

ASOMA® PHOENIX II

Determination of Chrome on Steel

ASOMA® Phoenix II

All samples were analyzed using the PHOENIX II EDXRF Benchtop system. This report demonstrates the capability of the PHOENIX II to analyze chrome coating on steel. The PHOENIX II provides both qualitative and quantitative analyses of a wide range of substances including liquids, solids, powders, pastes, slurries, films, filter deposits and coatings.

The PHOENIX with its x-ray tube source and proportional counter, complete with programmable detector filters, offers unparalleled sensitivity and precision compared to other EDXRF analyzers in its price range.

In addition to ensuring product quality throughout the process, XRF coating applications require little sample preparation. Coatings include Cr, V, Ti, Zr, P, etc. Simply place the sample aperture and analyze. Both these benefits work together to maximize quality and reduce operational costs.

Introduction

The PHOENIX II is an excellent benchtop XRF analyzer for at-line QC analysis or the laboratory alike. The treatment of a metal part surface to prevent corrosion or change the hardness is called a conversion coating. The PHOENIX II offers a fast, precise, simple and non-destructive analysis technique well suited for the determination of chrome coating on steel. The PHOENIX II can be used to analyze many conversion coating applications, such as Cr, Ti, V, Zr or P coatings.

The PHOENIX II employs state-of-the-art optics. Polarization excitation offers unique benefits because it eliminates most of the background scatter emerging from the x-ray tube before it arrives at the sample. This results in a dramatic improvement in peak-to-background signal, especially in highly scattering materials such as petrochemical products. This translates to vastly improved precision and lower detection limits than traditional direct excitation XRF systems can achieve.

The PHOENIX II uses an onboard PC computer with a simple touchscreen interface. Thus, an external computer is not required. Data handling and results storage can be obtained on a thermal 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 a network Ethernet connection.

Calibrations are readily carried out using assayed standards. This ensures easy traceability of results for quality purposes. This initial calibration process is a "once only" procedure. Subsequently, the curve can be restandardized if required, by the touch of a button on the main analysis screen.

The PHOENIX II offers power, versatility and performance all in a small, easy-to-use design.



Experimental Portion

Equipment

All measurements were conducted using a PHOENIX II XRF analyzer. The total analysis time per sample was 100 seconds for the chrome on steel application.

Sample Preparation

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Measurement Parameters

All measurement parameters are easily controlled through the touchscreen on the display panel. Operators simply choose the correct Method from the analysis screen (there may be more than one method stored, e.g. to deal with different metal substrates or various coatings) and then press the 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: 48 kV 50 W Air-cooled X-ray Tube

Detection: Gas-filled Proportional Counter

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

Atmosphere: Air

Options: HOPG for polarized X-rays; Moveable secondary target; Detector filter; Polypropylene 4 μ m film

Note: No helium purge is required.

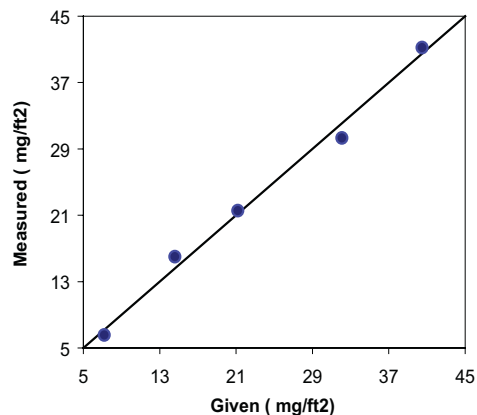
Typical flat sample shown in analysis position



Calibration Results for Chrome on Steel

Element: Cr		
Units: mg/ft ²	Std. Error of Estimate: 1.45	
Sample	Given	Measured
20a	40.5	41.2
15a	32.1	30.3
7a	21.2	21.6
4a	14.6	16.0
2a	7.2	6.6

Correlation Plot
for Cr on Steel



1 mg/ft² = 10.8 mg/m²

Precision

10 repeat analyses at 100 seconds per analysis

Element: Chrome			Units: mg/ft ²	
Sample	Given	Mean	Std. Dev.	% Rel.
20a	40.5	39.4	0.99	2.6
7a	21.2	21.3	1.05	4.9
2a	7.2	7.00	1.26	18.0

Minimum Detection Limit (MDL)

The Minimum Detection Limit (MDL) for an element is determined as three times the standard deviation of ten analyses on the blank uncoated sample. The following MDL was derived using this empirical method.

Element	MDL
Chrome	3.1 mg/ft ²

Conclusion

As can be seen from the above data, the use of the PHOENIX II EDXRF system gives excellent performance when applied to the determination of chrome on steel. PHOENIX II can also be used to measure coatings such as Cr, V, Ti, Zr, P, etc. Results are rapid, precise and analysis is easily carried out, even by non-laboratory personnel. Because no consumable chemicals are used (window film), the relative "cost of ownership" is much lower than other analytical techniques.



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