Application Note EDXRF1576

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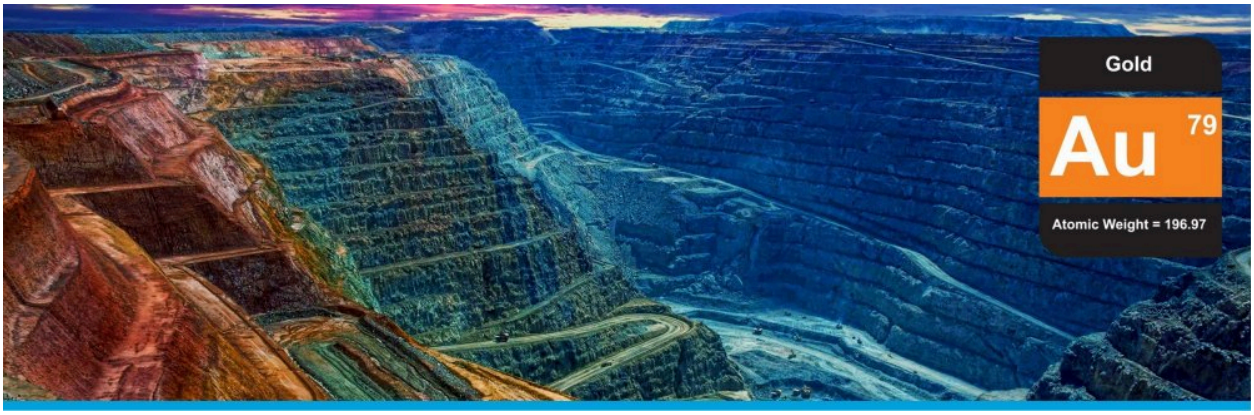
EDXRF1576 - Analysis of Au and U in used ore material



Scope

The measurement of gold is demonstrated in used ore material such as from ore dumps and tailing piles. This application note also shows the recovery of uranium from the used ore material.

Background

Recovering gold and other valuable metals from used ore materials can be a profitable recovery venture. In the processing of ores, the desired metals and other base metals are extracted leaving mostly silicates, minerals, and the other base ore materials. Gold and other precious metals can be recovered by further processing and extraction of the ore material from used ore dumps or old tailing piles. To screen and measure the gold content, Applied Rigaku Technologies offers the NEX DE EDXRF system with a high-throughput SDD detector to give superior measurement of trace valuable metals in various used ore materials.

Calibration

Because a high degree of accuracy is desired in the industry, the empirical regression calibration method is used. An empirical calibration was built using a set of 12 commercially available standards from AMIS (African Mineral Standards) that model used ore materials. Using the empirical approach, an overlap correction was employed to automatically compensate for the spectral overlap of the Zn-Kβ line on the Au-Lα line. Appropriate alpha corrections were enabled to compensate for various absorption/ enhancement matrix effects. A summary of the two empirical calibrations is shown here:

Table 1: Gold calibration

Element: Au Units: g/ton		
Sample I.D.	**Standard value**	**Calculated value**
94	2.7	4.3
244	6.8	6.7
245	88.4	88.4
369	26.4	26.5
412	5.7	4.4
428	43.4	43.6
429	22.9	22.5
430	2.7	2.5
455	52.2	52.2

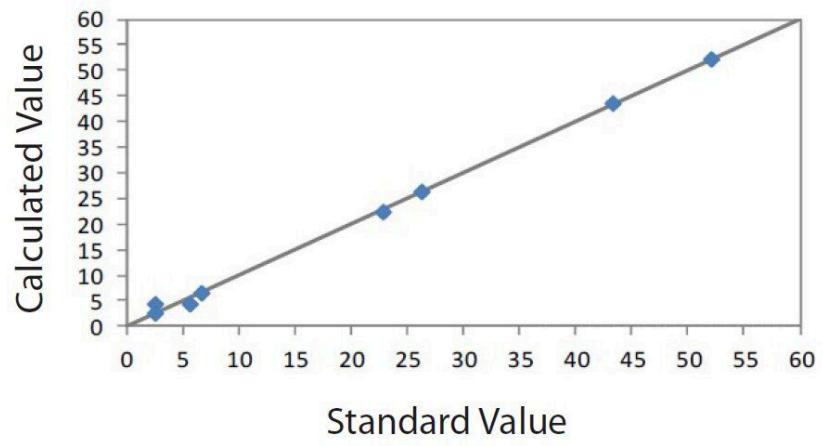


Figure 1: Correlation plot Au

Table 2: Uranium calibration

Element: U Units: ppm		
Sample I.D.	**Standard value**	**Calculated value**
94	95	91
208	58	55
244	331	337
245	491	493
299	40	40
369	1340	1355

412	205	213
428	1309	1304
429	722	699
430	113	117
455	3512	3511

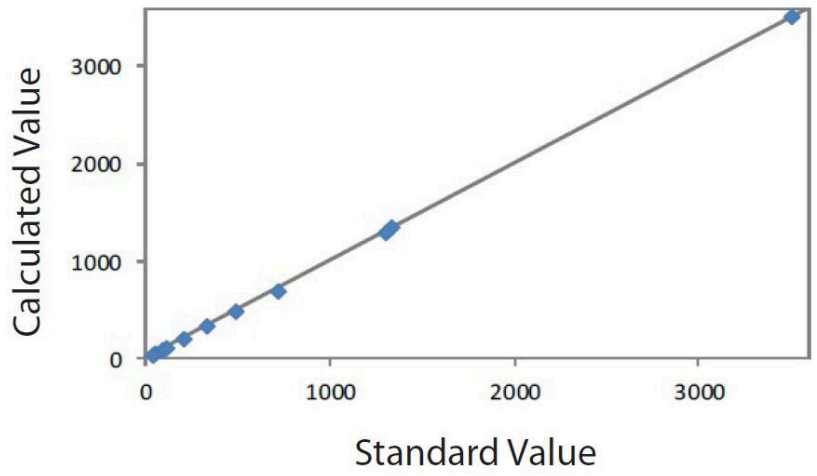


Figure 2: Correlation plot U

Repeatability

To demonstrate the repeatability and recovery of the measurement, three standards were measured 10 times each in static position. The average results and standard deviations are shown here.

Sample: Standard 412			**Units: ppm**	
Sample I.D.	**Standard value**	**Average value**	**Std. dev**	**% Relative dev**
Au	5.7	6.3	0.4	5.7%
U	205	209	1.0	0.3%

Sample: Standard 245			**Units: ppm**	
Sample I.D.	**Standard value**	**Average value**	**Std. dev**	**% Relative dev**
Au	88.4	86.9	1.7	1.9%
U	491	496	1.0	0.1%

Sample: Standard 369			**Units: ppm**	
Sample I.D.	**Standard value**	**Average value**	**Std. dev**	**% Relative dev**
Au	26.36	27.3	0.9	3.4%

U	1340	1346	1.0	0.11%

Conclusion

The NEX DE offers analysts and technicians a simple yet powerful and versatile system for quantifying elemental composition. The results of this study indicate that given matrix-matched calibration and proper sampling, the Rigaku NEX DE EDXRF can achieve excellent results for monitoring and measuring the concentration of gold and other valuable elements in the recovery of used ore materials.

Related products

NEX DE Series

High-power 60 kV EDXRF systems delivering speed, precisi
on, and small spot measurements