

Analysis of ultra-trace amounts of sulfur in metal

Background / Challenges - Requires ultra-trace sulfur analysis

Background

As the steel materials are becoming more sophisticated, such as natural gas or crude oil pipeline, sulfur content is recommended below 0.5 ppm. Hence, more accurate ultra-trace amount sulfur analysis is required. Analysis of trace amount of sulfur in steel materials can be done quickly with the conventional combustion-infrared absorption method, but the problem is that the sensitivity of the detector is insufficient and it can not be measured.



Challenges

Especially in the steel company, rapid analysis is required up to about 1-2 minutes. This is because the lack of rapid and accurate feedback of elemental analysis information can lead to significant loss.

Although various analytical methods have been proposed, none of them have been realized due to the problems of pre-processing and long analysis time.

Using HORIBA's ultraviolet fluorescence method technology, a UV fluorescence detector is mounted on Carbon/Sulfur Analyzer (EMIA). This has made it possible to increase the sensitivity to one-tenth of the original limit of detection.

Solution from HORIBA

QC department of a steel company

Ultra-trace amounts of sulfur can be analyzed with high accuracy in the same short analysis time as conventional C/S analyzer. It is also very convenient because the results of the infrared detector can be known at the same time.



Table 1

Comparison of analysis accuracy between infrared absorption method and ultraviolet fluorescence method

Detector	Ultraviolet(UV) fluorescence method	Infrared(IR) absorption method
Sample weight	1.0 g	1.0 g
Analysis range	0.2 ppm ~0.005%	2.0 ppm ~6.0%
Sulfur Measurement accuracy	$\sigma \leq 0.1\text{ppm}$	

Table 2

Measurement accuracy of steel certified reference materials by ultraviolet fluorescence method and infrared absorption method

Sample	Certified value (ppm)	Repeatability (n=10): ppm	
		UV Fluorescence	IR Absorption
Blank	-	0.05	0.24
JSS 001-6	1.5	0.04	0.26
SRM 131g	4.255	0.04	0.41
JSS 653-14	9.4	0.16	0.55
JSS 652-14	13.5	0.07	0.52
JSS 244-9	20	0.07	0.52

EMIA-Pro/Expert with UV detector



UV detector

Key features

- ✓ Highly reliable UV absorption detectors used in HORIBA's air pollution monitors
- ✓ NDIR and UV detector are both available
- ✓ Carbon analysis is also available
- ✓ High throughput (Cycle time 70 seconds)



APSA-370 series
Air pollution monitor (SO₂)

Reference customer

Copper manufacturer, precious metal recycling and turbine blades



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