Quick guide

X-ray Fluorescence Spectrometry (XRF)

In brief

- Elemental analysis from Be to U
- Solids, liquids, loose powders, filters, thin films of inorganic and organic materials
- Capable of quantifying elements from ppm to 100% in multi-element, multi-matrix samples from 0.5 mm to nearly 50 mm diameter
- Small spot analysis and mapping of elemental distribution
- Non-destructive analysis with minimal sample preparation
- High precision and reliability needed for process/quality control applications
- High flexibility and accuracy for investigative laboratory applications
- Ideally suited for the analysis of unknown samples using standard-less XRF analysis

Applications

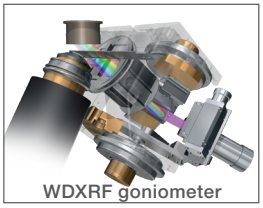
XRF instruments are widely used in:

- Cement manufacturing (from raw materials to final products, process and quality control)
- Iron, steel, sinters and slags
- Non-ferrous metals manufacturing (Al, Mg, brass, bronze, zinc)
- Petrochemicals (refineries, catalysts, polymers, chemicals, greases, lubricants)
- Environmental (air filters, soils, waters, waste materials, recycling)
- Geochemistry
- Glass, ceramics, refractories, raw materials as oxides, sulfides
- Food and beverages (nutrients and supplements in milk powders, cereals)
- Mining, minerals, ores and their processing
- Semiconductors, thin films and coatings
- Forensic labs
- Materials science and research
- Precious metals and dental alloys
- Paints and chemicals

Basic theory

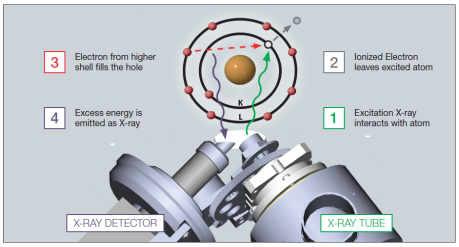
XRF technique consists of irradiating a solid or a liquid sample with high energy X-rays (from a controlled X-ray tube) which results in the secondary emission of X-rays (fluorescence). This fluorescence spectrum is characteristic of the elemental composition of the sample leading to qualitative and quantitative analysis of the bulk representative sample. There are two types of XRF instruments:

Wavelength Dispersive XRF (WDXRF) uses crystals to disperse the fluorescence spectrum into individual wavelengths of each element providing high resolution and low background spectra for accurate determination of elemental concentrations. WDXRF analysis can be performed either sequentially using Goniometers (scanning system) for flexibility and optimum performance across the periodic table or simultaneously using Monochromators (fixed channels) for speed and precision for a given set of elements or a combination of both sequential and simultaneous devices.



WDXRF goniometer

Energy Dispersive XRF (EDXRF) uses a Solid State Detector to collect the complete fluorescence energy spectrum which is then processed for qualitative or quantitative analysis.



Technology

EDXRF is a convenient technology to screen all kinds of materials for quick identification and quantification of elements from F to U. EDXRF instruments are generally portable or benchtop (transportable) for usage in the field or in a laboratory alongside other techniques with little or no sample preparation. Low cost of ownership and rapid elemental analysis of regular or irregular samples make EDXRF an attractive front-end analysis tool.

WDXRF technology is well established for high sensitivity down to low atomic number elements (from Be onwards), excellent repeatability and element selectivity in order to achieve performance needed for routine industrial applications. WDXRF is also exploited for its wide dynamic range and extremely good reliability for laboratory applications.

- ARL QUANT'X (EDXRF)
- ARL OPTIM'X (WDXRF)
- ARL PERFORM'X (WDXRF)
- ARL 9900 Series Sim-seq WDXRF
- ARL 9900 Series WDXRF with Integrated Compact XRD
- ARL SMS-XY and OEM Automation Systems (WDXRF)
- ARL SMS-2000/2300, ARL SMS-2500/3500 Automation Systems with robots and sample preparation machines

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