

# ASOMA PHOENIX II with Direct Excitation

## Measurement of Titanium in Nylon Sheets



This report demonstrates the capability of the ASOMA PHOENIX II Benchtop XRF analyzer for measuring titanium in nylon sheets or various plastic pellets (polystyrene, polyethylene, polypropylene, etc.).

The PHOENIX II can quickly and accurately give results for titanium at-line. Titanium dioxide is added to Nylon and plastics as a pigment and its other chemical properties. Measuring the titanium ensures quality is monitored and controlled throughout the manufacturing process. The measurement requires no sample preparation; simply place the Nylon sample in the chamber or fill an XRF sample cup with pellets and analyze. These benefits work together to maximize quality and reduce operational costs.

### Introduction

The ASOMA PHOENIX II direct excitation system is an excellent QC benchtop analyzer that offers a fast, precise, simple and non-destructive analysis technique well suited for the analysis of titanium in Nylon or plastic.

The ASOMA PHOENIX II is a powerful tool for monitoring titanium in nylon and plastics. The analyzer uses a rugged, time-proven proportional counter as its detection system and a direct excitation X-ray tube. This combination of ruggedness, power and simplicity using a small benchtop analyzer enables fast and precise results.

The PHOENIX II uses an onboard Panel PC computer with a simple touch screen 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.



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 that automatically brings the calibrations back to original status.

## Experimental Portion

### Equipment

All measurements were conducted using a ASOMA PHOENIX II XRF analyzer. The total analysis time per sample was 100 seconds.

### Sample Preparation

No sample preparation is required. Nylon squares were placed in the sample chamber for analysis.

### Measurement Parameters

All measurement parameters are easily controlled by a touch screen Panel PC. Operators simply choose the correct Method from the analysis screen (there may be more than one method stored, e.g. to deal with Nylon or plastic pellets) 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:	Direct excitation 30 kV 9 W Air-cooled X-ray Tube
Detection:	Gas-filled Proportional Counter
Analyte Optimization:	X-ray voltage, current and X-ray filters
Atmosphere:	Air
Options:	Tube Filter; Flat window ring (Nylon) Sample Spinner (plastic pellets)

**Note: No helium purge is required.**



**Nylon sample in analysis position**



**Cup assembly with film window**

## Sample Spinner



### Precision

10 repeat analyses at 100 seconds per analysis

Element: Ti		Units: %TiO <sub>2</sub>		
Sample	Given	Mean	Std. Dev.	% Relative
1	1.616	1.625	0.005	0.31
3	0.831	0.841	0.003	0.36
6	0.049	0.043	0.002	4.6

### Limit of Detection (LOD)

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

Element	LOD
Ti	26 ppm TiO <sub>2</sub>

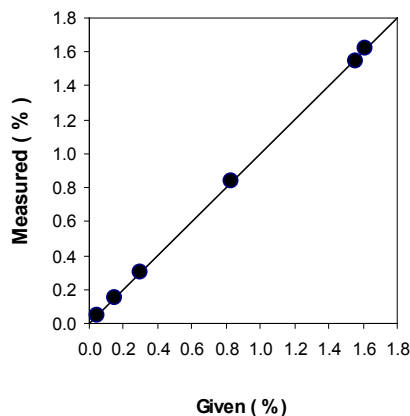
## Calibration Results: Titanium in Nylon Sheets

Element: Ti		Std. Error of Estimate: 0.01	
Units: %TiO <sub>2</sub>			
Sample	Given	Measured	
1	1.616	1.625	
2	1.561	1.545	
3	0.831	0.840	
4	0.301	0.303	
5	0.147	0.147	
6	0.049	0.042	

### Conclusion

As can be seen from the above data, the use of the ASOMA PHOENIX II XRF system gives excellent performance when applied to the quality control of titanium in Nylon or plastic. 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 & window film) the relative "cost of ownership" is much lower than other analytical techniques.

Correlation Plot





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