

**NONFERROUS METALS INDUSTRY STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

YS/T 820.23-2012

Methods for Chemical Analysis of Laterite Nickel Ores - Part 23: Determination of Cobalt, Iron, Nickel, Phosphorus, Aluminium Oxide, Calcium Oxide, Chromium Oxide, Magnesium Oxide, Manganese Oxide, Silicon Dioxide and Titanium Dioxide Content - Wavelength

红土镍矿化学分析方法 第23部分：钴、铁、镍、磷、氧化铝、氧化钙、氧化铬、氧化镁、氧化锰、二氧化硅和二氧化钛量的测定波长色散X射线荧光光谱法

(English Translation)

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Foreword

This Part was drafted in accordance with the rules given in GB/T 1.1-2009.

YS/T 820-2012, Methods for Chemical Analysis of Laterite Nickel Ores, includes 26 parts.

- Part 1: Determination of Nickel Content - Flame Atomic Absorption Spectrometry;
- Part 2: Determination of Nickel Content - Dimethylglyoxime Spectrophotometry;
- Part 3: Determination of Total Iron Content - Potassium Dichromate Titration;
- Part 4: Determination of Phosphorus Content - Phosphorus Molybdenum Blue Spectrophotometry;
- Part 5: Determination of Cobalt Content - Flame Atomic Absorption Spectrometry;
- Part 6: Determination of Copper Content - Flame Atomic Absorption Spectrometry;
- Part 7: Determination of Calcium and Magnesium Content - Flame Atomic Absorption Spectrometry;
- Part 8: Determination of Silica Content - Potassium Silicafluoride Titrimetric Method;
- Part 9: Determination of Scandium and Cadmium Contents - Inductively Coupled Plasma Mass Spectrometry;

- Part 10: Determination of Calcium, Cobalt, Copper, Magnesium, Manganese, Nickel, Phosphate and Zinc Content - Inductively Coupled Plasma-Atomic Emission Spectrometry;
- Part 11: Determination of Fluorine and Chlorine Contents - Ion Chromatography;
- Part 12: Determination of Manganese Content - Flame Atomic Absorption Spectrometry;
- Part 13: Determination of Lead Content - Flame Atomic Absorption Spectrometry;
- Part 14: Determination of Zinc Content - Flame Atomic Absorption Spectrometry;
- Part 15: Determination of Cadmium Content - Flame Atomic Absorption Spectrometry;
- Part 16: Determination of Carbon and Sulfur Content - High Frequency Combustion with Infrared Absorption Spectrometry;
- Part 17: Determination of Arsenic, Antimony and Bismuth Contents - Hydride Generation-atomic Fluorescence Spectrometry;
- Part 18: Determination of Mercury Content - Cold Atomic Absorption Spectrometry;
- Part 19: Determination of Aluminum, Chromium, Iron, Magnesium, Manganese, Nickel and Silicon Contents - Energy-Dispersive X-Ray Fluorescence Spectrometry;
- Part 20: Determination of Aluminum Content - EDTA Titration;
- Part 21: Determination of Chromium Content - The Ammonium-ferrous Sulfate Titration Method;
- Part 22: Determination of Magnesium Content - EDTA Titration;
- Part 23: Determination of Cobalt, Iron, Nickel, Phosphorus, Aluminium Oxide, Calcium Oxide, Chromium Oxide, Magnesium Oxide, Manganese Oxide, Silicon Dioxide and Titanium Dioxide Content - Wavelength Dispersive X-ray Fluorescence Spectrometry;
- Part 24: Determination Hygroscopic Moisture Content - Gravimetric Method;
- Part 25: Determination of Combined Water Content - Gravimetric Method;
- Part 26: Determination of Loss on Ignition - Gravimetric Method.

This Part is Part 23 of YS/T 820-2012.

This Standard shall be under the jurisdiction of National Technical Committee 243 on Non-ferrous Metals of Standardization Administration of China (SAC/TC 243).

The responsible drafting organizations of this Standard are Beijing General Research Institute of Mining and Metallurgy, Bayuquan Entry-exit Inspection and Quarantine Bureau of the People's Republic of China, Jinchuan Non-ferrous Group Co., Ltd.

1 Application Scope

This Standard specifies the wavelength dispersive x-ray fluorescence spectrometry for the determination of cobalt, iron, nickel, phosphorus, aluminium oxide, calcium oxide, chromium oxide, magnesium oxide, manganese oxide, silicon dioxide and titanium dioxide content in laterite nickel ores.

This Standard applies to the determination of cobalt, iron, nickel, phosphorus, aluminium oxide, calcium oxide, chromium oxide, magnesium oxide, manganese oxide, silicon dioxide and titanium dioxide content in laterite nickel ores. See Table 1 for the measuring range.

Table 1 -- Measuring Ranges of All Components in laterite nickel ores

2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition dated applies to this document. For undated references, the latest edition of the referenced documents (including all amendments) applies to This Standard.

GB/T 6379.2-2004, Accuracy (Trueness and Precision) of Measurement Methods and Results - Part 2: Basic Method for the Determination of Repeatability and Component Measuring range (mass fraction)/% Reproducibility of a Standard Measurement Method (ISO 5725-2:1994, IDT) GB/T 16597, Analytical Methods of Metallurgical Products General Rule for X-Ray Fluorescence Spectrometric Methods

3 Method Summary

Use a fusion-agent to cast specimen into specimen fuse-pieces suitable for the measurement of X-ray fluorescence spectrometer. Under the selected measuring conditions of the instrument, measure the X-ray fluorescence strength of the characteristic spectral line of elements to be measured in specimen fuse-pieces;

4 Reagents and Materials

Unless specified otherwise, the water used in the analysis shall be identified as analytically pure reagent and distilled water or deionized water or water of equivalent purity.

4.1 Mixed solvent of lithium tetraborate and lithium metaborate (12-22). guaranteed

reagent; burning for 4 h at 600°C before use.

4.2 Lithium nitrate. dry for 2 h at 105°C before use.

4.3 Lithium bromide. dry for 2 h at 105°C before use.

4.5 Mixed gas of argon and methane. containing argon of volume fraction 90% and methane of volume fraction 10%.

5.1 Wavelength dispersive X-ray fluorescence spectrometer. as specified in GB/T 16597.

5.2 Crucible. made of platinum alloy (95% Pt + 5% Au); and the volume is greater than 30 ml.

6.1 Specimen

The grain size of specimen shall be less than 160 µm.

7.1 Number of times of measurement

Carry out two measurements independently; and take the mean value.

7.2 Determination of loss on ignition

Use water to wash the porcelain crucible clean (30 ml); dry; burn in a high temperature furnace at 1 050°C ~ 1 100°C to constant weight; and place into a desiccator. Weigh about 1.0 g of specimen (6.1), accurate to 0.1 mg; place in the crucible of constant weight; and burn in the high temperature furnace at 1 050°C ~ 1 100°C to constant weight.

7.3 Preparation of specimen fuse pieces

One of the following methods may be used to weigh specimen.

7.4.1 Standard samples

Use reagents of high purity, solution of nitric acid or water medium of known concentration and/or multiple certified standard substances to prepare standard samples. See Annex A for the specific method for preparation. Multiple certified standard substances are recommended as the basis for the preparation of standard samples.

7.5.1 Drift correction

Choose appropriate specimen fusion pieces as the drift correction fusion pieces for the drift correction of the instrument. Use single-point correction or double-point correction;

and the time interval for correction shall be decided by the stability of the instrument.

After the mixed gas of argon and methane (4.5) is replaced, a drift correction must be carried out.