APPLICATION NOTE
XE-2012-3175

Xenemetrix
The Power to Change Energy Into Information

Qualitative Analysis of Platelet Alumina

With X-calibur EDXRF analyzer

By Shay Ben-Menachem
June 2012

ABSTRACT
Qualitative analysis of Platelet Alumina for the elements present using Xenemetrix EDXRF X-Calibur laboratory analyzer equipped with SDD detector.

OBJECTIVE
To detect all elements present in the Platelet Alumina sample.

BACKGROUND
Energy Dispersive X-ray Fluorescence (EDXRF) is a fast and non-destructive, non invasive, quick, technique for analysis of samples in form of solid, powder and liquid. EDXRF is an ideal method for a quick and simple qualitative and quantitative analysis for industrial control purposes offering the following advantages: 1) Fast and minimal sample preparation, 2) Automated analysis process, 3) Limited or no exposure to corrosive reagents used by other analytical techniques, 4) Ease of use for operation by non-technical or non-specialized personnel. These advantages have made XRF as the method of choice for diverse industries including mineral mine, chemicals and pharmaceutical.

ANALYTICAL CONFIGURATION

Table 1: Analytical Configuration

Instrument	X-Calibur SDD EDXRF Bench top Spectrometer System.
Excitation	Rh-Anode X-ray Tube, 50KV 50W
Detector	High Performance Silicon Drift Detector SDD
Analysis Time	300 seconds
Type of analysis	Qualitative method
Environment	Air and vacuum
Sample preparation	The samples were analyzed as obtained from the customer in X-ray cups and thin Prolene film support.

EXPERIMENTALS

Platelet Alumina sample, was provided for qualitative analysis. The spectra was acquired with different acquisition conditions in order to enhance the instrument sensitivity for group of elements. Low excitation energy in vacuum was used to stress the low Z elements. Vacuum purge was used to eliminate the oxygen in the X-ray beam path since otherwise the oxygen absorbs the low energy signal emitted by the light elements.
Higher excitation energies were applied for higher Z elements. Selectable Rhodium and Tungsten x-ray tube filters were used to reduce the background and enhance the signal to noise ratio for specific group of elements.

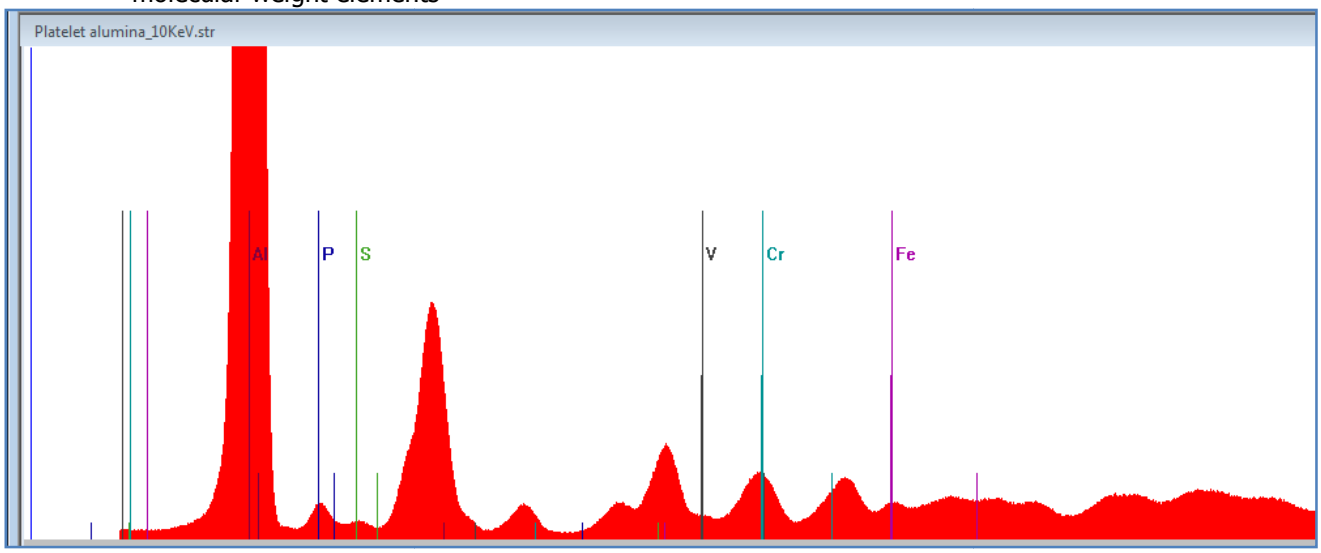
RESULTS and DISCUSSIONS

Three modes of acquisition conditions were used to specifically account for the major and trace elements in Alumina sample (Table 2). The spectra are shown in figures 1, 2.

