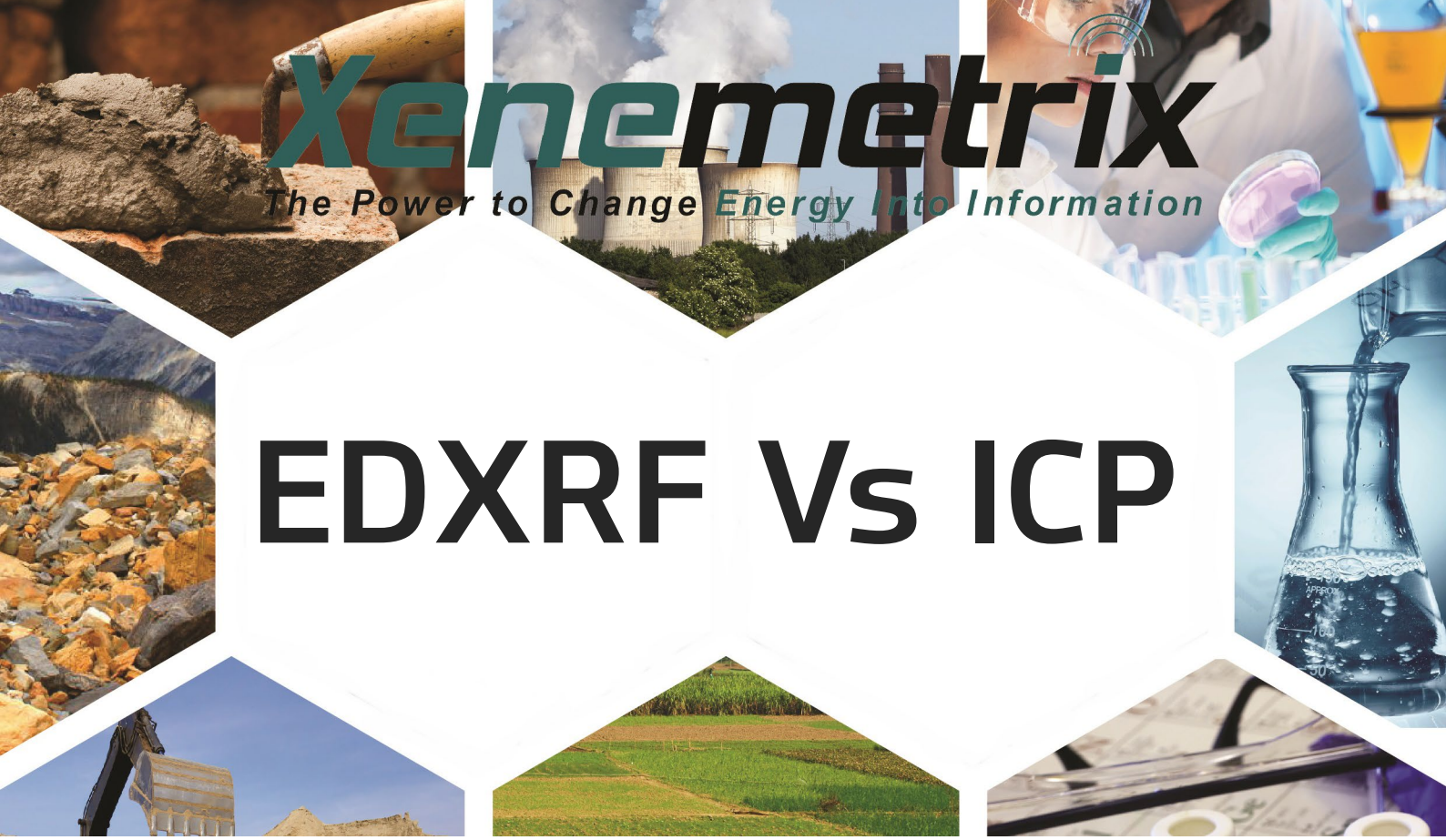



# EDXRF Vs ICP

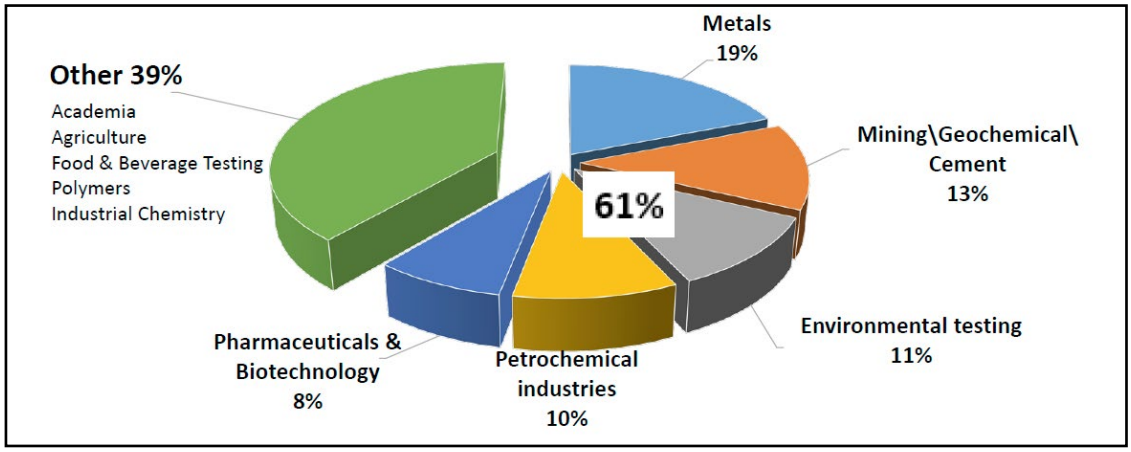
## X-ray fluorescence spectroscopy analysis shows good agreement with ICP-OES

**Are you still using AAS (Atomic Absorption Spectrometry) and having to routinely take powder samples and convert them into solutions using acid digestions for analysis?**
**If this is your daily routine it's time to consider the benefits of solid sample analysis using XRF and consider eliminating digestion, dissolution and solution preparation.**
**Replace digestion with lose powder analysis or for higher precision with mixing, miling sample briquetting and perform clean XRF analysis.**

## Atomic spectroscopy

Atomic spectroscopy is a technique used by almost every analytical laboratory in a variety of industries to determine the elemental composition and concentration in known/ unknown samples. All Atomic Spectroscopy techniques compete by they ability to identify wide range of elements and they low limit of quantification capability.

**Atomic Spectroscopy Market Share by Industry**



# XRF Spectroscopy Market share

Among all atomic spectroscopy technique, **X-Ray fluorescence** spectroscopy market accounts as the largest share (61%) to the atomic spectroscopy market. The ICP technology is used in the other part (39%) of market share.
XRF holds of Atomic Spectroscopy market share. XRF (WDXRF, EDXRF, TXRF) technologies is common technique that used for identification and quality control applications.

# Benefits of EDXRF Technology

XRF is a versatile, rapid technique which lends itself to a wide variety of samples from powders to liquids. It is convenient and economical to use, with the major input cost being the hardware itself.
ICP-MS is a versatile technique that is easily capable of determining many elements. However, usually samples must be in liquid form, which often requires acid digestion and laborious sample prep. One can sample solids with laser ablation ICP-MS but this is better suited to tiny spot sizes on the surface. ICP techniques also require copious amounts of expensive high-purity argon gas.

| | EDXRF | ICP / ICP MS |
|---|---|---|
| **Safety and health** | Safe for use | Liquid strong acids usually used for dissolution of sample (requires protective clothing and laboratory chemical fume hood) |
| **Sample preparation** | Not required | Not all the matrix dissolved completely into a solution - unrepeatable results |
| **Time of measuring** | 1 – 5 minutes, Automated | 1 – 2 days to wait for the results from external laboratory |
| **Maintenance costs** | Non related expenses | Related expenses of analytical equipment, standards, chemical fume hood and compressed gas |
| **Professional skills** | Ease of use for operation by non technical or non specialized personnel | Only trained person |
| **Type of analysis** | Non destructive analysis | Destructive analysis |

