

UCB008 - APPLIED CHEMISTRY



Atomic Emission Spectroscopy

Instrumentation – Types of Burners

by

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Learning Outcomes

At the end of this session participants should be able to:

- Understand the working of various types of burners used for atomic spectroscopic techniques

Types of burner

Mecker burner

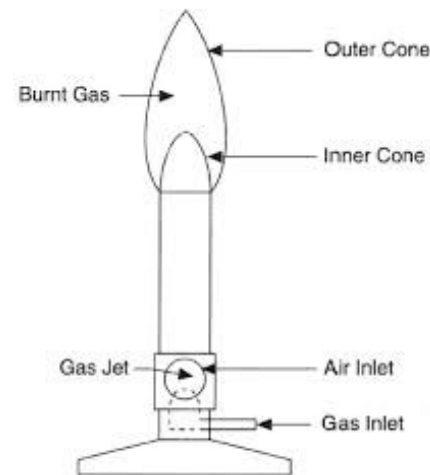
Total consumption burner

Laminar flow burner

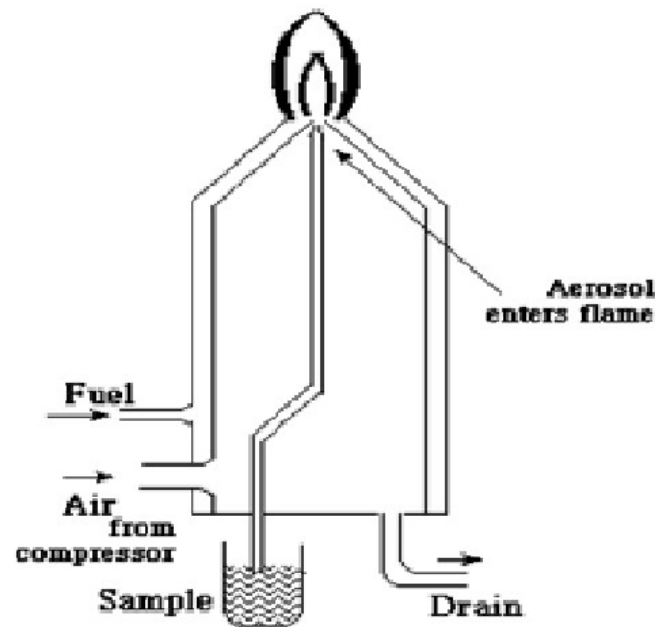
Burners

Mecker Burner-

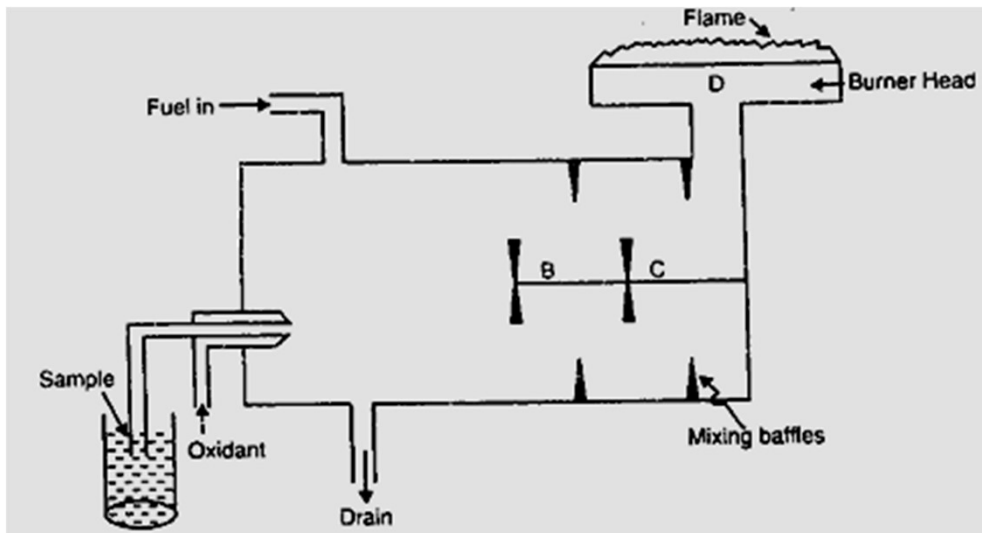
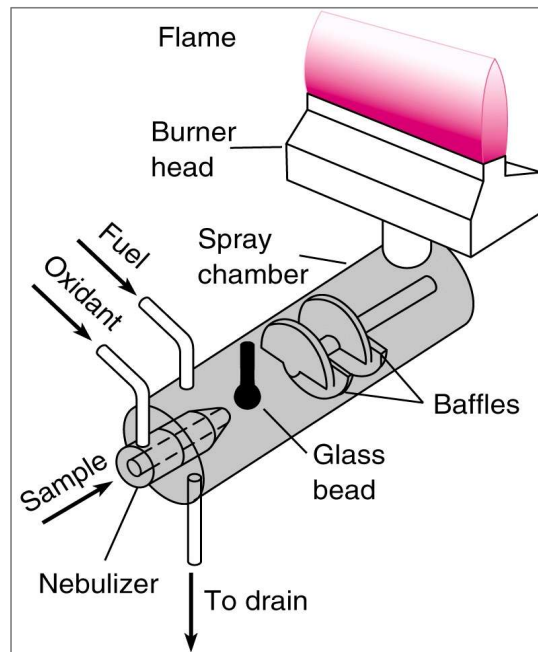
- Natural gas and oxygen are used as fuel and oxidant.
- Produces low temp, and low excitation energies.
- Used for alkali metals only.



Total consumption Burner



- As soon as liquid sample is drawn in the flame, oxygen aspirates the sample solution.
- Desolvation
- Vapourisation
- Atomization
- Excitation
- Emission process
- Flame is noisy and turbulent but can be adjusted to produce high temperature by controlling fuel to oxidant ratio.



Laminar-flow Burner (pre-mix)

- Sample, fuel and oxidant are thoroughly mixed before reaching the burner opening and then enters in the flame
- Gases move in non-turbulent fashion – laminar flow
- Only 5 percent of the sample in the form of small droplets reaches to the flame and gets decomposed
- Efficient atomization
- Larger droplets move out as condensate
- Flame is non-turbulent, noiseless and stable
- Disadvantages
 - When sample contains two solvents, more volatile solvent evaporates leaving sample in less volatile solvent
 - Therefore, smaller number of atoms would reach to the flame and emission intensity reduces

Comparison – Total Consumption & Pre-mix Burner

| Total Consumption Burner | Pre-mix Burner |
|---|---|
| Fuel, oxidant and sample meet together at the base of the flame | Nebulized sample get mixed thoroughly with fuel and oxidant then this mixture goes in the flame |
| The flame is turbulent, noisy and non-homogeneous | The flame is non-turbulent, noiseless, stable and laminar flow |
| Entire sample that entered through the capillary tube reaches to the flame and get burnt regardless of dropsize | Only 5% of the sample in the form of smaller droplets reaches to the flame and burnt |
| Atomization is non homogenous | Efficient and homogenous atomization takes place |
| Preferred for flame photometry | Preferred for atomic absorption spectroscopy |
| Cost-effective | Expansive |
| | |

In the next session.....

- Principles associated with atomic absorption spectroscopy