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CO_2 FIXATION TECHNOLOGIES: FROM BIOLOGY TO ELECTROCHEMISTRY

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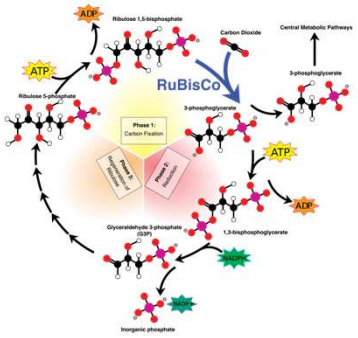
Introduction



Biological CO_2 fixation is a multistep process that involves the use of energy and production complex compounds.

Recycling of CO_2 into fuels and chemicals is a potential approach to reduce CO_2 emission and fossil-fuel consumption, and there is a feasible way for biological production of fuels and chemicals from CO_2 under normal conditions through biosynthetic pathways and bioengineering

In this work, we aim to use NaOH produced from an electrochemical cell (cathodic area, stainless steel electrode) designed to generate Cl^- from a NaCl solution (anodic area, boron doped diamond electrode), and fixing a flow of CO_2 into a adsorption glass column to produce carbonates and bicarbonates as secondary products, that can be commercialized and used for the desorption of CO_2 from the environment.

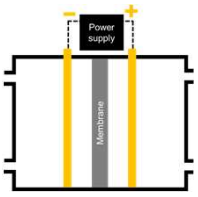
ELECTROCHEMICAL CELL

1

Cathode

Stainless steel

Generation of $NaOH$ and H_2



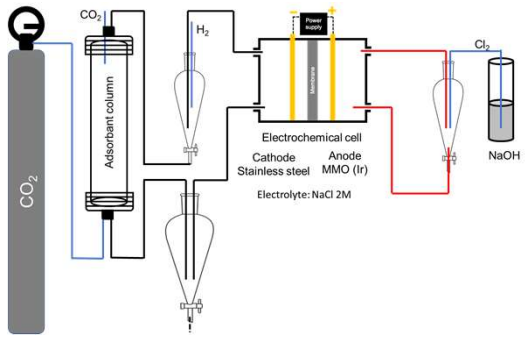
Anode

MMO (Ir)

Generation of Cl_2

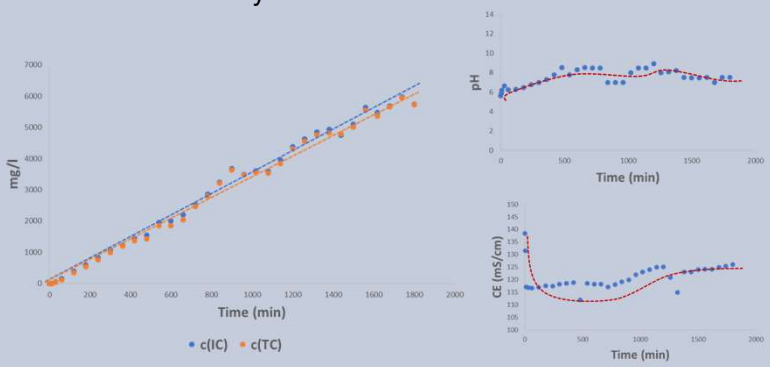
EXPERIMENTAL SETUP

2



a

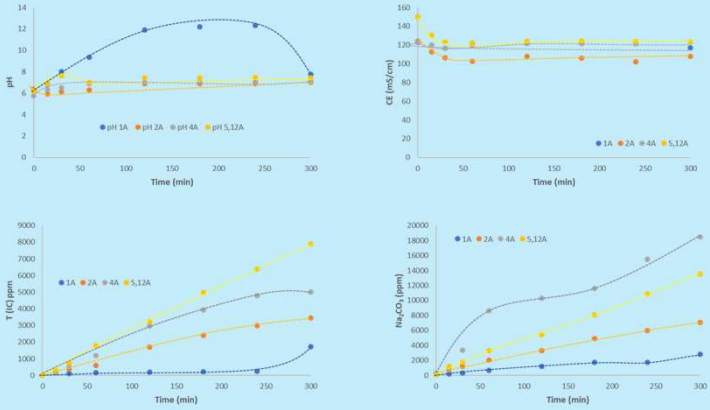
30 h duration experiment using a constant flow of CO_2 and 1 A intensity



These results show that at 1 A intensity, CO_2 can be fixed along with the production of NaOH from the cathodic chamber, and pH (7-8) and electric conductivity values (CE, 120 mS/cm) remains stable along the experiment, suggesting the formation of carbonic acid and bicarbonate ions.

b

300 min-duration experiments using a constant flow of CO_2 at different intensities (1, 2, 4 and 5,12 A).



When evaluating different intensities, it is evidente that intensity plays an important role on electrochemical CO_2 fixation, and pH values remain stable in all the experiments, although there is a pH increment in 1 A intensity, which suggest a slower fixation of CO_2.

Conclusions

Our results show that CO_2 can be fixed using a NaOH subproduct, from an electrochemical cell designed to produce Cl in the anode area, in a value-added compound (bicarbonate or carbonate), in the cathode area, and that this effect depends on the intensity applied to the system, the concentration and composition of the electrolyte and the flow of CO_2, which can influence on the generation of carbonates or bicarbonates as an added-value product.

References

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