ASOMA® PHOENIX II

Measurement of Zinc in Polystyrene

ASOMA® Phoenix II

This report demonstrates the capability of the ASOMA® PHOENIX II Benchtop XRF analyzer for measuring zinc in polystyrene pellets.

The PHOENIX II can quickly and accurately give results for zinc at-line. Zinc is added to polystyrene to ensure the pellets move properly through the production chutes. Measuring the zinc ensures quality is monitored and controlled throughout the manufacturing process. The measurement requires no sample preparation; simply fill an XRF sample cup with pellets and analyze. These benefits work together to maximize quality and reduce operational costs.

Introduction

The PHOENIX II is an excellent QC benchtop analyzer that offers a fast, precise, simple and non-destructive analysis technique well suited for the analysis of zinc in polystyrene pellets.

The PHOENIX II is an exceptionally powerful tool. The PHOENIX II uses the rugged, time-proven proportional counter as its detection section. A 48kV X-ray tube and indirect excitation with a secondary target yield extremely low background for exceptional detection limits. The PHOENIX II combines ruggedness and power in a small, compact design with simplicity designed for non-technical operators.

The PHOENIX II can also be equipped with a HOPG polarizing crystal along with the moveable secondary target, making the PHOENIX II a versatile tool in measuring many other elements in plastics and chemicals, whether in solid or liquid form.

Data handling and results storage can be obtained on a paper print out and are also stored in the hard drive of the PHOENIX II. The data can be readily transferred to a USB thumb-drive or networked using the Ethernet connection.

Calibrations are readily carried out with assayed calibration standards. This ensures easy traceability of results for quality purposes. The calibration process is a “once only” procedure in which the curve can be revalidated by using a simple standardization procedure.

Experimental Portion

Equipment

All measurements were conducted using a PHOENIX II XRF analyzer. The total analysis time per sample was 100 seconds for the high concentration zinc samples and 200 seconds for the low (ppm) concentration samples.

Sample Preparation

No sample preparation is required. Each sample cup was placed in the sample chamber for analysis.

Measurement Parameters

All measurement parameters are easily controlled by a touch screen PC. Operators simply choose the correct Method from the analysis screen (there may be more than one method stored, e.g. to deal high concentration vs. low concentration samples) and then press green ANALYZE button.

The results can be reported using a variety of different options: results are reported on the display screen; on a thermal paper printout; on an optional external printer; and in the database history within the analyzer.

Instrument Configuration

ASOMA® PHOENIX II

Excitation: Compact, air-cooled X-ray tube

Detection: Gas-filled Proportional Counter

Analyte Optimization: Display interface control of X-ray voltage and current

Atmosphere: Air

Options: Secondary target; Sample spinner

Note: No helium purge is required.

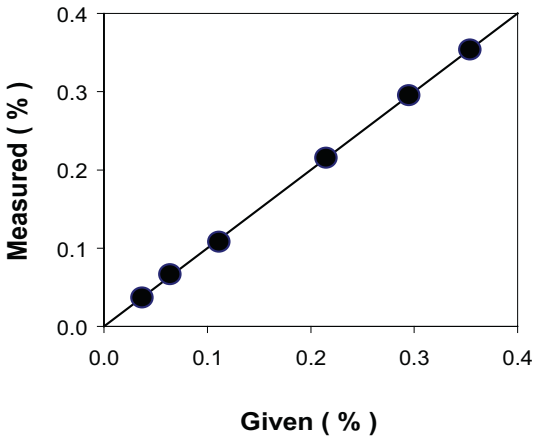
Easy assembly with film window

Sample Spinner

Calibration Results for the High Concentration Samples

Element: Zn		
Units: %	Std. Error of Estimate: 0.0020	
Sample	**Given**	**Measured**
1	0.3540	0.3526
2	0.2949	0.2954
3	0.2147	0.2154
4	0.1112	0.1083
5	0.0640	0.0664
6	0.0370	0.0367

Correlation Plot



Precision

10 repeat analyses at 100 seconds per analysis

Element: Zn		Units: %		
Sample	**Given**	**Mean**	**Std. Dev.**	**% Rel.**
1	0.3540	0.3543	0.0013	0.4
4	0.1112	0.1105	0.0013	1.2
6	0.0370	0.0376	0.0007	1.9

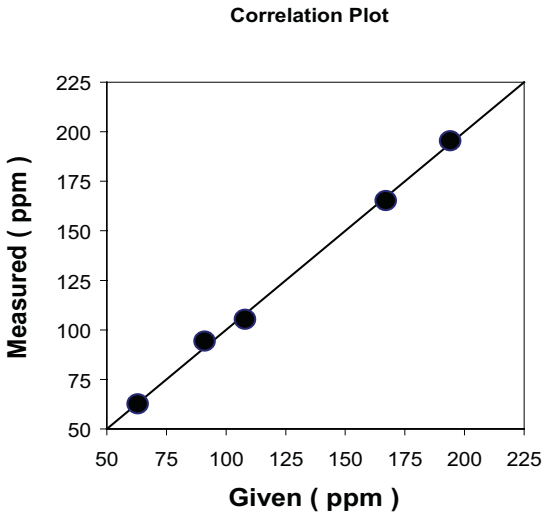
Minimum Detection Limit (MDL)

The Minimum Detection Limit (MDL) for an element is determined as three times the standard deviation of ten analyses of the blank sample. The following MDL was derived using this empirical method and applies to this matrix and concentration range.

Element	MDL
Zn	0.0017% (17 ppm)

Calibration Results for the Low Concentration Samples

Element: Zn Units: ppm	Std. Error of Estimate: 0.0020	
Sample	**Given**	**Measured**
1	194	195.4
2	167	165.2
3	108	105.4
4	91	94.4
5	63	67.2



Precision

10 repeat analyses at 100 seconds per analysis

Element: Zn		Units: ppm		
Sample	**Given**	**Mean**	**Std. Dev.**	**% Rel.**
1	194	194.4	1.74	0.9
3	108	106.8	1.14	1.1
5	63	64.4	1.45	2.3

Minimum Detection Limit (MDL)

The Minimum Detection Limit (MDL) for an element is determined as three times the standard deviation of ten analyses of the blank sample. The following MDL was derived using this empirical method and applies to this matrix and concentration range.

Element	MDL
Zn	3 ppm

Conclusion

As can be seen from the above data, the use of the PHOENIX II XRF system gives excellent performance when applied to the quality control of zinc in polystyrene pellets. Results are rapid and precise, and analysis is easily carried out by non-laboratory personnel. Because no consumable chemicals are used (only plastic sample cups and window film) the relative ”cost of ownership“ is much lower than other analytical techniques.

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ASOMA®
Application Note

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