



EXTRACTION OF ETHANOL FROM CARBONDIOXIDE

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Abstract:

In recent days the emission of Carbon dioxide is increasing day-by-day. The globalization of earth increases the emission of CO₂. The uses of automobile get increased. This leads to increases of amount of CO₂ in atmosphere that results global warming. The emission of carbon dioxide must be reduced. Carbon Capture Utilization and Storage is a gas injection technology that enables the storage of CO₂ underground. Unlike, this is a time for consuming and costly process. There is a simple and less time consuming process of converting CO₂ into some other useful product is possible. This paper deals with the reduction of Carbon dioxide by extrusion of Bio-fuel from it. This is achieved through various processes. Some of the chemical processes are suggested to extract ethanol from carbon dioxide. It can only be unlocked by overcoming the technical and social challenges. This paper will describe how the emission of Carbon dioxide was controlled and how to overcome the challenges of CCUS technologies.

According to CCPI (Climate Change Performance Index 2016) India ranked 14th out of 56 nations and European Union in emitting the CO₂ now we have been in 20th place of controlling the CO₂ in 2017. This shows the improvement of control of emission of Carbon dioxide. Further, China is one of the highest GHG emitting countries, ranked at 41st. The top three ranks are still unoccupied.

Carbon dioxide is a greenhouse gas since; it has the capability to store heat. Thus, the temperature of earth gets increased. CO₂ will absorb the infrared radiation in a planet's atmosphere warm its lower atmosphere and surface.CO₂ in atmosphere results for 9-26% of greenhouse effects.

Carbon dioxide, a waste product of combustion is pushed for combustion reaction backwards with very selectivity to a useful fuel as ethanol. Carbon dioxide takes up 65% of global greenhouse gas emission, comes out primarily by burning of fossil fuel and industrial processes.

CCUS is the most commonly used technology to regulate emission by keeping it from reaching the atmosphere by turning Carbon dioxide and particulate combustion residue into solid waste-a waste-to-waste process. Based on the statistics of Global 17 projects were held in North America, this was the most effective of any Nation in the world. The number of CCUS projects held in India is still less than two. It is a time consuming process and it has serious impacts on Environment to overcome this problem by converting the Carbon dioxide into useful renewable fuel as ethanol.

I. INTRODUCTION

Fossil fuels, especially coal that is rich in carbon, constitute the highest proportion of primary energy in all over the world. In recent years, the rapid urbanization and development of industries including power plants, steel plants etc. The green house gas emission of various Nations is shown in the table.1

Table.1 :Green House gas emission by Percentage

China	25.93%
US	13.87%
UK(28)	9.33%
UK(15)	7.45%
India	6.43%

II. LITERATURE SURVEY:

The Journal “Worldwide Status of CCUS Technologies and Their Development and Challenges in China”, explains that China government forcing to pay more attention to the development of green and clean energy and reducing the emission of greenhouse gas.

China tackles their greenhouse emission by CCUS Technologies. Multistage hydraulic fracturing in the horizontal wells has been widely used in shale gas production in China. However, this technology is still not mature enough for production of shale gas at depths >3500 m.

III. EXTRUSION PROCESS:

The ethanol can be extracted from carbon dioxide by various chemical processes. Some of the processes are described below

- Fischer Tropsch Process
- Carbon Nanospikes Structure Catalyst (CNS)

3.1. FISCHER TROPSCH PROCESS:

The Fischer–Tropsch process is a collection of chemical reaction that converts a mixture of carbon monoxide and hydrogen into liquid hydrocarbons. These reactions occur in the presence of certain metal catalysts, typically at temperatures of 150–300 °C (302–572 °F) and pressures of one to several tens of atmospheres. The process was first developed by Franz Fischer and Hans Tropsch at Germany, in 1925.

3.1.1 FISCHER–TROPSCH INTERMEDIATES AND ELEMENTAL REACTIONS:

Converting a mixture of H₂ and CO into aliphatic products obviously should be a multi-step reaction with several sorts of intermediates. For one –CH₂– group produced by

CO + 2 H₂ → (CH₂) + H₂O (1) several reactions are necessary.

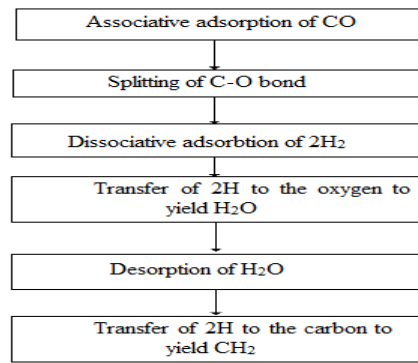


Fig 3.1: Process of conversion of CO₂ into Ethanol by Fischer-Tropsch process

3.1.2 FEEDSTOCK: GASIFICATION

Synthesis gas obtained from coal gasification tends to have a H₂: CO ratio of ~0.7 compared to the ideal ratio of ~2. This ratio is adjusted via the water-gas shift reaction.

3.1.3 DESIGN OF THE FISCHER–TROPSCH PROCESS REACTOR:

Efficient removal of heat from the reactor is the basic need of Fischer–Tropsch reactors since these reactions are characterized by high exothermicity.

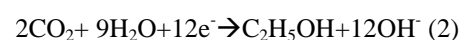
3.1.4 CATALYSTS:

A variety of catalysts can be used for the Fischer–Tropsch process; the most common are the transition metals cobalt, iron and ruthenium. Nickel can also be used, but tends to favour methane formation (“methanation”).

3.2 CARBON NANO SPIKES STRUCTURED CATALYST (CNS):

A catalyst made of carbon, copper and nitrogen and applied voltage to trigger a complicated chemical reaction that essentially reverses the combustion process. Nanotechnology-based catalyst which contains multiple reaction sites that helps the solution of carbon dioxide dissolved in water into ethanol.

Fabricated copper nanoparticles embedded in carbon nanospikes, providing ample reaction sites to facilitate conversion of carbon dioxide to ethanol.



PROCESS LAYOUT:

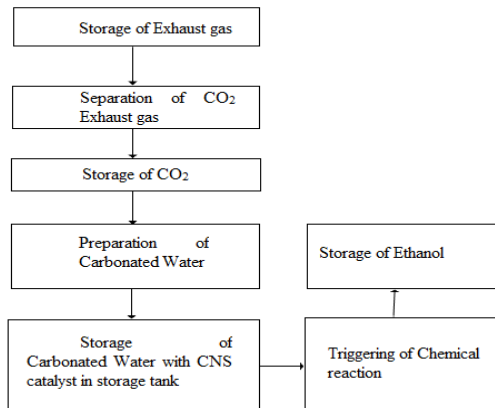


Fig 3.2: Process of conversion of CO₂ into Ethanol by CNS catalyst

III. CONCLUSION:

Many countries are participated in activities to tackle global climate change during the last few years. CCUS projects can store a large amount of CO₂, captured from large-scale point source emission sites, deep underground thus effectively decreasing emission in the atmosphere to reduce the emission of CO₂ by altering it into useful fuel as ethanol.

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REFERENCE

1. H.J.Liu, Worldwide Status of CCUS Technologies and Their Development and Challenges in China, 2017.