eurofins | EAG Laboratories

TECHNIQUE NOTE

Inductively Coupled Plasma (ICP) Services

INTRODUCTION

Inductively Coupled Plasma (ICP) analytical techniques are multi-element analysis techniques that use an inductively coupled plasma source to dissociate the sample into its constituent atoms or ions, and either exciting them to a level where they emit light of a characteristic wavelength or the ions themselves are detected in a mass analyzer.

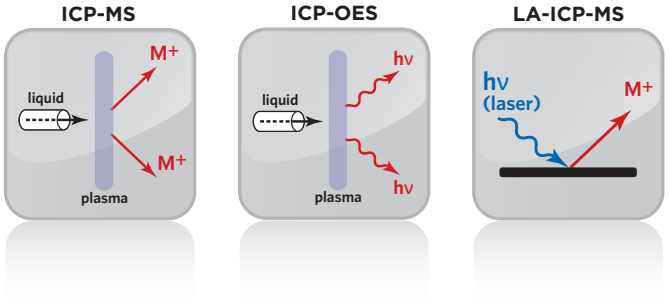
Solid samples are generally dissolved or digested into a liquid solution.

The sample is typically introduced into the ICP plasma as an aerosol, either by aspirating a liquid or a solution sample into a nebulizer or using a laser to directly atomizing solid samples into an aerosol. Once the sample aerosol is introduced into the ICP torch, it is completely de-solvated and the elements in the aerosol are converted first into gaseous atoms and then ionized towards the end of the plasma.

ICP-OES VS ICP-MS: A COMPARISON OF THE TWO TECHNIQUES

ICP-OES (Inductively Coupled Plasma-Optical Emission Spectrometry) measures the light emitted at element-specific characteristic wavelengths from analytes. A detector measures the intensity of the emitted light, which is then used to evaluate the concentration of that particular element in the sample by comparison with calibration standards.

ICP-MS (Inductively Coupled Plasma-Mass Spectrometry) measures the intensity of analyte ions generated in the inductively coupled plasma source. The ions created in the plasma are separated by their mass to charge ratios, enabling the identification and quantitation of the analytes present. ICP-MS offers superior sensitivity (i.e. low detection limits) for a wide range of elements.



'LASER ABLATION INDUCTIVELY COUPLED PLASMA MASS SPECTROMETRY (LA-ICP-MS)

In Laser Ablation Inductively Coupled Plasma Mass Spectrometry, the sample is directly analyzed by ablating a solid sample with a pulsed laser beam. The created aerosols are transported by a gas stream into the core of inductively coupled argon plasma (ICP). The plasma in ICP-MS is used to generate ions that are then introduced to the mass analyzer. The constituents of an unknown sample can then be identified and measured.

For laser ablation, any type of solid sample can be ablated for analysis; there are few sample-size restrictions and no sample preparation procedures. Chemical analysis using laser ablation requires a smaller amount of sample (micrograms) than that required for solution ICP-MS (milligrams). Depending on the analytical measurement system, very small amounts of sample may be sufficient for this technique. In addition, a focused laser beam permits spatial characterization of heterogeneity in solid samples, with typically micron resolution both in terms of lateral (x, y) and depth (z) directions.