Application Note EDXRF1527

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EDXRF1527 - Phosphorus in Coal

Scope

The measurement of phosphorus in coal is demonstrated.

Background

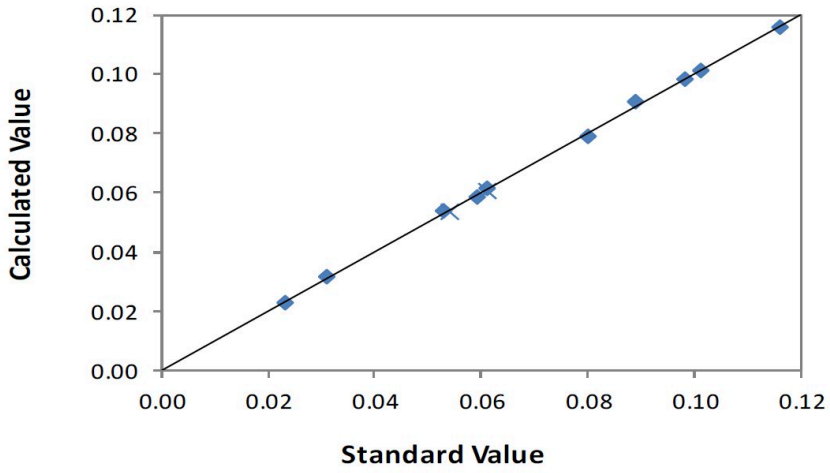
Coke used in the steelmaking process is required to have a low phosphorus (P) content, as P is a damaging element in most steel. The P content in coke is directly related to the P content of the parent coal, and so P concentration, as well as S, Cl, and ash content, is used in part to grade coking coal. Therefore, in grading and processing coking coal, a fast and reliable means of measuring and monitoring the P content is vital. To meet the industry needs, Rigaku offers NEX QC+, a simple and versatile benchtop EDXRF analyzer for the analysis of phosphorus and other elements in coal.

Calibration

An empirical calibration was built using a set of 12 assayed coal powder samples provided by a coal processing facility. Si, S, Cl, Ca, Ti, Fe, and Sr were also measured to enable influence coefficients (alpha corrections) that compensate for variations in matrix X-ray absorption/enhancement effects. A summary of the calibration for 0.4 – 2.6% S is shown here.

Element: P Units: % "as received"		
Sample I.D.	**Standard value**	**Calculated value**
1	0.098	0.0983
2	0.054	0.0539

3	0.053	0.0535
4	0.080	0.0788
5	0.061	0.0605
6	0.089	0.0907
7	0.116	0.1157
8	0.061	0.0612
9	0.059	0.0582
10	0.031	0.0317
11	0.023	0.0228
12	0.101	0.1008



Correlation plot P

Repeatability

To demonstrate repeatability (precision), the low, medium, and high samples were chosen from the set of calibration standards. Each sample was measured in static position for ten repeat analyses with typical results shown below.

Element: S Units: %				
Sample I.D.	**Standard value**	**Average value**	**Std. Dev**	**% Relative**
11	0.023	0.0233	0.0010	4.3
5	0.061	0.0615	0.0017	2.8
7	0.116	0.1167	0.0018	1.6

Conclusion

The performance shown here demonstrates the ability of the NEX QC+ to yield excellent results for the measurement of phosphorus in coal. Given concentration assay values, other elements such as S, Cl, Si, Ca, Ti, Fe, and Sr can also be measured. Simple, modern touchscreen interface allows for reliable and efficient measurement protocols to meet the analytical needs throughout the coal and steelmaking industries.

Related products

NEX QC Series

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