

ABSTRACT

Aluminum metal samples were analyzed qualitatively and quantitatively using EX-6600SDD EDXRF analyzer. The quantification of the elemental composition was done by a fundamental parameter method that does not need any calibration standards. The powerful EX-6600SDD equipped with a high resolution silicon drift detector working at high count rate allowed for a complete analysis within a very short time.

OBJECTIVES

Quantitative analysis without the need of certified calibration standards

BACKGROUND

EDXRF is an ideal method for a quick and simple elemental analysis for industrial control purposes offering the following advantages: 1) Fast and minimal sample preparation, 2) An 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. The instrument's high resolution detector, enhanced peak to background ratio, superior flux and ability to handle higher count rates provide superior sensitivity for metal analysis. Standardless fundamental parameter software makes it possible to perform quantitative analysis without the need of expensive certified calibration standards.

ANALYTICAL CONFIGURATION

Table 1: Analytical Configuration of EX-6600 SDD

Instrument	EX-6600 SDD EDXRF Analyzer
Excitation	Rh-Anode X-ray Tube targets
Detector	High resolution Silicon drift detector (123eV at 5.9keV)
Analysis Time	300 seconds per acquisition condition
Analysis Method	Professional Standardless Fundamental Parameter Method
Environment	vacuum

EXPERIMENTAL

Two Aluminum metal samples were provided both in a "bulk metal piece" as well as in thin sheets. Quantitative analysis on EX-6600SDD using a special Fundamental Parameter software that provides quantitative results without the need of calibration standards were performed on all samples and results are tabulated in Table 2 and 3.

To improve on the XRF analysis the two metal blocks were polished so that a flat and shiny surface was presented to the x-ray beam. The sheets were analyzed "as is"

**RESULTS : QUANTITATIVE ANALYSIS ON ZINC METAL SAMPLES
USING A STANDARDLESS FUNDAMENTAL PARAMETER METHOD**

Table 2: Al piece 1050 and two sheets of Al_1050

Element	Al_1050		Al_1050_2sheets
	Measurements units	Concentration ± error	Concentration ± error
Zinc	Weight %	0.017±0.000	0.036±0.001
Aluminum	Weight %	99.52±0.158	99.58±0.148
Lead	Weight %	0.001±0.000	0.000±0.000
Cadmium	Weight %	0.002±0.000	0.000±0.000
Iron	Weight %	0.283±0.002	0.294±0.002
Copper	Weight %	0.014±0.001	0.016±0.001
Tin	Weight %	0.002±0.001	0.000±0.000
Magnesium	Weight %	0.030±0.001	0.024±0.001
Silicon	Weight %	0.090±0.005	0.096±0.001
Chrome	Weight %	0.005±0.000	0.001±0.000
Calcium	Weight %	0.004±0.001	0.000±0.000
Titanium	Weight %	0.025±0.002	0.027±0.002
Lithium	Weight %	Not detected in XRF	Not detected in XRF
Nickel	Weight %	0.007±0.001	0.006±0.001
Manganese	Weight %	0.003±0.000	0.002±0.000

Table 3: Al piece 8011 and two sheets of Al_8011

Element	Metal piece of Al_8011		Al_8011_2sheets
	Measurements units	Concentration ± error	Concentration ± error
Zinc	Weight %	0.021±0.001	0.021±0.001
Aluminum	Weight %	98.49±0.165	98.89±0.147
Lead	Weight %	0.001±0.000	0.001±0.000
Cadmium	Weight %	0.003±0.001	0.001 ±0.000
Iron	Weight %	0.938±0.006	0.294±0.002
Copper	Weight %	0.087±0.002	0.876±0.005
Tin	Weight %	0.001±0.001	0.000±0.000
Magnesium	Weight %	0.028±0.001	0.024±0.001
Silicon	Weight %	0.354±0.014	0.073±0.003
Chrome	Weight %	0.008±0.000	0.004±0.000
Calcium	Weight %	0.018±0.001	0.000±0.000
Titanium	Weight %	0.037±0.003	0.025±0.002
Lithium	Weight %	Not detected in XRF	Not detected in XRF
Nickel	Weight %	0.009±0.001	0.008±0.001
Manganese	Weight %	0.003±0.000	0.002±0.000

DISCUSSION

The EX-6600 SDD is a very powerful EDXRF analyzer. The high resolution silicon drift detector together with the digital multi channel processor makes it possible to convert the very high flux of photons into useful concentration data within a very short time.

CONCLUSIONS

In summary this report show the excellent properties of EX-6600 SDD combined with fundament parameter software to analyze metal samples in a simple and rapid way.