

Article Overview

Spectrometers are essential tools in mining and geology for rapid, accurate identification and analysis of ore minerals and their elemental composition.

Overview of Ore Spectrometry

Spectrometers are analytical instruments that measure the interaction of light or radiation with a sample to determine its composition. In ore analysis, they are used to identify minerals, detect trace elements, and map mineral alterations, which is critical for exploration and mining operations . Spectroscopy provides a faster and more precise alternative to traditional physical, chemical, or manual ore identification methods, which can be time-consuming and costly .

Types of Spectrometers Used in Ore Analysis

1. Near-Infrared (NIR) Field Spectrometers

- o Devices like the oreXpress, oreXplorer, and oreXpert are portable NIR spectrometers designed for field use .
- o oreXpress: Standard resolution (3nm) for quick, reliable mineral analysis.
- o oreXplorer: Higher resolution and sensitivity for distinguishing minerals with similar spectral features.
- o oreXpert: Ultra-high resolution (1.5nm) for identifying trace minerals and unmixing complex ore samples.
- o These instruments allow geologists to perform mineral identification directly in the field, core shack, or lab, enabling faster decision-making and exploration efficiency .

2. Handheld X-Ray Fluorescence (XRF) Spectrometers

- o Devices like TITAN provide immediate elemental analysis of rocks, soils, and drill cores .
- o XRF spectrometers are non-destructive and can detect light elements such as magnesium, supporting geochemical mapping and anomaly detection.
- o They are rugged and suitable for harsh field conditions, delivering near-instant results for exploration and ore characterization .

3. Laboratory-Based Spectroscopy

- o Techniques such as ICP-OES, ICP-MS, MP-AES, and AAS are used for detailed elemental analysis of ore samples .
- o These methods are highly sensitive, capable of detecting trace elements, and are often used for quality control, environmental monitoring, and research applications.
- o Laboratory spectrometers complement field instruments by providing precise multi-element quantification and resolving spectral interferences .

Advantages of Spectrometers in Ore Analysis

- o Speed and Efficiency: Rapid identification of minerals and elements reduces exploration time and costs .



Spectrometer Ore

- o Accuracy: High-resolution instruments can distinguish minerals with similar spectral features and detect trace elements .
- o Portability: Field-ready spectrometers allow on-site analysis, minimizing the need for sample transport .
- o Data Integration: Modern spectrometers can integrate with software for mineral mapping, machine learning, and predictive modeling, enhancing exploration strategies .

Applications

- o Mineral identification for gold, silver, copper, iron, nickel, uranium, and other ores .
- o Mapping mineral alterations and pathfinders to vector toward ore deposits .
- o Monitoring ore flotation processes and quality control in processing plants .
- o Environmental and safety monitoring in mining operations . Spectrometers have become indispensable in modern mining, providing geologists and engineers with rapid, accurate, and actionable data to optimize exploration, reduce costs, and improve ore processing efficiency.

OreXpress Field Portable Spectrometer For Mineral Identification and Analysis SPECTRAL EVOLUTION OreXpress Spectrometers

SWIR spectroscopy technique based on measured spectra of white mica has been widely applied in spectral studies of

With Spectral Evolution oreXpress, oreXplorer, oreXpert field portable NIR spectrometers and EZ-ID

Check out our flexible spectroscopy solutions for efficient, accurate, and low-cost elemental analysis in ores, as well as fast and

The oreXpert(TM) NIR field spectrometer is specifically designed to provide the highest resolution available for the harsh requirements

The oreXpress(TM) spectrometer delivers the benefits of a full-range NIR spectrometer to geologists in the field. The oreXpress makes

X-ray fluorescence (ED-XRF) spectrometry provides a convenient, rapid method of analysis for rocks,

Abstract page for arXiv paper 2402.02614: Lunar ore geology and feasibility of ore mineral detection using a far-IR

Base metal ore analysis is typically performed using flame atomic absorption spectroscopy (FAAS) or inductively coupled plasma

Laser-induced breakdown spectroscopy (LIBS) is a type of optical emission spectroscopy capable of rapid,

With Spectral Evolution field portable UV-Vis-NIR spectrometers and EZ-ID(TM) mineral identification software,

Ideal for the analysis of ores, concentrates, and tailings, for environmental screening, compliance testing

Application Brief Analysis of Secondary Components in Iron Ore and Iron Sinter Application Brief Advanced ED-XRF Spectroscopy

In mineral exploration and mining, fast access to reliable geochemical data helps guide decisions in the

Knowledge of the ore type allows for adjustments to be made, ensuring that the

An X-ray fluorescence (XRF) spectrometer is an x-ray instrument used for routine, relatively

Web: <https://www.millstraining.co.za>