Table 2: Qualitative analysis of different samples

Sample Type	#	Acquisition conditions	Sample ID – Elements detected
Platelet alumina	1	Low excitation energies in Vacuum	Al, P, S, V, Cr, Fe
	2	High excitation energies with Rhodium (Rh) filter	Fe, Ni, Zn, Ga, Sn
	3	High excitation energies with Tungsten (W) filter	No additional information

Figure 1: Platelet Alumina acquired at low energies in vacuum without any filter; enhances the low molecular weight elements



Tungsten (W) filter was used to reduce the Rhodium peak, generated by X ray tube of the EDXRF analyzer. This improves the sensitivity for elements which are closely related in emission energies to Rhodium and are thus overlapped by the Rhodium peak. Examples are Ag, Cd, Sn, Sb. The complete list of elements which are enhanced by the use of Tungsten filter is shown in figure 3; the elements labelled in orange as the Tungsten filter. Using the tungsten filter helps to detect the presence or absence of elements such as Ag, Cd, Sn which are blocked by Rh peak. Tin (Sn) (figure 2) was seen only with the use of Tungsten filter.
The X-Calibur analyzer provided 6 software selectable filters, each dedicated for a group of elements. The filter and the corresponding elements are grouped by colour. For example, Fe filter (Green) is advised for elements as Sc Ti V Ni Cu Zn Hf Ta W Re Os Pr Nd Yb and Lu (figure 3).

Figure 2: Platelet Alumina acquired with Rhodium (red) and Tungsten (green) filters

