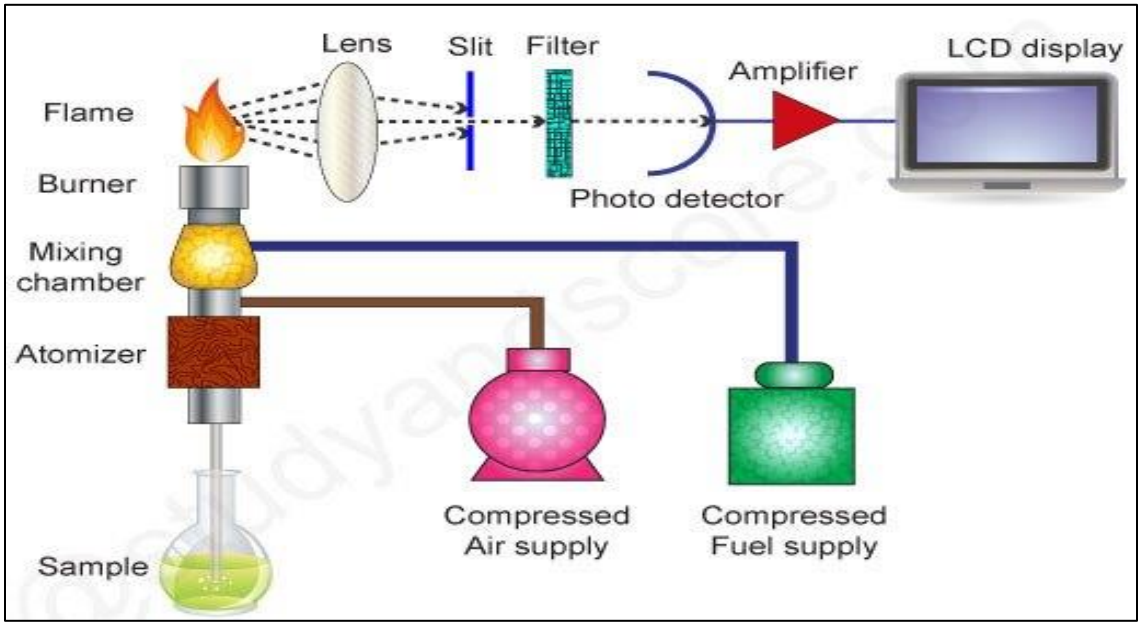
Flame Photometry

Flame photometry is a technique in which the intensity of the emitted light is measured when atomized metal is introduced into the flame. The wavelength and intensity of the colour indicates the element and the % of that element in the compound.



1.14.1. Principle

$M^+ X^-$ (Sample solution) $\xrightarrow{\text{Evaporation}}$ M X (Solid salt) $\xrightarrow{\text{Vaporaization}}$ M X (Gaseous Molecule) $\xrightarrow{\text{Dissociation}}$ M + X (Gaseous atoms)

When metallic salt solution is introduced into the flame the following changes occurs.

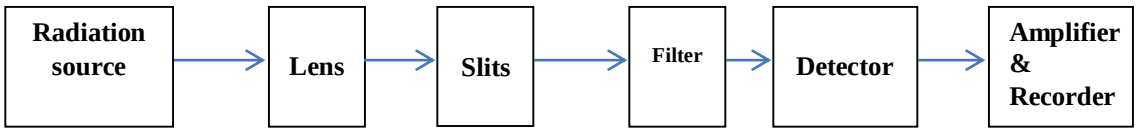
(a) Evaporation of solvent.

(b) Vaporization of solid salt into gaseous molecule.

(c) Dissociation of gaseous molecule into atoms.

(d) Thermal excitation and return to the ground state with emission of radiation.

Instrumentation:



Block diagram of flame photometer

Components:

Radiation source: flame is used as radiation source,

1. It should evaporate the solvent
2. It should vaporize the solid salt into gaseous molecule
3. It should dissociate the Gaseous molecule into atom
4. It should excite the atom and cause them to emit radiation.

Lens:

It is used to increase the amount of radiation reaching the detector.

Slits:

There are two types of slits.

(a) Entrance slit: It permits only the radiation comes from the lens.

(b) Exit slit: It prevents the entry of interfering lines.

Filter or Monochromator:

It is also called monochromator. It allows the light of required wavelength only.

Detector:

It measures the intensity of radiation falling on it and it is converted into current.

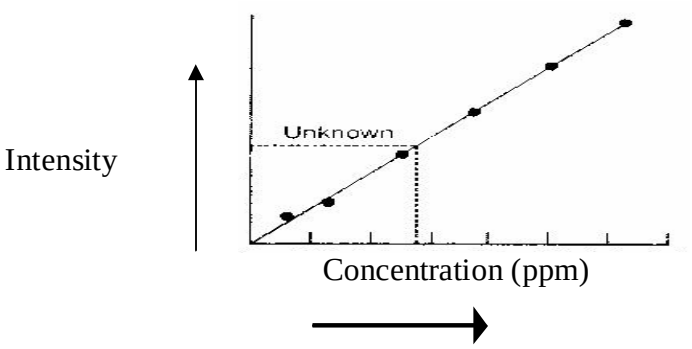
Amplifier & Recorder:

The current coming out from the detector is weak, so it is amplified and recorded.

Working:

The sample is mixed with air and fuel gas in the mixing chamber and this mixture is passed into the burner. The radiation emitted from the flame is passed successively into the lens,

filter, detector and finally into the recorder. The above experiment is carried out using a series of standard solutions and the readings noted for each trial. Finally a graph of calibration curve is drawn between concentration verses intensity of emitted light. After finding out the intensity of test solution experimentally, the concentration will be determined from the graph.



Advantages:

- It is a well – understood technique.
- Low running and maintenance cost.
- Measurement is possible in a wide range of liquid systems.

Drawbacks:

- It is necessary to use liquid samples.
- It never emits the light on the molecular form of the metal present in the test solution.
- All metal ions and inert gases cannot be determined.