Application Note EDXRF1595

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EDXRF1595 - Metals & Alloys

Scope

The semi-quantitative measurement of metals in various alloys is demonstrated using the Fundamental Parameters approach without the need for a reference library.

Background

Standard and specialty alloys vary in metal composition to give the alloy its specific physical, mechanical, and chemical properties. Analyzing alloy composition by XRF (X-ray Fluorescence) is important to ensure the proper alloy grade meets the needs for its specific use. The Rigaku NEX QC+ QuantEZ system gives the operator a quick, simple, and reliable means of checking alloy composition without damaging or changing the sample.

Results

Sample: SS 303
Units: mass %

Element	Specification range	NEX QC+ QuantEZ result	Statistical error
Fe	Balance	68.8	—
Cr	17.0 – 19.0	19.3	0.025
Ni	8.0 – 10.0	7.35	0.014
Mn	2.0 max	1.88	0.010

Si	1.0 max	0.64	0.003

Sample: SS 304 **Units: mass %**			
Element	Specification range	NEX QC+ QuantEZ result	Statistical error
Fe	Balance	69.4	—
Cr	18.0 – 20.0	20.0	0.024
Ni	8.0 – 10.5	7.9	0.014
Mn	2.0 max	1.00	0.009
Si	1.0 max	0.69	0.003

Sample: Al 7075 **Units: mass %**			
Element	Specification range	NEX QC+ QuantEZ result	Statistical error
Al	87.1 – 91.4	92.4	—
Cr	0.18 – 0.28	0.24	0.002
Cu	1.2 – 2.0	1.18	0.002
Fe	0.5 max	0.27	0.002
Mg	2.1 – 2.9	ND*	—
Mn	0.3 max	0.03	0.001
Si	0.4 max	ND*	—
Ti	0.2 max	0.06	0.002
Zn	5.1 – 6.1	5.34	0.003

*Mg and Si at low levels are not detectable in an aluminum alloy due to aluminum absorption of Mg and Si X-rays

Sample: MONEL Alloy K-500 **Units: mass %**			
Element	Specification range	NEX QC+ QuantEZresult	Statistical error
Ni	63.0 min	64.2	—
Mn	1.5 max	0.84	0.006
Fe	2.0 max	0.01	0.002
Si	0.5 max	0.09	0.002
Cu	27.0 – 33.0	31.2	0.024
Al	2.30 – 3.15	2.77	0.012

Ti	0.35 – 0.85	0.60	0.009

Sample: Hastelloy B-3 **Units: mass %**			
Element	Specification range	NEX QC+ QuantEZ result	Statistical error
Ni	65.0 min	64.9	—
Cr	1.0 – 3.0	1.83	0.016
Mo	27.0 – 32.0	27.8	0.017
Mn	1.0 max	0.67	0.009
Cu	0.2 max	0.50	0.010
Si	0.1 max	0.43	0.006
Ti	0.2 max	ND*	—
Co	3.0 max	ND*	—
V	0.2 max	ND*	—
Fe	1.0 – 3.0	1.64	0.009

*Trace levels of Ti and V and low levels of Co are not detectable in this alloy due to high levels of Ni and Mo that absorb transition metal X-rays

Sample: Alloy R405 **Units: mass %**			
Element	Certified value	NEX QC+ QuantEZ result	Statistical error
Cu	32.3	32.2	0.025
Ni	64.8	64.9	—
Al	0.08	ND*	—
Fe	1.31	1.37	0.005
Mn	1.03	1.14	0.006
Si	0.05	ND*	—
Ti	0.005	ND*	—
Cr	0.008	ND*	—

*Trace levels of Al, Si, Ti, and Cr are not detectable in this alloy due to high levels of Cu and Ni that absorb transition metal and light element X-rays

Sample: CDA 544 Units: mass %			
Element	Certified value	NEX QC+ QuantEZ result	Statistical error
Cu	87.7	88.9	—

Fe	0.02	ND*	—
Pb	3.87	2.82	0.011
Ni	0.077	ND*	—
Sn	4.73	3.97	0.006
Zn	3.55	3.67	0.009

*Trace levels of Fe and Ni are not detectable in this alloy due to high levels of Cu that absorb transition metal X-rays

Conclusion

The NEX QC+ QuantEZ provides a rapid, non- destructive means for semi- quantitative measurement for screening, identification and other semi-quant needs without the need for a special library. To optimize the FP results for a specific family of alloys, the QuantEZ software also gives the user a simple way of creating a Matching Library using one more certified alloy sample of that family type, providing a fast and simple means to design libraries to fit exact analysis needs.

Related products

NEX QC II Series

Compact, intuitive benchtop EDXRF for everyday elemental testing