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EDXRF1614 - High Calcium Limestone



Scope

The measurement of CaCO_3 , MgCO_3 , Fe_2O_3 , Al_2O_3 , SiO_2 and K_2O in high calcium limestone is demonstrated using empirical calibration.

Background

Limestone (calcium carbonate) has many uses as the main ingredient in cement and mortar and is used as an aggregate in concrete and asphalt for building roads. Limestone is also used as a soil conditioner and is the raw material for making quick lime (calcium oxide), slaked lime (calcium hydroxide). During mining and processing operations it is important to monitor and control the limestone composition to ensure proper quality and characteristics desired for the various products. Rigaku meets this industry need with a high-performance, low-cost benchtop EDXRF system. Rugged and reliable, the [NEX QC+](#) is an ideal tool for measuring major carbonate and oxide components in limestone, with simple and intuitive software designed for the non-technical, at-line operator and for use in quality control labs.

Calibration

A set of 14 assayed site-specific standards were provided by an industry user for this demonstration.

Compound	Concentration range
CaCO_3	85 – 99%
MgCO_3	0.6 – 10.1%
Fe_2O_3	0.03 – 1.3%

Al ₂ O ₃	0.1 – 2.1%
SiO ₂	0.6 – 3.5%
K ₂ O	0.04 – 0.18%

Precision

Typical precision is shown here. Ten repeat analyses of each sample were performed with the sample in static position.

Element: H12				
Units: %				
Compound	Standard value	Average value	Std. dev	% Relative
CaCO ₃	85.556	85.356	0.114	0.2
MgCO ₃	10.065	9.832	0.127	1.3
Fe ₂ O ₃	0.291	0.283	0.007	2.4
Al ₂ O ₃	0.386	0.375	0.011	2.8
SiO ₂	3.324	3.327	0.043	1.3
K ₂ O	0.13	0.100	0.018	14

Element: H14				
Units: %				
Compound	Standard value	Average value	Std. dev	% Relative
CaCO ₃	92.854	93.642	0.081	0.1
MgCO ₃	5.923	5.952	0.103	1.7
Fe ₂ O ₃	0.081	0.082	0.003	3.7
Al ₂ O ₃	0.208	0.193	0.013	6.3
SiO ₂	0.748	0.704	0.013	1.7
K ₂ O	0.07	0.078	0.014	20

Element: H15				
Units: %				
Compound	Standard Value	Average Value	Std. Dev	% Relative
CaCO ₃	93.734	93.679	0.122	0.2
MgCO ₃	3.978	4.155	0.080	2.0
Fe ₂ O ₃	0.207	0.192	0.004	1.9
Al ₂ O ₃	0.531	0.539	0.015	2.8

SiO ₂	1.226	1.267	0.020	1.6
K ₂ O	0.16	0.179	0.015	9.4

Element: H6				
Units: %				
Compound	Standard value	Average value	Std. dev	% Relative
CaCO ₃	91.389	91.167	0.147	0.2
MgCO ₃	1.163	1.045	0.075	6.4
Fe ₂ O ₃	1.337	1.376	0.039	2.9
Al ₂ O ₃	1.094	1.101	0.023	2.1
SiO ₂	3.541	3.663	0.118	3.3
K ₂ O	0.1	0.130	0.021	21

Conclusion

The performance shown here demonstrates that NEX QC+ provides excellent sensitivity and performance for the measurement of carbonates and major oxides in limestone. Self-contained with a simple touchscreen operation, NEX QC+ is an excellent tool for at-line control and quality checks throughout the mining and processes.

Related products



NEX QC Series

Combines quality, affordability, and performance for a wide range of applications