

Inductively Coupled Plasma (ICP)

ICP is an analytical atomic spectrometer. It can identify most of the elements (except of H,N,O,C,F) and quantify their concentrations in ppm units (mg\liter).The analysis is performed in aqueous homogeneous media. The media may be also dilute acidic or basic-up to 10%. Organic polar solvent is suitable for the analysis only if it can be diluted with water without causing precipitations.

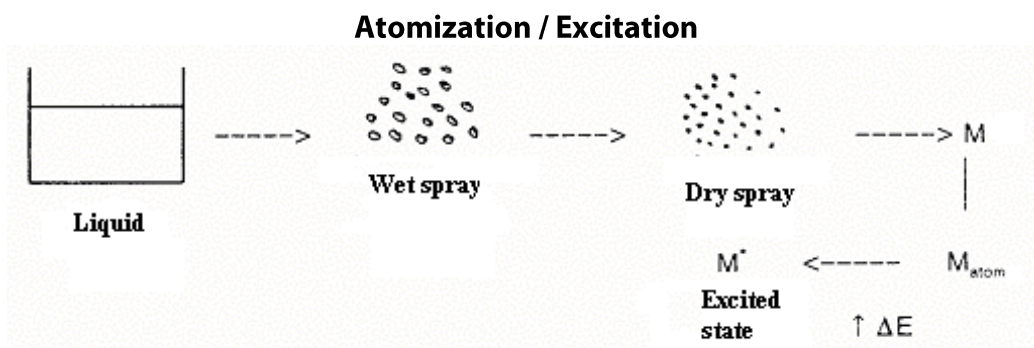
For the moment, non-polar organic media cannot be used, as it needs special equipment.

Principle of ICP Instrumental Technique

ICP is an Atomic Emission Spectrometer (AES). It measures the energy lost by an atom going from an excited state to a lower energy state. The energy is released in the form of light with a wavelength characteristic to each element. The intensity of the emitted light is proportional to the number of atoms of the element. The sample is atomized in the instrument in the following way:

- The liquid sample is converted to wet spray (nebulization).
 - Water is driven off and the remaining solid and liquid portions are converted to gases.
 - The gases enter the plasma where atomization and excitation occurs.
- A plasma is an inert gas, usually argon, maintained in high temperature (6000°K-10000°K). It becomes ionized by an electric discharge and transfers its energy to the sample.

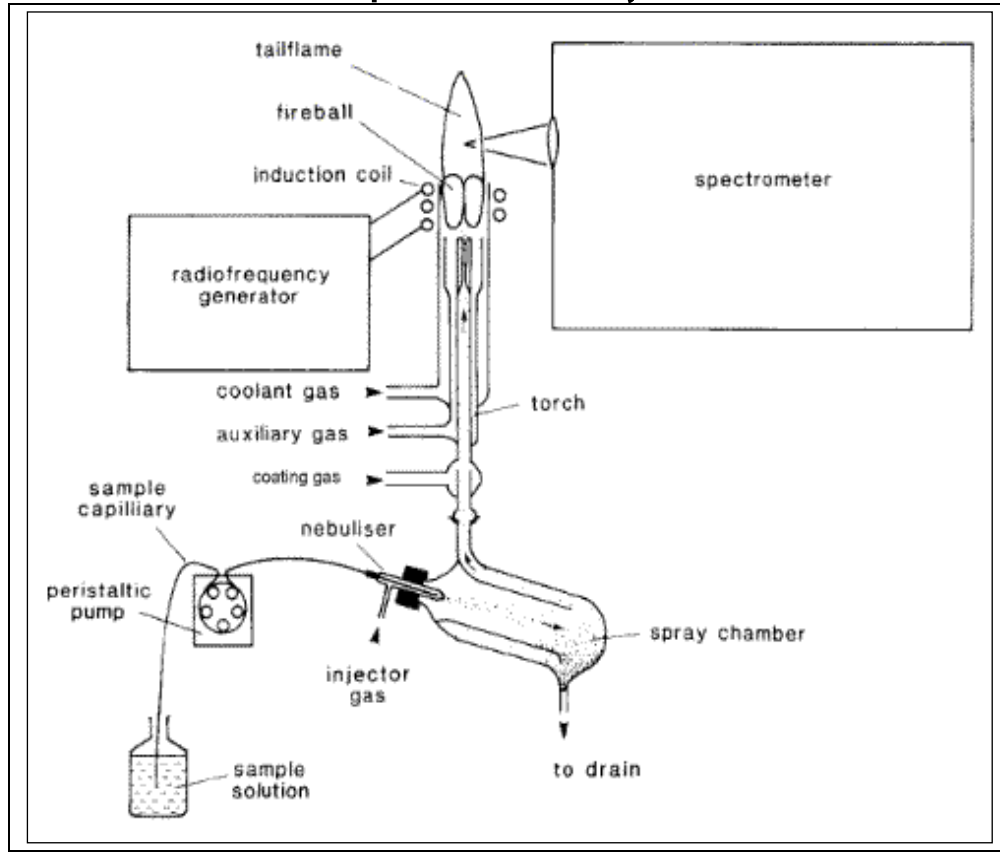
The atomization and excitation of a compound M in liquid sample is schematized below.



An ICP-AES instrument consists of:

- A sample delivery system (or "sample introduction system").
- An Inductively Coupled (IC) plasma to generate the signal.
- One or more optical spectrometers to measure the signal.
- A computer for controlling the analysis.

Sample Introduction System



The most common sample delivery system consists of a peristaltic pump and capillary tube to deliver a constant flow of analyte liquid into a nebuliser. The largest droplets fall out into a drain in the bottom of a spray chamber and the finest droplets are carried by gas into the ICP plasma.

Temperatures in the plasma

