

Factors influencing the Intensity of Emitted Radiations in Flame

Emission spectroscopy

FACTOR INFLUENCING THE INTENSITY OF EMITTED RADIATIONS IN FE:-

There are some factors which influence the intensity of emitted radiations in FE spectroscopy.

1- Viscosity:-

The addition of a substance which increase the viscosity of solution decreases the intensity of light emission. This decrease results in due to reduction in efficiency of atomization.

2- Formation of stable compounds:-

Formation of stable compounds at low temp. also cause the reduction in formation of free neutral atoms hence decrease the intensity of emitted radiations.

3- Presence of metals:-

Presence of other metals which cause the spectral interference. So, it alter the intensity of emitted radiations.

4) Aqueous solvents-

Aqueous solvent decrease the intensity of emitted radiations.

Effect of solvents in flame photometry

Solvent can effect in two ways

1) Viscosity

1) Viscosity

Viscosity ↑

flow rate ↓ ⇒ less atoms excite ⇒ less emission ⇒ intensity ↓

The rate at which sample is aspirated into the flame effected by viscosity. There is an optimum sample flow rate.

If rate is too high, the flame is swamped.

If rate is too low, then signal is decreased bcoz insufficient sample finds its way to flame.

* Second effect of solvent is caused by dif b/w aqueous or organic material.

⇒ If it is aqueous, then sample required energy to evaporate it. Generally an inorganic salt is left behind which requires more energy from the flame to decompose it. This is endothermic process which slows down the atomization process.

⇒ If solvent is organic, it burns on introduction to the flame and leaves organic residue which ^{so} intn burn inside the flame. Each of these steps are exothermic. The atomization efficiency is increased and there is an enhancement of the signal. This is the reason for signal enhancement when organic solvent are used rather

Applications of Flame Photometry:

Flame photometer has both quantitative and qualitative applications. Flame photometer with monochromators emits radiations of characteristic wavelengths which help to detect the presence of a particular metal in the sample. This help to determine the availability of alkali and alkaline earth metals which are critical for soil cultivation.

In agriculture, the fertilizer requirement of the soil is analysed by flame test analysis of the soil.

In clinical field, Na^+ and K^+ ions in body fluids, muscles and heart can be determined by diluting the blood serum and aspiration into the flame.

Analysis of soft drinks, fruit juices and alcoholic beverages can also be analysed by using flame photometry.

Application

- Flame photometry is useful for the determination of alkali and alkaline earth metals.
- It is used in the study of electrolyte balance in physiology and in clinical analysis.
- Used in determination of lead in petrol.
- Used in the study of equilibrium constants involving in ion exchange resins.
- Used in determination of calcium and magnesium in cement.

Qualitative and Quantitative applications.

Applications of Flame photometry:-

1) **Qualitative Applications:-**

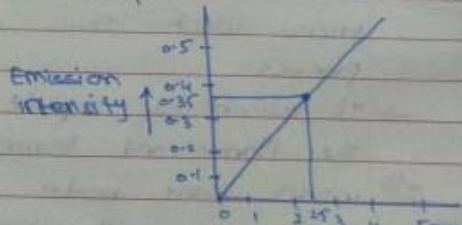
FE is only used to detect the elements of group I & II in periodic table (PT). These elements are Na, K, Li, Mg, Ca, Sr & Ba. Some of these elements can be detected visually by the colour in flame e.g. Na; it gives golden yellow flame. So we can visualize it easily but this method is not reliable.

Best method is to use the flame photometer with filter or monochromator which only allows the emission at particular wavelength.

2) **Quantitative analysis:-**

For this purpose, it is necessary to prepare calibration curve of emission intensity versus conc. of elements. The straight line will be obtained from the emission of sample. We can get conc. of the particular element in the sample.

By knowing emission intensity, we find out the unknown conc. of sample.



Concentration (ppm)	Emission Intensity
0	0
2.5	0.4

Advantages:

1. Simple quantitative analytical test based on the flame analysis.
2. Inexpensive.

3. The determination of elements such as alkali and alkaline earth metals is performed easily with most reliable and convenient methods.
4. Quite quick, convenient, and selective and sensitive to even parts per million (ppm) to parts per billion (ppb) range.

Disadvantages:

Moreover the flame photometer has a wide range of applications in the analytical chemistry, it possess many disadvantages which are explained below:

1. The concentration of the metal ion in the solution cannot be measured accurately..
2. A standard solution with known molarities is required for determining the concentration of the ions which will corresponds to the emission spectra.
3. It is difficult to obtain the accurate results of ions with higher concentration.
4. The information about the molecular structure of the compound present in the sample solution cannot be determined.
5. The elements such as carbon, hydrogen and halides cannot be detected due to its non radiating nature.