

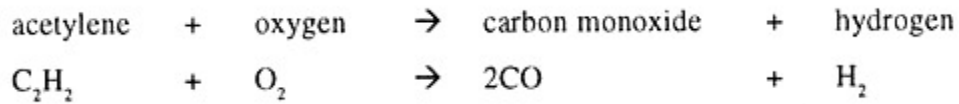
## Gas welding

Gas welding is a fusion welding process in which the heat for welding is obtained by the combustion of oxygen and fuel gas. The fuel gas may be acetylene, hydrogen, propane or butane.

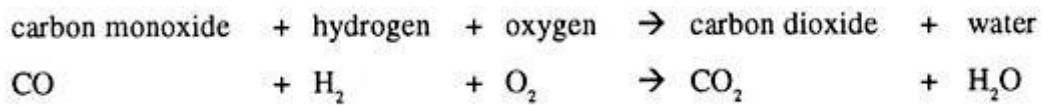
The Composition of filler rod is usually same as that of base metal. The filler metal is used to fill up the cavity made during edge preparation. A flux material is also used during welding to remove impurities and oxides present on the metal surfaces to be joined.

### Oxy-Acetylene Welding:

- ✓ When a combination of oxygen and acetylene is used in correct proportions, to produce an intense gas flame, the process is known as Oxy-acetylene welding.
- ✓ An Oxy-acetylene gas flame has a temperature of about 3200°C and thus can melt all commercial available metals. A filler rod of the same material is used to fill up the cavity made during edge preparation, if metal thickness is more than 15 mm. A flux is used to remove impurities and oxides present on the metal surface.
- ✓ The acetylene hose from the acetylene regulator should be connected to the acetylene torch needle valve marked 'AC'. The oxygen hose from the oxygen regulator should be connected to the needle valve of torch marked 'OX'.
- ✓ **This process of combustion occurs in two stages:**
  - (1) The innermost blue, luminous core;
  - (2) The outer envelope.
- ✓ **In first stage, the acetylene combines with the oxygen supplied to form carbon monoxide and hydrogen:**



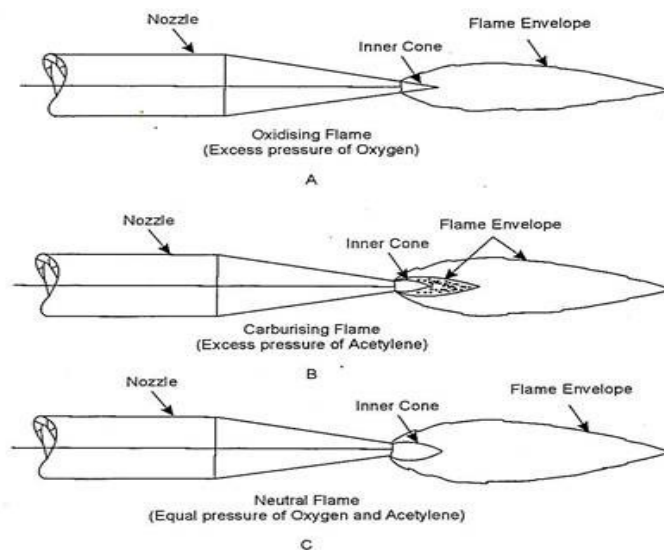
- ✓ In the second stage, the carbon monoxide burns and forms carbon dioxide, while the hydrogen formed from the above actions combines with oxygen to form water:



The three different types of gas flames produced by changing the mix volumes.

### Neutral flame:

- ✓ If this mixture is made up of equal volumes of both the gases, then complete combustion will take place on ignition, with addition of one and half volumes of oxygen from the surrounding atmosphere to form a Neutral Flame.



## Oxidizing flame:

- ✓ When the proportion of oxygen supplied in the blowpipe is increased, and then gives an oxidizing flame. The inner cone is shorter and more pointed, and the excess of oxygen will react with the metal being welded.
- ✓ The oxidizing flame is somewhat hotter than the neutral flame.

## Reducing flame:

- ✓ The effect of increasing the proportion of acetylene is to produce the reducing flame.
- ✓ This flame is characterized by three flame zones; the hot inner cone, a white-hot "acetylene feather", and the blue-colored outer cone.
- ✓ The unburned carbon insulates the flame and drops the temperature to approximately 5,000 °F (2,800 °C).

