

GAS WELDING

Gas Welding also called an oxy-fuel gas welding, derives the heat from the combustion of a fuel gas (such as acetylene) in combination with oxygen. The process is a fusion welding process wherein joint is completely melted to obtain the fusion.

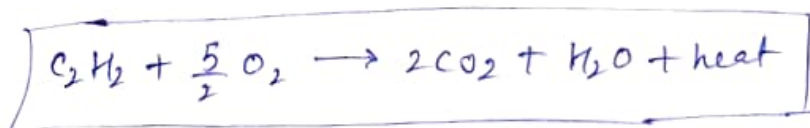
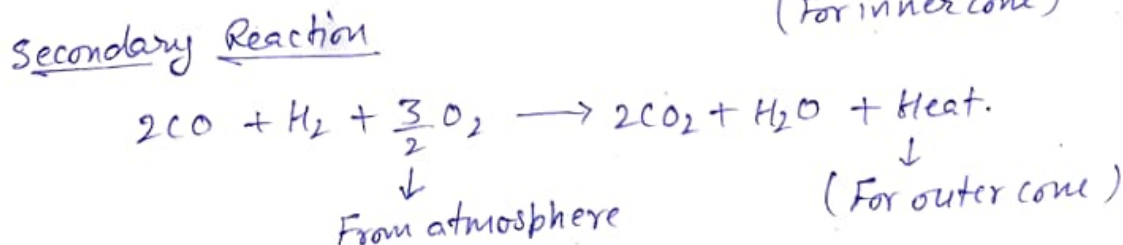
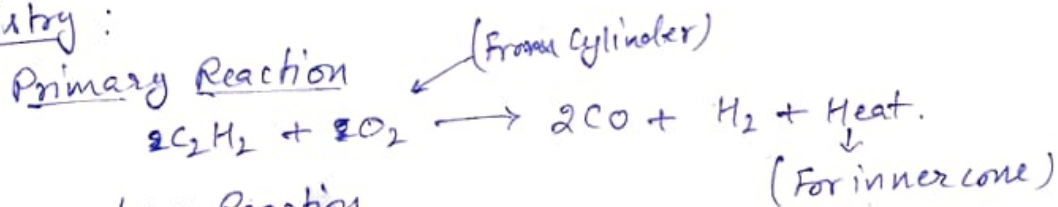
characteristics of fuel gas.

Gas	Chemical formula.	Flame temp. (°C)
Acetylene	C_2H_2	3100
Propylene	C_3H_6	2500
Propane	C_3H_8	2450
Hydrogen	H_2	2390
Natural gas	$CH_4 + H_2$	2350

OXY-ACETYLENE WELDING:

Principle: When acetylene is mixed with oxygen in correct proportions in the welding torch and ignited, the flame is produced which is sufficiently hot to melt and join the parent metal. Temp. of flame is about $3100^\circ C$. A filler rod is generally added to build up the seam for greater strength.

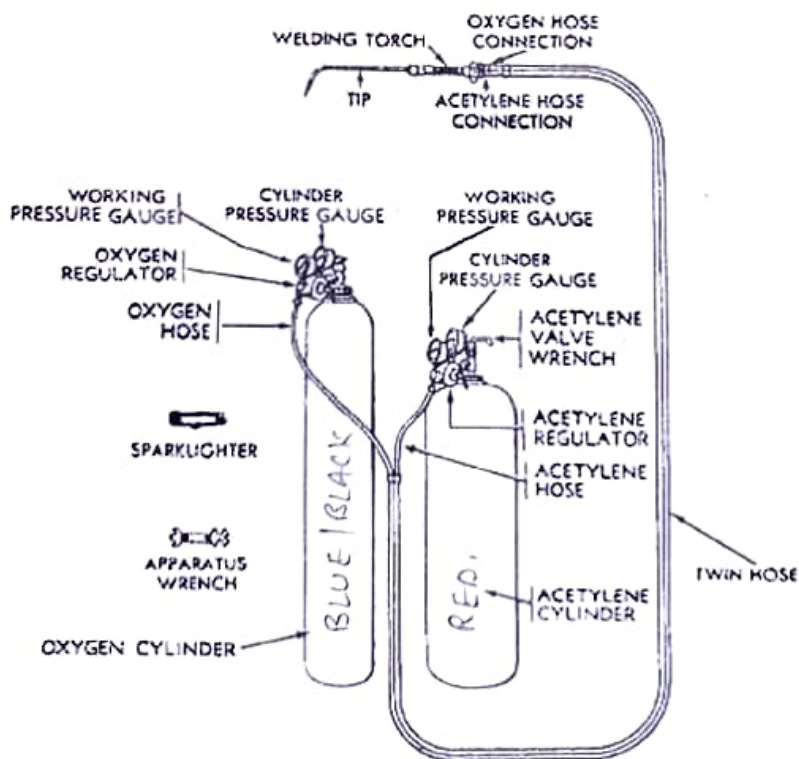
Chemistry:



$< 5mm \rightarrow$ No filler used.

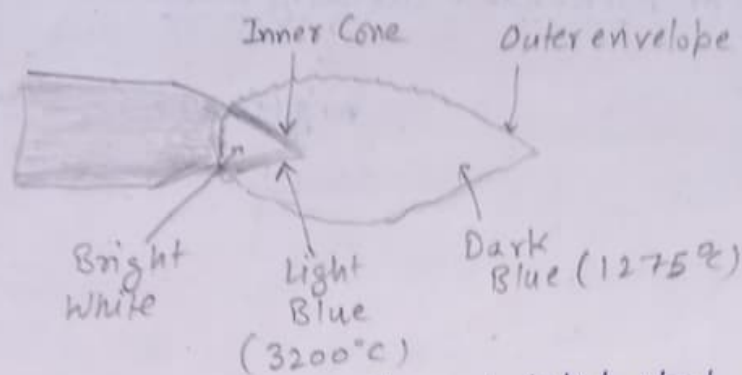
$> 5mm \rightarrow$ filler material needed.

