Application Note EDXRF1231

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EDXRF1231 - Sulfur in coal

Scope

The measurement of sulfur (S) in coal is demonstrated.

Background

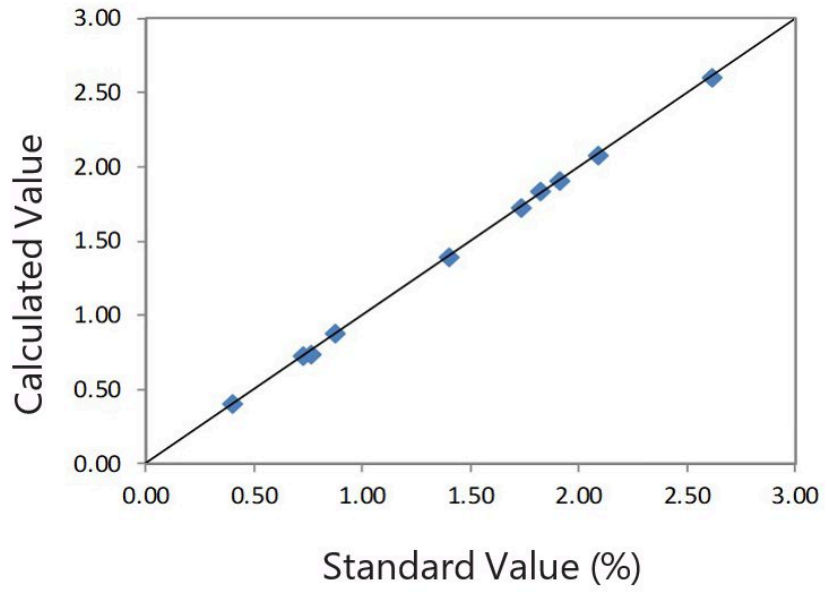
Pyrite (Fe_2S) is a major mineral found in most coal. Coal contains various amounts of sulfur, based in part on how much sulfur and iron is combined in the peat as it is formed into coal, and the wetness of the climate during the coal formation. In the burning of coal, higher sulfur content causes more rapid corrosion of metal equipment, while sulfur as it burns is also an environmental pollutant. For these reasons, measuring the sulfur content of coal is important for the characterization and value of the coal, and a rapid and simple means of monitoring sulfur levels in coal is critical, from mining to industrial use. To meet the industry needs, Rigaku offers NEX QC, a simple and versatile benchtop EDXRF analyzer for the analysis of sulfur and other elements in coal.

Calibration

An empirical calibration was built using a set of assayed coal powder standards. A summary of the calibration for 0.4 – 2.6% S is shown here.

Element: S **Units: %**		
Sample I.D.	**Standard value**	**Calculated value**
STD 1	0.40	0.405

STD 2	0.72	0.729
STD 3	0.76	0.737
STD 4	0.87	0.879
STD 5	1.40	1.393
STD 6	1.73	1.724
STD 7	1.82	1.841
STD 8	1.91	1.913
STD 9	2.09	2.081
STD 10	2.61	2.608



Correlation plot S

Repeatability

To demonstrate repeatability (precision), the select samples were chosen from the set of calibration standards. Each sample was measured in static position with typical results shown below.

Element: S **Units: %**				
Sample I.D.	**Standard value**	**Average value**	**Std. dev**	**% Relative**
STD 1	0.40	0.412	0.003	0.8
STD 6	1.40	1.434	0.009	0.6
STD 11	2.61	2.614	0.011	0.4

Discussion

While the majority of coal does not contain Cl, the coal evaluated here did contain significant amounts. The measurement of Cl to compensate for its effects on the S reading shows the versatility of the NEX QC for multi-element analysis. Si was measured, although its matrix effects were not significant. The heavier elements Ca, Ti, and Fe were also measured, in order to compensate for their effects on the sulfur reading, correcting for variations in matrix effects among coal types and samples.

Sulfur is a main element of interest in coal analysis, and the other major elements are measured for their effect on the sulfur reading. In the case of measuring two or more distinct coal types, such as sulfur-bearing coal that is not primarily pyrite and a coal that is mainly pyrite, optimum accuracy can be achieved by building separate calibrations for each distinct coal type.

Conclusion

The performance shown here demonstrates the ability of the NEX QC to yield excellent results for the measurement of sulfur in coal, without the need for helium purge. The simple, modern touch screen interface allows for reliable and efficient measurement protocols to meet the analytical needs throughout various industries.

Related products

NEX QC Series

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