General Topic

ACTIVA-M Assistance Tools

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Instrument: ACTIVA-M

1 Introduction

THE ACTIVA-M ICP-AES instrument is dedicated to the true multi-line analysis concept. The high reliability of results that every analyst wishes is easily achieved, with the use of specific assistance tools.
This new approach of ICP-AES analysis has led the ACTIVA-M to win the bronze award for best new product at Pittcon 2007.
ACTIVA-M brings ICP expertise to the laboratory via a series of software assistance tools, ideal for laboratories with a variety of applications and/or a high sample load.

2 Principle

The strong interaction between advanced instrumental configuration and innovative assistance is the essence of the revolutionary concept of the ACTIVA-M for true multi-line analysis.

The classical way of conducting the determination of an element in ICP-AES is to select a single line with adequate sensitivity and free from spectral interferences.
With the use of multi-channel detection such as CCD detectors, the amount of spectral information has significantly increased and it is then possible to use multiple lines per element, especially when the combination of specific optical system and detection allows the acquisition of the full spectrum (120 – 800 nm for ACTIVA-M) and when the performance resulting from constant resolution and high dynamic range is there.

The concept of ACTIVA-M consists of using several lines per element to makes the detection of outliers possible, thereby coping with unexpected spectral interference and consequently improving the reliability of the results. If the nature and the concentration of the matrix are not constant, there is a risk of unexpected spectral interferences, which can become significant: when the analyte peak is interfered, a positive bias will be generated, while the bias may be negative when the matrix influences the background correction, as illustrated in Figure 1.

The use of multiple lines per element allows then the identification of such outliers. However, the method development can become complex if multiple lines must be selected, for a wide range of elements.

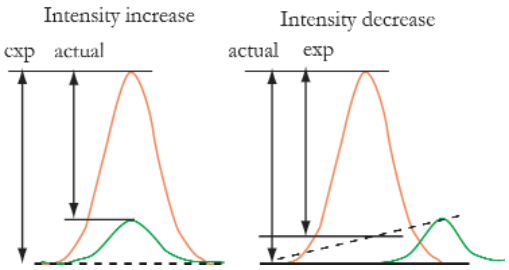

Figure 1: Potential bias due to interference (Left: on peak ; Right: on background).

The revolutionary approach is to offer the user timesaving and user-friendly step-by-step operations through unique software tools. Method development, validation and routine analysis are therefore simplified and quality ensured. The concept specifications are detailed in Figure 2.

Specifications	Assistance tools
Database	S³-base
Complete spectra	IMAGE
Multi-line selection	MASTER
Calibration statistics	CALSTAT
Outlier detection	SOS
Dedicated hardware	ACTIVA-M
High analytical performance	ACTIVA-M

Figure 2: Multi-line analysis specifications

3 Assistance tools

The incomparable and practical use of multi-line analysis is summarised in the analysis flow-chart illustrated in Figure 3.

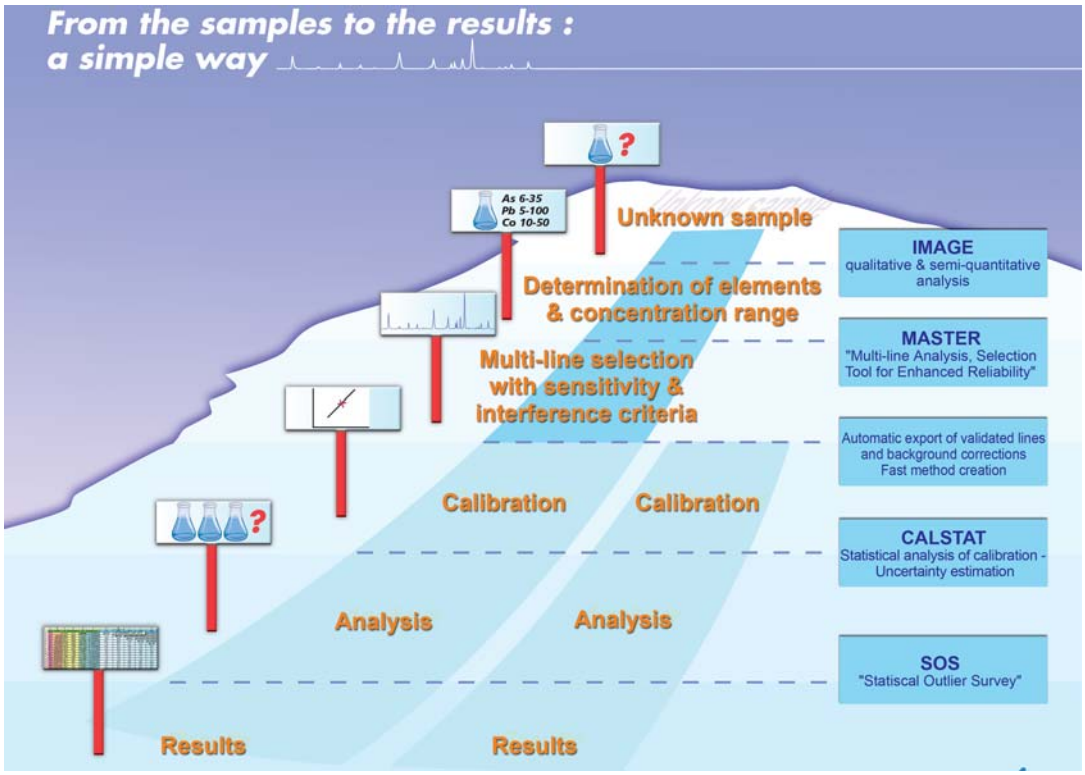

Figure 3: Time-saving and user-friendly step-by-step operations.

The objective of the MASTER (Multi-line Analysis, Selection Tool for Enhanced Reliability) tool is to help the operator in the selection of appropriate lines for a defined application (matrix, elements and concentrations), and to control the eventual spectral interferences.
If elements and concentrations are not known, IMAGE first will offer the sample identification, from the acquisition of the full spectrum and rapid semi-quantitative analysis.

The essence of MASTER is the S^3-base (Single-element Spectra, Spectroscopic data), a real ICP-based data base with dual access that has been developed by HORIBA Jobin Yvon. It is a collection of single-element spectra (acquired on an ACTIVA-M instrument, at different concentrations, for all elements) and a data base containing wavelengths, ionisation state, excitation energy, sensitivity, background level, limit of detection, maximum concentration below detector saturation and line width. More than 50 000 lines have been assigned.

MASTER offers an automatic selection of lines which save development time (no solution preparation, no search in wavelength tables, no profiling).
CALSTAT helps the analyst to evaluate the calibration procedure.
SOS (Statistical Outlier Survey) is a statistical processing of the multi-line results, for the rejection of possible outliers and thereby to provide a single reliable element concentration.

More reading:
(1) ACTIVA-M brochure, HORIBA Jobin Yvon, www.jobinyvon.com
(2) Application Note 46: "MASTER assistance for impurities anlaysis in Nb/Ni/Zr matrix"
(3) Application Flash GEO 01: "MASTER-SOS assistance for Rare Earth Analysis in geological samples"