

VALORIZATION OF CO₂ VIA A NEW KIND OF CATALYSTS

New iron porphyrin-based catalysts could turn CO₂ from waste to resource and become a pillar of the Carbon Capture & Utilization (CCU) industry.

ERG\NEO

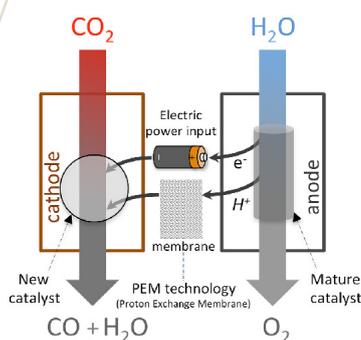
L'AVENIR EST FAIT D'AUDACE

PRESENTATION

CO₂ is a highly stable molecule that needs a lot of energy in order to be transformed and react with other molecules. Hence, CO₂ utilization by the industry has remained limited. However, one could see CO₂ as a source of carbon and use this material to store energy by breaking C-O bonds and making energy-rich C-H bonds instead.

Over the past 20 years, thousands of scientific articles about CO₂ catalyzed reduction have been published but the reported catalysts are either based on rare materials (such as Pd, Re, Ru) or show poor performances.

In contrast, our PEM technology based on iron porphyrin catalysts is very promising since it does not rely on rare materials and has proved excellent performances to turn CO₂ into CO at ambient temperatures both in organic and neutral pH aqueous solutions. Electrogenerated CO could be further processed with green hydrogen for synthetic fuel production.



CO₂ valorization - CO₂ electroreduction - Low cost catalyst -
Iron porphyrin - Carbon monoxide - Synthetic fuels - Syngas -
Electrofuels - Energy conversion and storage

COMPETITIVE ADVANTAGES

- Cheap catalyst (Fe) vs. actual ones (Ru, Rh, Pd, Re, Pt...)
- Ambient temperature / Atmospheric pressure
- Compatible with organic and aqueous solvents (pH 7)
- High catalytic efficiency (>90% selectivity, low overpotential)
- Heterogeneous catalysis
- Catalytic film materials do not require any special care

APPLICATIONS

- Chemical industry: synthesis of CO and syngas used for the production of methanol or synthetic fuels
- CO₂ capture and utilization (CCU)
- Valorization of intermittent sources of electricity (energy conversion and storage)

DEVELOPMENT PHASE

- ✓ A lab-scale electrolyzer to selectively convert CO₂ to CO is currently in design phase

INTELLECTUAL PROPERTY

US, CA, AU patent applications:
US2015096899

International patent application:
WO2015169763.

Priority patent application filed on Feb.,
2015

CONTACT

+33 (0)1 44 23 21 50

industriels@erganeo.com

Ref. project : 054/098

PUBLICATIONS

C. Costentin, S. Drouet, M. Robert, and J. M. Saveant. A local proton source enhances CO₂ electroreduction to CO by a molecular Fe catalyst. *Science*, 338(6103):90–4, 2012.

C. Costentin, M. Robert, and J. M. Saveant. Catalysis of the electrochemical reduction of carbon dioxide. *Chem Soc Rev*, 42(6):2423–36, 2013.

C. Costentin, M. Robert, J.-M. Savéant, A. Tatin, Efficient and selective molecular catalyst for the CO₂-to-CO electrochemical conversion in water. *Proc Natl Acad Sci USA*, 2015 ; 112(22):6882–6.