



Flue gas analysis (orsat method)

The mixture of gases (like CO_2 , O_2 & CO) coming out from the combustion chamber is called flue gas.

- The analysis of a flue gas would give an idea about **the complete or incomplete combustion process**.
- The analysis of flue gas is carried out by using **Orsat's apparatus**.

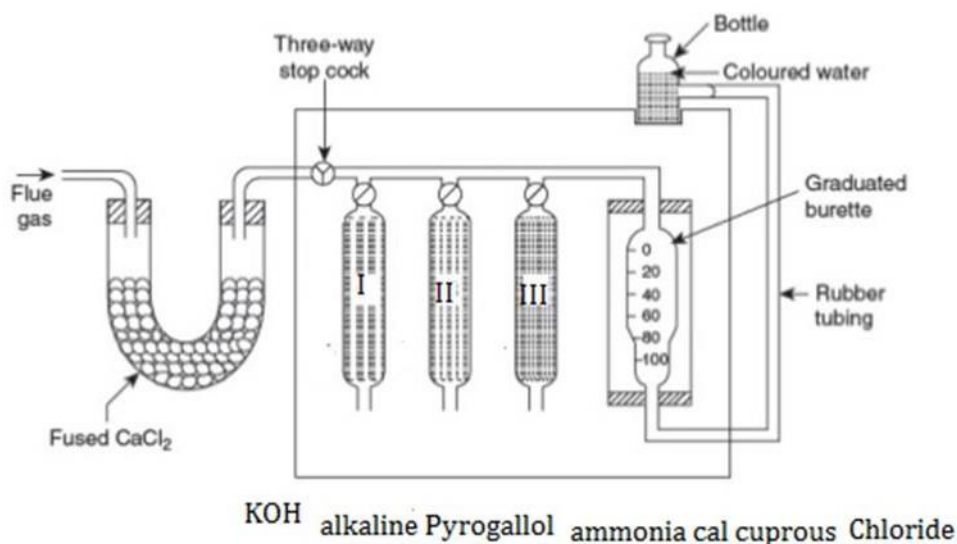
Description of Orsat's apparatus

- It consists of a horizontal tube.
- At one end of this tube, 'U' tube containing fused CaCl_2 is connected through 3 – way stop cock.
- The other end of the tube is connected with a graduated burette.
- The burette is surrounded by a water jacket to keep the temperature of the gas constant.
- The lower end of the burette is connected to a water reservoir by means of a rubber tube.
- The level of water in the burette can be raised or lowered by raising or lowering the reservoir.
- The horizontal tube is also connected with three different absorption bulbs 1, 2 and 3 for absorbing CO_2 , O_2 and CO .

Bulb 1 contains **KOH** and it absorbs **CO_2** only.

Bulb 2 contains **alkaline pyrogallol** and it absorbs CO_2 and O_2 .

Bulb 3 contains **ammoniacal cuprous chloride** and it absorbs **CO_2 , O_2 and CO** .



Working



- The three way stop cock is opened to the atmosphere and the burette is completely filled with water and air is sent out.
- The burette is filled with flue gas to 100 cc by raising or lowering the reservoir. Now the 3- way stop cock is closed.

1. Absorption of CO₂

- The bulb 1 is opened and all the gas is passed into bulb1 by raising the level of water in the burette.
- The gas enters into bulb1 where CO₂ is absorbed by KOH. The gas is again sent to the burette.
- The process is repeated several times to ensure complete absorption of CO₂.
- The decrease in volume of the flue gas = the volume of CO₂ in 100cc of the flue gas.

2. Absorption of O₂

- Bulb 1 is closed and bulb 2 is opened.
- The gas is again sent into bulb 2 where O₂ in the flue gas is absorbed by alkaline pyrogallol.
- The decrease in volume of the flue gas = the volume of O₂.

3. Absorption of CO

- Bulb 2 is closed and bulb 3 is opened.
- The remaining gas is sent into bulb 3, where CO is absorbed by ammoniacal cuprous chloride.
- The decrease in volume of flue gas = the volume of CO.
- The remaining gas in the burette after the absorption of CO₂, O₂ and CO is taken as nitrogen.

Significance

- i) It gives an idea about the complete or incomplete combustion.
- ii) If the flue gas contains considerable amount of CO, it indicates incomplete combustion and short supply of O₂.
- iii) If the flue gas contain considerable amount of O₂, it indicates complete combustion and excess supply of O₂.