- For complete combustion of "1 mol of Acetylene", "2.5 mol of Oxygen" is required in which "1 mole" is supplied from oxygen cylinder and rest " $\frac{3}{2}$ mol" are consumed from atmosphere.
- For heat released in the primary reaction forms the inner cone and is responsible for welding.
- The heat released in the secondary reaction is less as compared to primary and responsible for Pre-heating and Post-heating.
- CO_2 released in the secondary acts as a shielding gas to protect the weld pool.
- Water vapours are released at the end of process.
- Acetylene is stored in the form of Acetone in the cylinder because it is highly explosive in general condition. and helps stabilize the gas making it non-reactive within the cylinder.
- By controlling the volume flow rate of oxygen & acetylene, different flames can be produced and they will be used for different application.

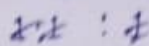
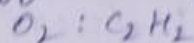


18. TYPES OF FLAMES

(1) Neutral flame



Oxygen : Acetylene.



It is used for welding of Mild steel, Stainless steel, Copper, Cast Iron, Aluminium etc.

(2) Oxidizing flame :

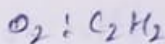
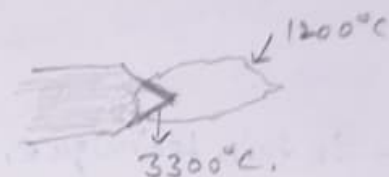
- After the neutral flame, if the supply of oxygen is further increased, the result will be an oxidizing flame.

- Its inner cone is more pointed, outer flame envelope is much shorter.

- It burns with loud roar.

- The flame is harmful for steels, because it oxidizes the steels.

- Only in the welding of copper, and copper based alloys.



(3) Reducing flame :

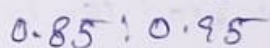
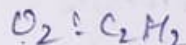
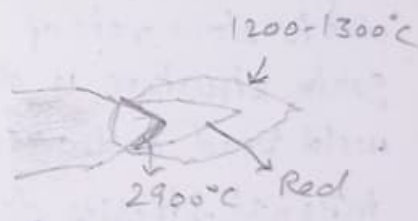
- If the volume of oxygen supplied to the neutral flame is reduced, the resulting flame will be a carburizing or reducing flame i.e. rich in acetylene.

- Metals that tend to absorb carbon should not be welded with reducing flame.

- Carburizing flame contains more acetylene than a reducing flame.

- Carburizing flame is used for the welding of lead and for carburizing (surface hardening) purposes.

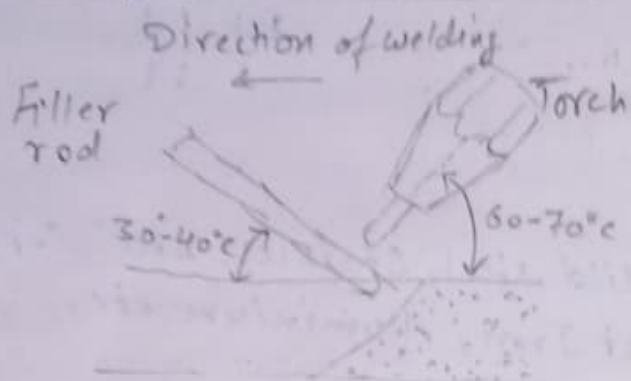
- Reducing flame is used with low alloy steel and for welding high carbon steel.



WELDING TECHNIQUES

- ① Leftward techniques or fore-hand welding method :
- ② Rightward techniques or back-hand welding method .

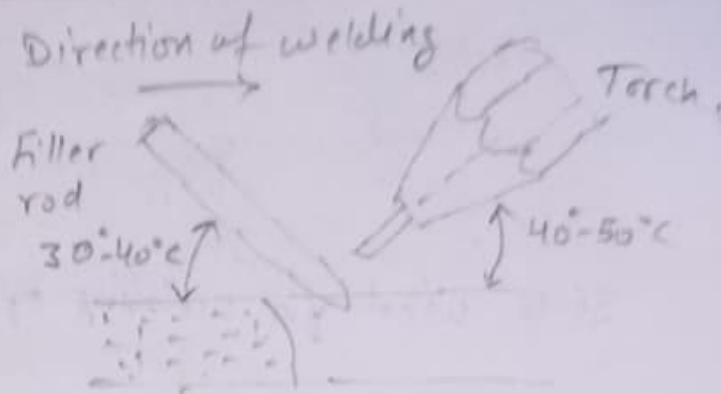
Leftward



Preheating

- In this technique, welding torch is moving right to left.
- During the process, inner cone is melting the base material and outer flame is preheating the base material before welding.
- By reducing the diff. of temp. due to slow rate of cooling, coarse grain structure is developed in the weld bead and due to this, internal stresses developed in the weld bead can be reduced and crack formation can be minimized.

Rightward.



Post heating or Reheating.

- In this technique, welding torch is moving left to right.
- During the process inner cone is melting the base material & outer flame is reheating the already welded metal.
- During the process, stresses developed in the joint can be relieved (Annealing) and crack formation can be minimized.
- In case of cast iron if the diff. of temp. is very high, free form of Carbon will be converted into carbides, they will become more brittle, hard and cracks will be formed. To overcome this, it can be easily welded by gas welding with the preheating process.