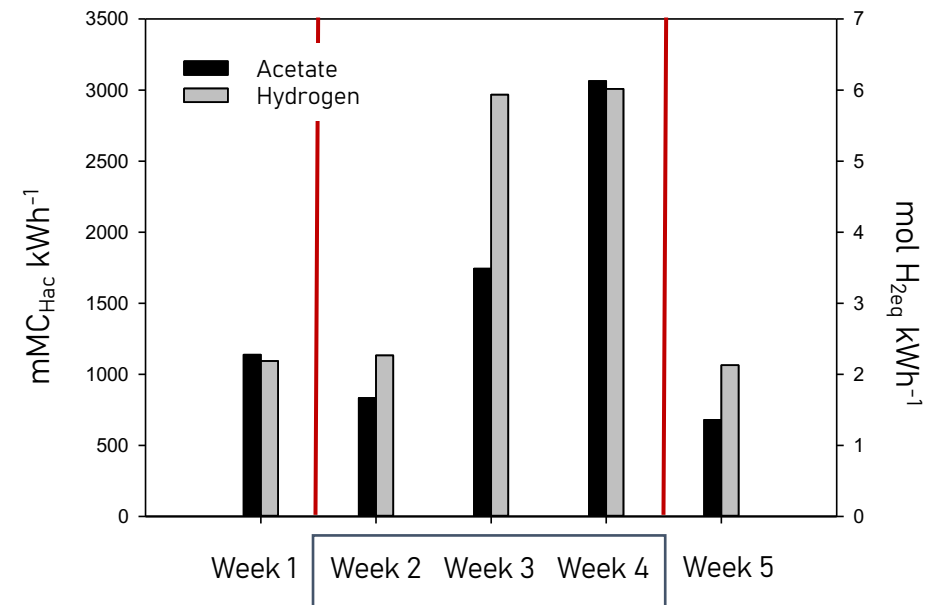
Thermophilic process

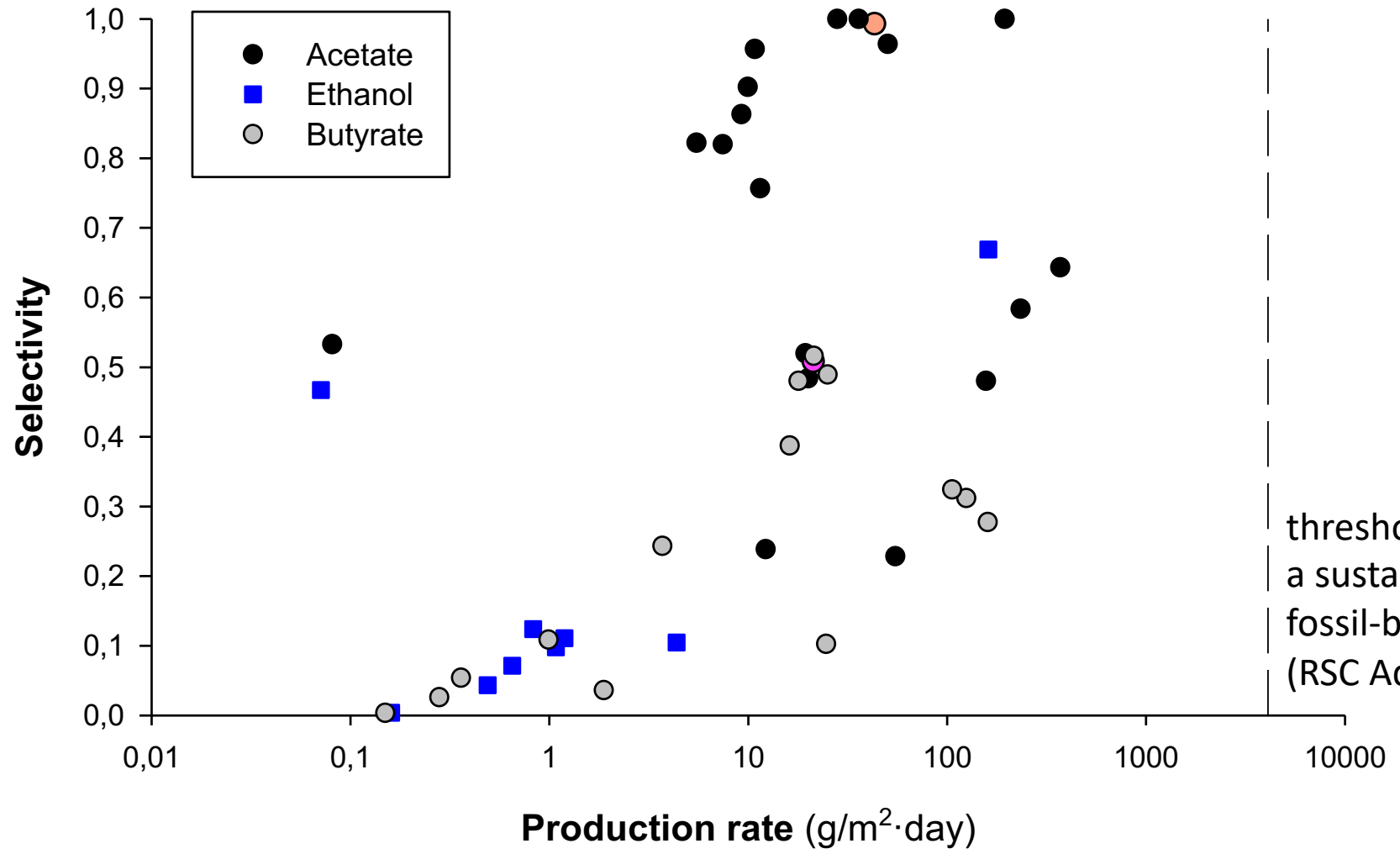


Reactor A



Reactor B





threshold production rate as a sustainable alternative to fossil-based AA production (RSC Adv., 2021, 11, 9921)





Thank you for your
attention!

sebastia.puig@udg.edu

 @sebastia.puig



Horizon 2020
European Union Funding
for Research & Innovation

BioRECO₂VER

The sole responsibility for the content of this dissemination and communication activity lies with the authors. It does not necessarily reflect the opinion of the European Union (EU) Horizon 2020. The EU is not responsible for any use that may be made of the information contained therein.