## Components used in gas welding

The cylinder, cylinder valves, Regulators, pressure- adjusting screws, Gas Hose-pipe, torch, nozzle.

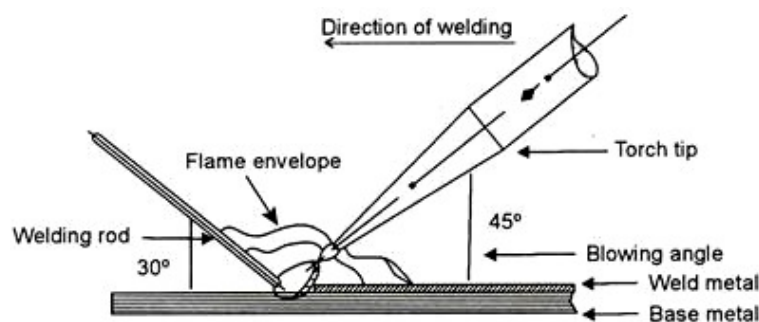


Fig. 5.1 Oxy-acetylene Gas Welding Process

## Filler Rods in Gas Welding:

The function of filler rod (also called welding rod) is to provide the additional metal required for welding. It is generally made of same composition and properties as the base metal. It should be free from dust, grease, rust, non-metallic particles, and any other contamination.

### **Functions of Flux:**

1. The flux prevents the formation of oxides, nitrides and other undesirable material in the weld pool.
2. The flux protects the molten metal from atmospheric oxygen to go inside.
3. The flux chemically reacts with the oxides present and forms a low melting temperature fusible slag, the slag floats during the welding and deposited on the top surface of the joint after Solidification of metal. It can be easily brushed off by brush and chipping hammer.
4. The flux acts as better cleaning agent. It helps to clean and protect the surface of the base metal.

### **Applications of Gas Welding:**

1. For joining most ferrous and non-ferrous metals, carbon steels, alloy steels, cast iron, aluminum and its alloys, nickel, magnesium, copper and its alloys, etc.
2. for joining thin metals.
3. for joining metals in automotive and aircraft industries.
4. For joining metals in sheet metal fabricating plants.
5. For joining materials those requires relatively slow rate of heating and cooling, etc.

### **Advantages of Gas Welding:**

**The following are the advantages of gas welding:**

**1. Portable and Most Versatile Process:**

Gas welding is probably portable and most versatile process. The ranges of gas welding products are very wide. It can be applied to variety of manufacturing, maintenance and repair work.

**2. Better Control over the Temperature:**

Gas welding provides better control over the temperature of the metal in the weld zone by controlling the gas flame.

**3. Better Control over Filler-Metal Deposition Rate:**

In gas welding, the source of heat and filler metal are separate unlike arc welding. This provides better control over filler-metal deposition rate.

**4. Suitable to Weld Dissimilar Metals:**

The gas welding can be suitable to weld the dissimilar metals with suitable filler and flux material.

**5. Low Cost and Maintenance:**

The cost and maintenance of the gas welding equipment's is low as compared to some other welding processes. The equipment is versatile, self-sufficient and portable.

**Disadvantages of Gas Welding:**

**1. Not Suitable for Heavy Sections:**

Since the heat produced is not sufficient and hence heavy sections cannot be joined economically.

**2. Less Working Temperature of Gas Flame:**

The flame temperature is less than the temperature of the arc.

**3. Slow Rate of Heating:**

The rate of heating and cooling is relatively slow. In some cases this is advantageous.

#### **4. Not Suitable for Refractory and Reactive Metals:**

Refractory metals like tungsten, molybdenum and reactive metals like titanium and zirconium cannot be welded by gas welding process.

#### **5. Larger Heat affected Area:**

Gas welding results in a larger heat affected area due to prolonged heating of joint.

#### **6. Flux Shielding is not so effective:**

Flux-shielding in gas welding is not as effective as in case of TIG or MIG welding. The oxidation cannot be avoided completely.

#### **7. Problem in Storage and Handling of Gases:**

More safety problems are associated with the storage and handling of explosive gases e.g., acetylene and oxygen.