APPLICATION NOTE
 # XE-2011-3115

Quantitative analysis of tungsten alloy cutting tools

ABSTRACT
Four cutting tools samples made of W-Al-Co alloys were investigated on X-CiteSDD. The edges of the tools were analyzed by the Xenemetrix X-CiteSDD.

OBJECTIVE
To measure Al on the edges of cutting tools

BACKGROUND
EDXRF is a fast and non-destructive technique that can quantify any type of sample solid, powder or liquid from within a few minutes and can be the method of choice. Energy Dispersive X-ray Fluorescence (EDXRF) spectrometers can play an important role in assuring that consistent quality of samples is retained throughout a manufacturing process.
In the recycling industry it can be the method of choice for fast scanning and quantification of valuable elements such as the important rare earth elements.

ANALYTICAL CONFIGURATION
Table 1: Analytical Configuration of X-CiteSDD

Instrument	X-CiteSDD EDXRF Laboratory Spectrometer System
Anode	Rh-Anode X-ray Tube, 50W
Detector	High Resolution, high flux efficiency Silicon Drift Detector
Analysis Time	100 second
Type of analysis	Quantitative regression analysis.
Sample Preparation	No samples preparation. The samples were investigated on their sides.
Acquisition parameters	5kV, 1.8mA, Helium atmosphere

RESULTS
EXPERIMENTALS
The four samples were delivered in doublets (i.e in total eight samples). The concentrations of W, Co and Al per set of two samples are listed below in Table 2. The samples were all analyzed on an edge side (the side opposite to the edge with sample name). Since the sample edge was small compared to measuring position it was held in place in a XRF sample cup with a 4μm prolene XRF support thin film.

Table 2: Given concentrations of the four samples

Sample ID	Al w/w%	Co w/w%	W w/w%
AS IS	0	12.17	86.43
Honing	6.38	7.25	85.85
WSB1	0.75	10.68	88.36
WSB3	0.96	6.94	91.44

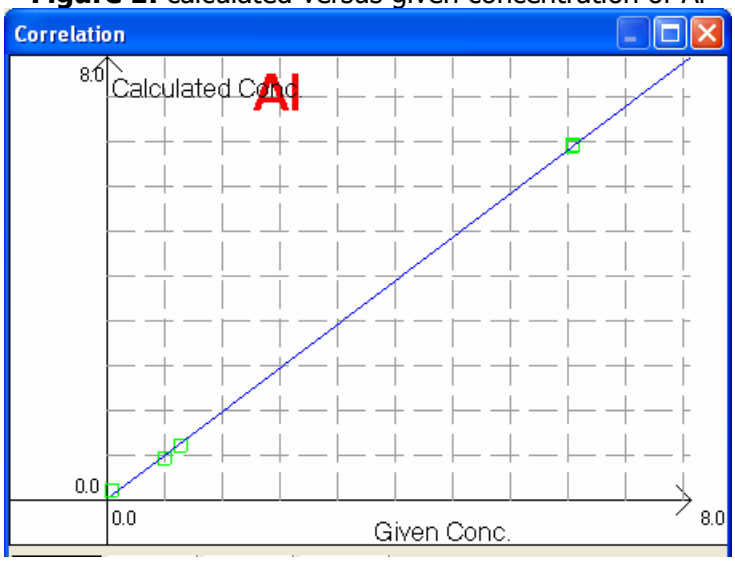
To avoid absorption of the Al signal by oxygen from air, the sample chamber was evacuated and the acquisition was performed in vacuum instead of air. Based on Al elemental peak intensity data calibration Al is shown in figure 1.
A repeatability study was performed on all four samples using the calibrated X-CiteSDD for analysis. The results of 3 precision studies are shown in table 4 where the measured mean value ±standard deviation (at 1 sigma) per element and the accuracy of the measurements presented as relative error in % are shown.

Table 3: Calibration data

	Al correlation=0.9997, standard deviation 0.061		
	Given	Calc'd mean	Accuracy (absolute)
AS IS	0.00	0.09	0.01
Honig	6.38	6.39	0.01
WSB1	0.75	0.70	0.05
WSB3	0.96	0.91	0.04

CORRELATION PLOT

Figure 1: calculated versus given concentration of Al



PRECISION

Nine consecutive acquisitions were performed on the edge of a tool sample without moving the sample between the acquisitions. Precision on three of the four tool samples was investigated. Results are shown in Table 4.

Table 4: Repeatability data on the four tool samples

ID	Al	Al	
	Given concentration	Measured mean±stand.dev.	Accuracy (absolute)
HONING	6.38	6.48±0.06	0.10
WSB1	0.75	0.67±0.023	0.08
WSB3	0.96	0.98±0.022	0.02

DISCUSSION

This report shows how fast and simple the non-destructive EDXRF analysis is. Different steps in an industrial process can be analyzed within a few minutes.
The use of Xenemetrix powerful EDXRF analyzer X-CiteSDD equipped with the highly flux efficient and very sensitive silicon drift detector makes this type of quick and accurate analysis the method of choice.