Application Note EDXRF1323

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EDXRF1323 - Analysis of S, V, Ni in Crude Oil

Scope

The analysis of sulfur, vanadium and nickel in crude oil is demonstrated.

Background

Sulfur, vanadium, and nickel occur naturally in crude oil, and their concentrations vary depending on the geographical region of the oil deposits. Vanadium and nickel can foul the refining process during crude oil cracking, so crude oil with low levels of vanadium and nickel is desirable. In the oil fields and offshore drilling, a quick and easy means of screening for vanadium and nickel is a valuable tool to begin to characterize the quality of the crude before refining. Applied Rigaku Technologies meets the industry analytical need with the NEX QC series of EDXRF analyzers. Fast and simple, the NEX QC + provides an ideal tool for monitoring the concentrations of vanadium and nickel in crude, as well as the sulfur content.

Calibration

Empirical calibrations were built using a suite of ten commercially available mineral oil calibration standards that represent crude oil.

Element	Concentration range
S	0.30 – 4.00%
V	5 – 50 ppm
Ni	3 – 50 ppm

Repeatability

To demonstrate repeatability (precision), two calibration standards were measured in ten repeat analyses without moving the sample between measurements.

Sample: Std 8				
Element	**Standard value**	**Average value**	**Std. dev**	**% Relative dev**
S	3.202%	3.200%	0.023	0.7
V	40.1 ppm	40.1 ppm	0.3	0.7
Ni	5.0	4.9	0.9	---

Sample: Std 3				
Element	**Standard value**	**Average value**	**Std. dev**	**% Relative dev**
S	1.152%	1.159%	0.010	0.3
V	5.0 ppm	4.8 ppm	0.3	---
Ni	45.1	45.6	0.4	0.9

Conclusion

The NEX QC+ offers analysts a simple yet powerful and versatile system for quantifying elemental composition using the empirical approach. The results of this study indicate that given stable samples, proper sample handling and proper calibration technique, the Rigaku NEX QC+ EDXRF can achieve excellent results in monitoring the concentration of sulfur, vanadium, and nickel in oil.

Related products

NEX QC II Series

Compact, intuitive benchtop EDXRF for everyday elemental testing