

## Acetylene

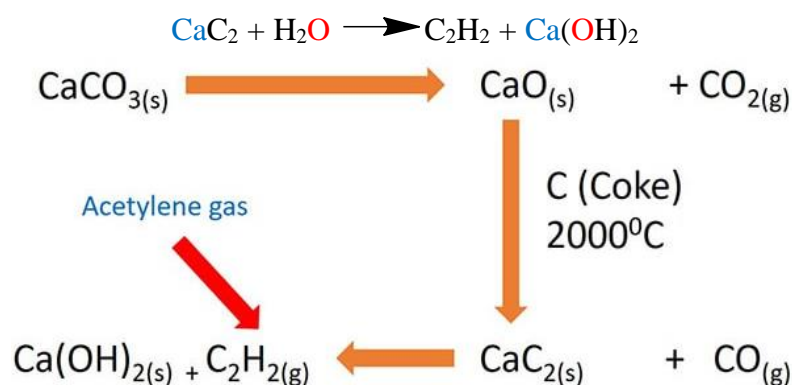
- ❖ Acetylene (C<sub>2</sub>H<sub>2</sub>) is a colourless and flammable gas.
- ❖ At 100 % purity, acetylene is odourless, but at commercial purity it has a garlic like odour.
- ❖ Acetylene can be liquefied and solidified with ease, although in both cases it explodes with extreme violence when ignited.
- ❖ Acetylene can be inhaled in rather high concentrations without chronic, harmful effects.
- ❖ It is used as an anaesthetic.
- ❖ However, it is a simple asphyxiate if present in concentrations high enough to deprive the lungs of oxygen and produce suffocation.

### Methods of Preparation

- ❖ Two methods: Calcium carbide method and thermal or arc cracking of hydrocarbons.

#### Calcium Carbide Method:

- ❖ A primary method for the manufacture of acetylene is to react calcium carbide, the principal raw material, with water to produce acetylene with calcium hydroxide as a by-product:



Scheme 1: Route for acetylene synthesis.

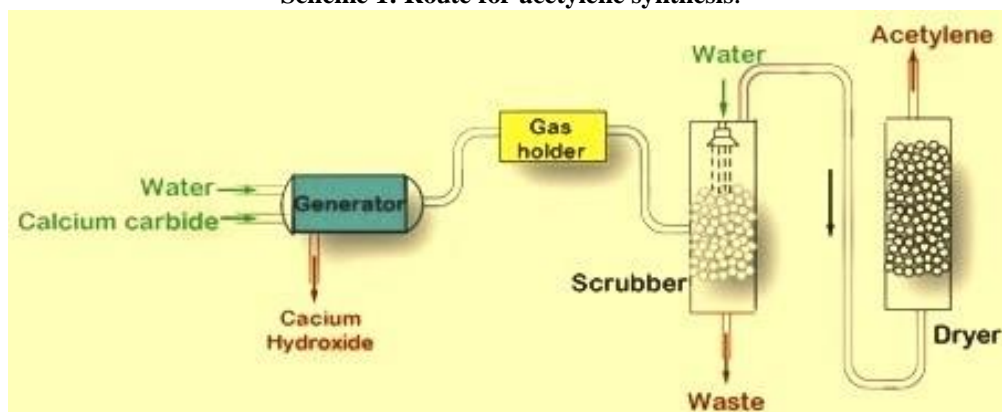


Figure 1: Acetylene synthesis.

- ❖ In the primary method for producing acetylene, calcium carbide is fed into a generator containing water.
- ❖ The resulting wet acetylene gas at 120°F to 140°F is piped to a cooler condenser where it is cooled to 80°F to 90°F and the water vapour is condensed.
- ❖ This is the first step in the drying process.
- ❖ The gas then goes to a low-pressure dryer filled with calcium chloride.
- ❖ The calcium chloride absorbs the moisture from the acetylene gas, which then enters a compressor, where the pressure is increased to 200 to 375 psig.
- ❖ An oil separator filters out excess impurities and oil.

- ❖ The gas next goes to a high-pressure dryer, where all remaining water is removed.
- ❖ The gas is then pumped into cylinders for shipment.
- ❖ The by-product calcium hydroxide is sent to a storage tank, where water is decanted off the top, and is recovered.
- ❖ The acetylene produced from calcium carbide is basically pure, with only water and air as impurities.

### Thermal Cracking of Hydrocarbons:

- ❖ Acetylene is manufactured by thermal or arc cracking of hydrocarbons and by a process utilizing the partial combustion of methane with oxygen.

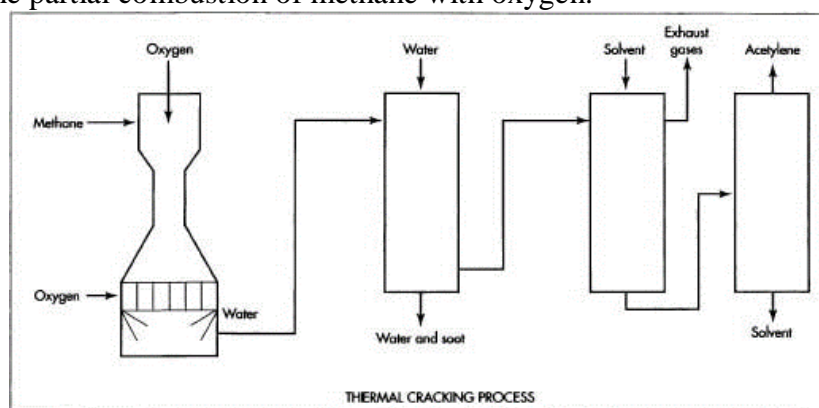


Figure 1: Thermal cracking method of acetylene synthesis.

### Application of Acetylene:

- ❖ 80 % of the acetylene produced is used for chemical synthesis.
- ❖ Acetylene is an important raw material for a series of organic compounds such as acetaldehyde, acetic acid, acetic anhydride, acetone, and vinyl chloride.
- ❖ Those compounds are used to manufacture a large group of products, including plastics, synthetic rubber, dyestuffs, solvents, and pharmaceuticals, and in the manufacture of carbon black.
- ❖ The other 20 % is used for oxy-acetylene welding, cutting, heat-treating, lighting purposes, buoys and beacons.

### Transportation of Acetylene:

- ❖ The only method of distributing acetylene other than pipeline, is by means of portable steel tanks containing a porous solid filler saturated with acetone or other suitable solvent, in which the acetylene is dissolved under pressure.
- ❖ Acetylene alone is not handled at pressures higher than two atmospheres because of its tendency to decompose explosively dissolved in acetone it may be stored at pressures of 10 to 15 atmospheres.

**Stay at Home**  
**Maintain Social Distancing**