Application Note EDXRF1587

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EDXRF1587 - MgO & P_2O_5 in Phosphate Rock

Scope

The measurement of the control oxides P_2O_5 and MgO is demonstrated, as well as other major oxides in phos rock.

Background

Phos rock (phosphate rock, rock phosphate, phosphorite) is mined from high phosphorous clay deposits and processed to be used in fertilizers. During mining and processing it is critical to measure and monitor the levels of P_2O_5 and MgO, as well as the other major oxides CaO, Al_2O_3, SiO_2, and Fe_2O_3 to ensure proper product quality of the physical and chemical properties desired. To meet this industry need, Rigaku offers NEX QC+ EDXRF analyzer. The self-contained unit with touchscreen operation is ideal for at-line quality checks by non-technical operators, as well as in the QA/QC lab.

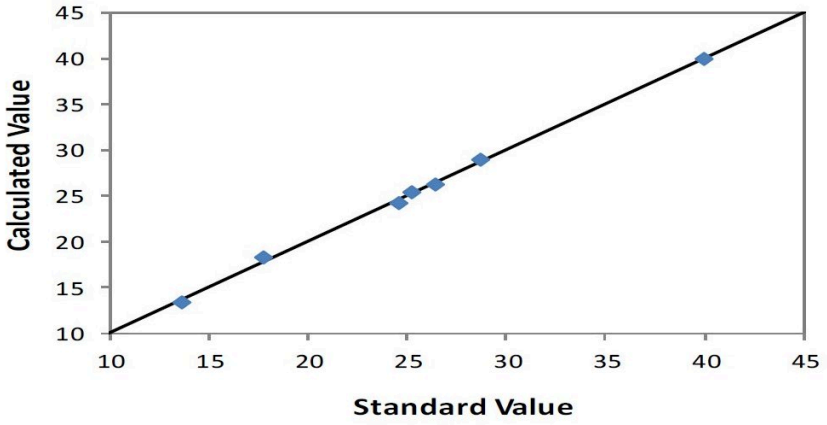
Calibration

For demonstration, an empirical calibration was built using a set of seven commercially available standards. Two of the calibration standards are certified reference materials. Boric acid was measured to generate special background correction that automatically compensates for the specific amount of background in each individual sample measured.

Control Oxides

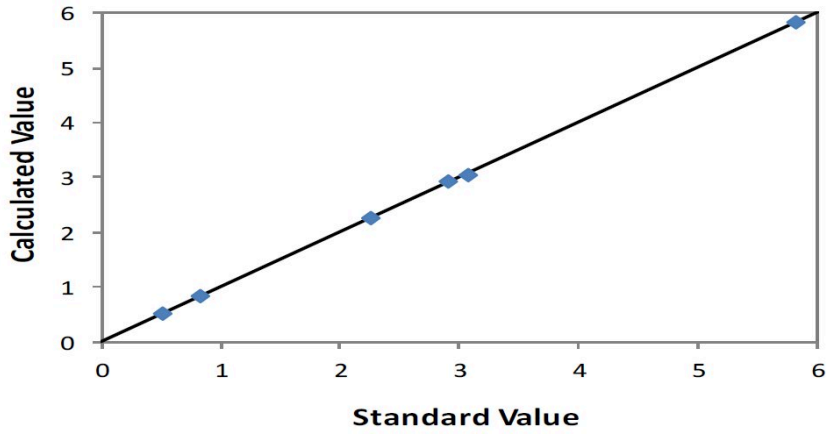
P_2O_5 **Units: mass %**		
Sample I.D.	**Standard value**	**Calculated value**

SARM 32	39.96	39.945
CRM CGL 107	26.38	26.144
GPO-01	28.66	28.967
GPO-17	13.55	13.387
GPO-15	25.22	25.302
GPO-16	17.76	18.206
GPO-14	24.52	24.099



Correlation plot P_2O_5

MgO **Units: mass %**		
Sample I.D.	**Standard value**	**Calculated value**
SARM 32	0.50	0.501
CRM CGL 107	2.26	2.257
GPO-01	0.83	0.830
GPO-17	5.82	5.825
GPO-15	2.90	2.933
GPO-16	6.38	6.377
GPO-14	3.07	3.034



Correlation plot MgO

Other oxides

Oxide	Concentration range
CaO	39 – 55%
Fe_2O_3	0.1 – 3.5%
Al_2O_3	0.05 – 1.8%
SiO_2	0.4 – 21%

Repeatability

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

Sample: SARM 32
Units: mass %

Oxide	Standard value	Average value	Std. dev	% Relative
P_2O_5	39.96	40.066	0.070	0.2
MgO	0.50	0.505	0.012	2.4
CaO	54.44	54.361	0.040	0.1
Fe_2O_3	0.14	0.141	0.003	2.1
Al_2O_3	0.05	0.059	0.008	16
SiO_2	0.40	0.470	0.022	5.5

Sample: GPO-17 Units: mass %				
Oxide	**Standard value**	**Average value**	**Std. dev**	**% Relative**
P_2O_5	13.55	13.479	0.027	0.2
MgO	5.82	5.910	0.066	1.1
CaO	39.14	38.812	0.079	0.2
Fe_2O_3	1.29	1.277	0.005	0.4
Al_2O_3	1.83	1.890	0.018	1.0
SiO_2	11.62	11.777	0.126	1.1

Conclusion

The performance shown here demonstrates NEX QC+ provides excellent sensitivity and performance for the measurement of P_2O_5, MgO and other major oxides in phos rock. Self-contained with simple touch screen operation, NEX QC+ is an excellent tool for at- line control and quality checks throughout the mining and processing of phos rock.

Related products

NEX QC Series

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