

## Basic Chemical Material Manufacture:

1: Hydrogen & Oxygen can be obtained in large quantities from water H<sub>2</sub>O by electrolysis.

2: Hydrogen - H<sub>2</sub> & Nitrogen -N<sub>2</sub> can be used to make Ammonia NH<sub>3</sub> & Nitrates – both useful as a necessary supplementary agricultural fertilizer.

Sodium-nitrate [Chile Saltpeter]- NaNO<sub>3</sub>

Potassium-nitrate - KNO<sub>3</sub>

Ammonium-nitrate - NH<sub>4</sub>NO<sub>3</sub>

3: With access to high-temperature steam and charcoal – Carbon-monoxide can be produced:

Carbon C + Water H<sub>2</sub>O + heat -----> Carbon-monoxide CO + Hydrogen H<sub>2</sub>

4: Using certain catalysts and Hydrogen - Carbon-monoxide can be transformed into Methane CH<sub>4</sub>:

Carbon-monoxide CO + Hydrogen 3H<sub>2</sub> + heat -----> Methane CH<sub>4</sub> + Water H<sub>2</sub>O

5: Carbon-monoxide can also be transformed into liquid alcohol – Methanol:

Carbon-monoxide CO + Hydrogen 2H<sub>2</sub> + heat => Methanol CH<sub>3</sub>OH

Methanol can be used as fuel in spark-ignition engines and as a solvent.

6: Methane can likewise be used as fuel, a solvent and by the use of other catalysts transformed into Acetylene – a basis raw-material for a number of organic materials.

Methane 2CH<sub>4</sub> + heat -----> Acetylene CH ≡ AcetyleneCH + Hydrogen 2H<sub>2</sub>

The necessary process heat can be provided from wood-powered thermal/steam electric generation sources.

However it may be noted that the original start-material used is charcoal - if coke [from coal] is available this can be used as a raw-material instead of charcoal.

Even though adequate electric power is available – the limiting factor of such chemical industrial-process will be the availability of charcoal or other carbon fuel.

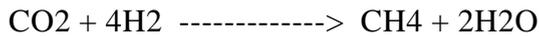
Such a bottle-neck can be overcome - using atmospheric Carbon-dioxide CO<sub>2</sub> - provided large quantities of power are available

Carbon-dioxide is first prepared as in dry-ice manufacture [cold-solid CO<sub>2</sub>]. Thereafter fine particles of Zinc react under pressure with the Carbon-dioxide.

CO<sub>2</sub> + Zn => CO + ZnO

The resulting Carbon-monoxide can be hydrogenated [dissolved under a hydration process] with Hydrogen to Methane or Methanol. The remaining Zinc-oxide can be regenerated under high pressure & high temperature with Hydrogen to Zinc. The Zinc is not consumed but changes between metallic Zinc and Zinc-oxide.

It is also possible to produce Methane & Methanol by direct reaction between atmospheric Carbon-dioxide and Hydrogen produced by electrolysis of water.

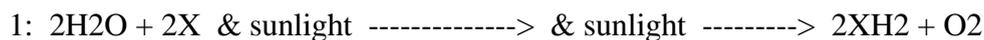


However in a technical production this process requires large and stable pressure-tanks,

This process is similar to photosynthesis in green plants – whereby Carbohydrates/starch are formed following the formula:



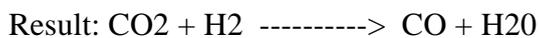
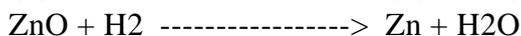
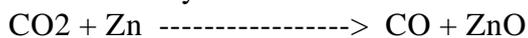
This process is in two stages as follows:



This second stage is the real hydrogenating process of Carbon-dioxide. However it is in this first stage that the splitting of water by Chlorophyll and sunlight;– That is the energy-demanding process of the synthesis of Carbohydrate by plants occurs.

Extra notes:

Carbon-dioxide CO<sub>2</sub> can be used as a raw-material to produce organic-chemical compounds with Zinc as a catalyst.

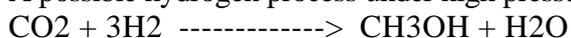


With CO => conventional synthesis of Methane -----> Acetylene.

Methanol -----> Formaldehyde CH<sub>2</sub>O

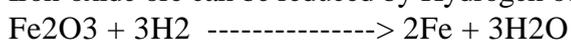
Hydrogen used in this above process can be obtained by the electrolysis of water.

A possible hydrogen process under high pressure can be as follows:



Iron-ore:

Iron-oxide ore can be reduced by Hydrogen obtained by electrolysis.



**Basic manufacture of lime for construction cement & for magnesium as a substitute for copper for electrical windings & power lines etc – for use during periods of very severe material shortages:**

**Cement:**

Burn limestone to unslaked lime or quick lime & carbon dioxide  
 $\text{CaCO}_3 + \text{CO}_2$

**Magnesium:**

Lime  $\text{CaO}$  is obtained by burning of limestone  $\text{CaCO}_3$ . The Carbon-dioxide  $\text{CO}_2$  disappears leaving lime.

A small bay or inlet on the sea coast containing sea-water is enclosed by a constructed dam.

Lime is then continuously poured into this sea-salt water. Magnesium-salt in solution precipitates & falls to the bottom as Magnesium-hydroxide.

This is then collected by shovel & thereafter treated in a thick semi-liquid form with hydrochloric acid -  $\text{HCl}$ .

Hydrochloric acid is obtained by electrolysis of concentrated sea-water to Chlorine  $\text{Cl}$  + Hydrogen  
 $\Rightarrow \text{HCl}$

Hydrochloric acid and Magnesium-hydroxide mixed together will give Magnesium-chloride.

This is first dried and then is ready for smelting by electrolysis by 10-12 VDC at several thousand amperes. The Magnesium will be deposited on the cathode as melted metal.

Electrical power is required at two stages in the process:

- A: Electrolysis of the sea-water
- B: Electrolysis of Magnesium-chloride

Heat - possibly from wood - will be required at three stages:

- A: Preparation of Lime from limestone.
- B: Concentration of sea-water
- C: Concentration of the Magnesium-chloride solution.

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