

## Elemental Spectrometer for Boron-Iron Materials



### Overview

ferro.lyte® is a mobile spectrometer, optimized for use in metal production, metal processing and metal recycling.

### Key Takeaways

For precise analysis of boron in iron-based materials, wavelength-dispersive X-ray spectrometry (WDS), optical emission spectrometry (OES), and X-ray fluorescence (XRF) are the most effective spectrometer technologies. Wavelength-Dispersive X-ray Spectrometry (WDS)

WDS is highly sensitive to light elements like boron, making it ideal for microanalysis of boron-containing phases in steel. Systems such as QUANTAX WDS can map boron distributions at the nanoscale, even in trace concentrations, with pixel resolutions down to 14 nm. WDS is particularly useful for studying boron-induced precipitation hardening in austenitic Cr-Ni steels or high-temperature steels, where boron enrichments occur in sub-micron cementite ( $\text{Fe}_3\text{C}$ ) phases. WDS can be combined with EDS for simultaneous multi-element mapping, providing detailed phase and compositional information in boron-iron alloys .

Optical Emission Spectrometry (OES)



OES is widely used in steel plants and foundries for routine elemental analysis, including boron. Modern OES systems, such as the PG Spark OES CCD Metal Analyser, can detect boron at ultra-low levels alongside other elements like carbon, nitrogen, sulfur, and phosphorus. OES is suitable for bulk analysis of iron alloys, offering high throughput and reliable results for quality control and regulatory compliance. Mobile OES units are also available for on-site testing of large components or castings .

#### X-ray Fluorescence (XRF)

XRF spectrometers, such as the Thermo Scientific ARL X900, provide versatile elemental analysis from boron to heavy elements. XRF is advantageous for non-destructive testing and can handle multiple monochromator channels for precise detection. While XRF is less sensitive than WDS for light elements, it is effective for rapid screening and comparative analysis of boron in steel matrices, especially when calibrated with certified reference materials .

#### Choosing the Right Spectrometer

- For nanoscale boron mapping and research applications: WDS combined with EDS is preferred due to its high spatial resolution and sensitivity to trace boron .
- For routine industrial quality control: OES provides fast, accurate, and cost-effective analysis of boron and other alloying elements in iron-based materials .
- For non-destructive or multi-element screening: XRF offers flexibility and speed, suitable for both research and production environments .

#### Summary

Selecting a spectrometer for boron-iron materials depends on the required sensitivity, spatial resolution, and application context. WDS excels in trace-level, nanoscale mapping, OES is ideal for bulk industrial analysis, and XRF provides rapid, non-destructive elemental screening. Combining these techniques can offer comprehensive insights into boron distribution, alloy composition, and microstructural effects in iron-based materials.

## Article Content

### Elemental Mapping of Nanoscale Boron-Containing

QUANTAX WDS is a parallel-beam wavelength-dispersive X-ray spectrometer that is optimized for light

### Optical Emission Spectrometry | OES Analysis

Our OES analyzers are designed for fast, high-performance elemental analysis of iron samples across multiple stages of the

Metal Analysis by Optical Emission Spectroscopy – IspatGuru

Fig 1 Emission spectrum for iron and lithium Optical emission spectroscopy also known as optical emission

### Optical Emission Spectrometers

Elemental analysis for the metals industry Metal producing industries like foundries, steel- copper-, aluminium plants, and all kinds of

Instruments for optical emission spectrometry (OES)

Spark optical emission spectrometry (OES) is the most reliable and established analytical technique to determine the mass fraction

Quick guide Spark-Optical Emission Spectrometry (OES)

Applications Basic theory Technology Spark-OES is used in all types of metal The analysis is based on the ablation of Well

Mobile optical emission spectrometer ferro.lyte®

ferro.lyte® is a mobile spectrometer, optimized for use in metal production, metal processing and metal recycling. It uses the principle

Optical Emission Spectrometry | OES Analysis

OES analysis allows you to understand the elemental composition of metals. Learn about optical emission spectrometry for metals

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This document is for preliminary research. Verify specifications against current standards, product documentation and project requirements.

