



ParisTech

Ecole nationale supérieure de chimie de Paris

Laboratoire de Génie des Procédés Plasmas et Traitements de Surface
EA 3492 - 11, rue Pierre et Marie Curie - F75231 Paris Cedex 05



Professeur Jacques AMOUROUX

Téléphone

+ 33 1 44 27 68 14

Fax

+ 33 1 44 27 68 13

Courriel

Jacques-amouroux@enscp.fr

Site web

www.enscp.fr/labos/lgppts/

Carbon dioxide a raw material for sustainable development

Professor J.AMOUROUX, Dc P.SIFFERT, Dc.JP.MASSUE, Prof. S.CAVADIAS, Prof. B.TRUJILLO
LGPPTS ---- UPMC/ENSCP/EMRS/INPM

Since the last 20 years, carbon dioxide was only a waste from combustion processes using gas, coal, wood ,oil..., it was dropped in the atmosphere and no one take care about the consequences of 30 billions tons of gas emission per year.

Kyoto protocol and the opening of TS exchange in the European market open a route for CO₂ trapping by adsorption or absorption processes using MEA, NH₃, zeolithe, or cryogenic technique.

The cost of CO₂ is to day close to 25-30 \$/T from that kinds of unit operations. European commission have decided to support 10 industrial plants for coal power station of 1000 MW in order to trap 1.5 million tons of CO₂ each year.

Each unit cost around 1 billion Euros, so the question is how to propose a new industry for a sustainable development.

CO₂ is one of the key step for Carbon recovery, but the question is how to propose large pilot plant to produce a feed back to hydrocarbons, methanol or methane.

The breakthrough is to take into account that energy storage from non Carbon sources (PV, wind turbine, nuclear plant) needs to use a Carbon source such as CO₂ and to transform it by redox processes for industrial applications such as oil for car; energy storage for the pick of consumption of the network, new biodegradable molecules for polymers, new cements...

However the key step is to storage energy at a level which is in agreement with the electrical power plant: 1000 MW.

To do that we can explore the way of hydrogen by electrolysis which opens the way of fischer tropesch (CO₂ + H₂) from the last patent of US and South Africa, methane by redox process in a catalytic plug flow reactor, or methanol from catalytic plant using Ru, La,...

The efficiency of these processes depends of the catalytic material; it is a main parameter in order to increase the energy recovery from the previous one .

At the same time Plasmas processes that mean direct impact of electron to CO₂ open route for CO production, or oxosynthesis of alcohol or aldehyde from olefins ; by that way we can develop gas phase reactor with very short residence time and a starting time of few seconds which is a key parameter for discontinuous process using discontinuous electrical energy sources (PV, wind turbine) or electricity during the night from nuclear plant.

Our paper is able to present the different kinds of technical processes from the CO₂ recovery to the chemical and physical processes which are tested in pilot plant. At the same time we give some economical data which are proposed for these new industrial developments