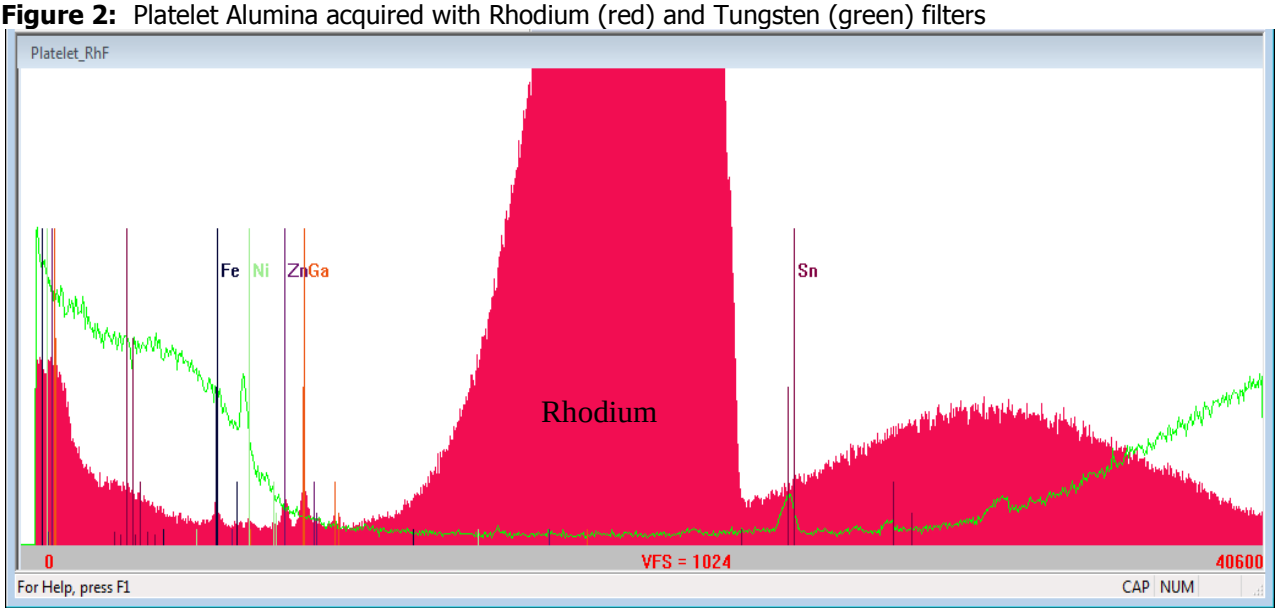
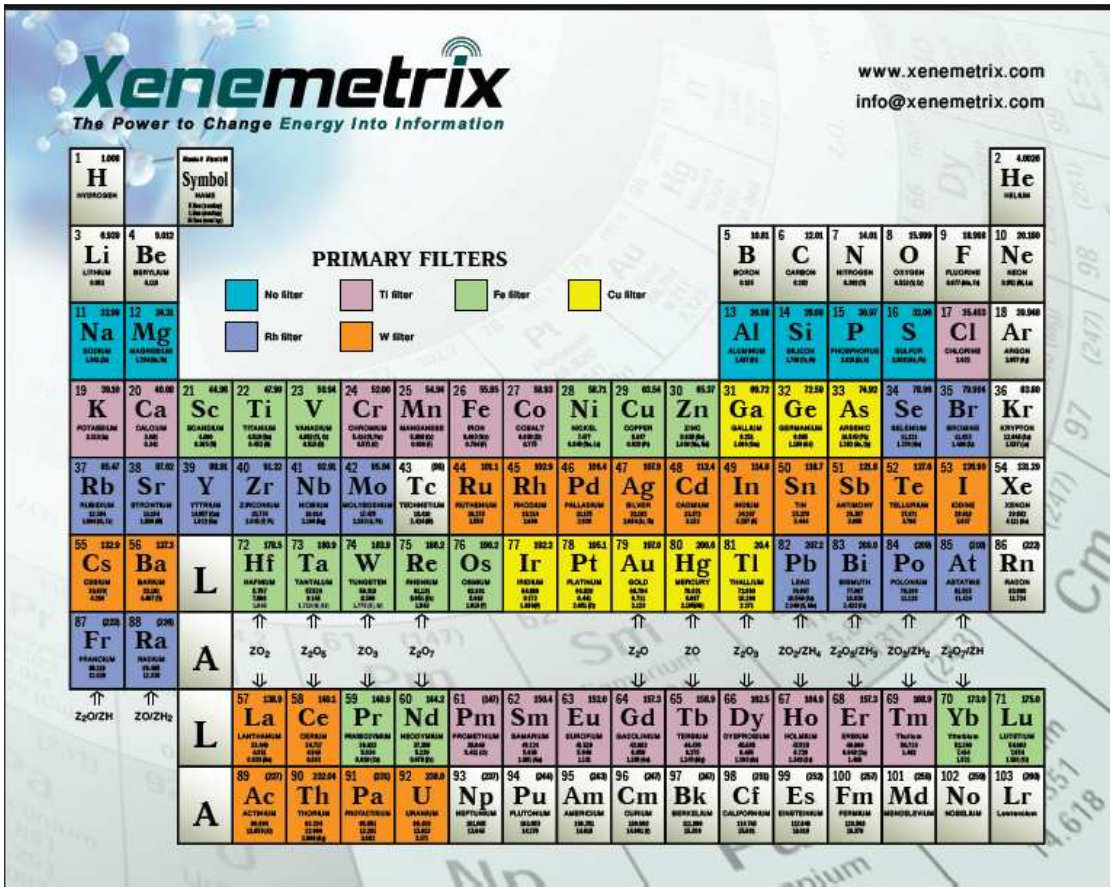


Figure 3: Set of filters, provided by X-Calibur analyzer. Each for optimization of the acquisition conditions for specific group of elements. The filter and its correspoding elements are labeled with the filter's colour.



CONCLUSIONS

This report shows the superior performance of X-Calibur SDD EDXRF analyzer for analysis of unknown samples. Six selectable filters and capability of working in ait free environment (vacuum or helium) provide the necessary tools for detection of most groups of elements from F to Fm.

Quantitative analysis can also be performed with empirical calibrations with the use of standards.

X-Calibur-SDD EDXRF provides the necessary tools for analysis of all sorts of unknown samples qualitatively and quantitatively.