# EDXRF & ICP Technologies

## EDXRF - Energy-Dispersive X-Ray Fluorescence

**Electron ejected from atomic orbital**

An electron can be ejected from its atomic orbital by the absorption of a light wave (photon) of sufficient energy. The energy of the photon (hv) must be greater than the energy with which the electron is bound to the nucleus of the atom.

↓

**Electron ejected from atom**

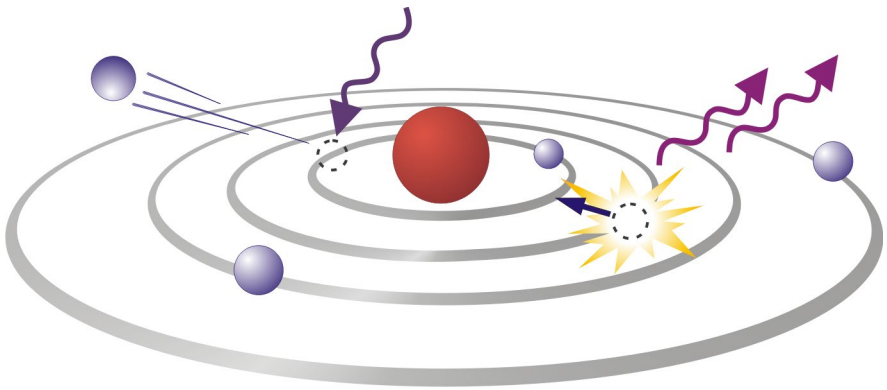
When an inner orbital electron is ejected from an atom, an electron from a higher energy level orbital will be transferred to the lower energy level orbital.

↓

**Photon emitted from atom creating fluorescent light**

During this transition a photon maybe emitted from the atom. This fluorescent light is called the characteristic X-ray of the element. The energy of the emitted photon will be equal to the difference in energies between the two orbitals occupied by the electron making the transition.

The energy difference between two specific orbital shells, in a given element, is always the same (i.e. characteristic of a particular element), the photon emitted when an electron moves between these two levels, will always have the same energy. Therefore, by determining the energy (wavelength) of the X-ray light (photon) emitted by a particular element, it is possible to determine the identity of that element.



## ICP - Inductively Coupled Plasma

ICP is an atomic emission technique, which measures the energy lost by an atom passing from an excited state to a lower energy state. The number of photons emitted is proportional to the number of atoms of the element present.

**Sample must be atomized**

To be excited, the sample must be atomized, meaning dissociated into free ions or atoms. The emission phenomenon takes place in a plasma. A high-frequency current is sent through a high-frequency coil, generating a magnetic field. Plasma is then formed from the gas (Typically argon) flowing through the coil. In the plasma, there are the same number of Ar+ and electrons, maintaining an electrical balance.

**Plasma reaches high temperature**

The argon plasma reaches a temperature of 6000 to 8000K. When a sample is introduced into the plasma via a carrier gas, nearly all of the elements in the sample become highly excited by the energy from the plasma and begin emitting light.

**Elements highly excited emitting light**

Each element emits light with a wave length (spectrum) specific to that element.

Therefore It is possible to analyze and identify the elements in the test sample by separating the emitted light into its spectral components using a high-performance spectrometer.

# Summary

EDXRF analyzers have unique advantages and strong performance.
Xenemetrix unique EDXRF technology provide customers a replacement for ICP & ICP-MS technique with the best X-ray tubes in the world with variety of power levels for different applications and machine types and the best X-ray detector in the world market of EDXRF that enables extremely High count rate applications with excellent energy resolution.

Xenemetrix
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