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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB 3653.4-1983

Replacing GB/T 3653.4-2008

**Ferroboron - Determination of aluminum content - EDTA titrimetric
method, chrome azurol S spectrophotometric method and inductively
coupled plasma atomic emission spectrometric method**

(English Translation)

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Foreword

This document complies with the provisions of GB/T 1.1-2020 "Standardization Work Guidelines Part 1: Structure and Drafting Rules of Standardization Documents".

Drafting.

This document is Part 4 of GB/T 3653.GB/T 3653 has already published the following parts.

- Determination of Boron, Iron, and Boron Content by Alkali Titration (GB/T 3653.1);
- Determination of Carbon Content in Ferroboration by Gas Volumetric Method (GB/T 3653.2)
- Determination of Boron-Iron-Silicon Content by Perchloric Acid Dehydration Gravimetric Method (GB/T 3653.3);
- Determination of Boron-Iron-Aluminum Content. EDTA titration, Chromium Azure S spectrophotometry, and Inductively Coupled Plasma Atomic Emission Spectrometry (GB/T 3653.4);
- Chemical Analysis Methods for Ferroboration. Determination of Sulfur Content by Chromatographic Separation and Barium Sulfate Gravimetric Method (GB/T 3653.5);
- Chemical Analysis Methods for Boron-Iron. Determination of Phosphorus Content by Antimony-Phosphorus-Molybdenum Blue Spectrophotometry (GB/T 3653.6);
- Determination of Boron, Iron, and Sulfur Content by Infrared Absorption Method (GB/T 3653.7).

This document supersedes GB/T 3653.4-2008 "Determination of Boron, Iron, and Aluminum Content by EDTA Titration".

In comparison, aside from structural adjustments and editorial changes, the main technical

changes are as follows.

- a) The scope has been changed (see Chapter 1, Chapter 1 of the 2008 edition);
- b) The instruments and equipment were changed (see 4.3, Chapter 5 of the 2008 edition);
- c) Added "Number of measurements" (see 4.5.2);
- d) Added "Representation of Analysis Results" (see 4.6.2);
- e) Added "Method 2.Chromium Azure S Spectrophotometry" (see Chapter 5);
- f) Added "Method 3.Inductively Coupled Plasma Emission Spectroscopy" (see Chapter 6);
- g) A "Flowchart for Accepting Sample Analysis Results" has been added (see Appendix A);
- h) "Performance test of inductively coupled plasma emission spectrometer" has been added (see Appendix B).

Please note that some content in this document may involve patents. The issuing organization of this document assumes no responsibility for identifying patents.

This document was proposed by the China Iron and Steel Association.

This document is under the jurisdiction of the National Technical Committee on Standardization of Pig Iron and Ferroalloys (SAC/TC318).

Introduction

Because the detection of ferroboron involves many elements, and the applicable scope and methods for each element differ, it is crucial to ensure the accuracy of boron detection.

To ensure the convenience and accuracy of iron testing standards, we have established a national standard system to support the analysis of different elements in ferroboron.

The GB/T 3653 series of analytical methods for ferroboron is the basic standard for the detection of ferroboron in my country, and it is proposed to consist of the following seven parts.

---Determination of Boron Content in Ferroboron by Alkali Titration (GB/T 3653.1). The purpose is to determine the boron content in ferroboron using alkali titration.

Titration method.

---Chemical Analysis Method for Ferroboron. Determination of Carbon Content by Gas Volumetric Method (GB/T 3653.2). The purpose is to measure the carbon content in ferroboron.

The volume was determined using the gas volumetric method.

---Determination of Silicon Content in Ferroboron - Perchloric Acid Dehydration Gravimetric

Method (GB/T 3653.3). The purpose is to determine the silicon content in ferroboron.

The amount was determined by the perchloric acid dehydration gravimetric method.

---Determination of Boron-Iron-Aluminum Content. EDTA titration, Chromium Azure S spectrophotometry, and Inductively Coupled Plasma Atomic Emission Spectrometry (GB/T 3653.4). The purpose is to measure the aluminum content in ferroboron using EDTA titration and chromium azurite S spectrophotometry.

And inductively coupled plasma emission spectroscopy.

---Chemical Analysis Method for Boron-Ferrous Iron. Determination of Sulfur Content by Chromatographic Separation and Barium Sulfate Gravimetric Method (GB/T 3653.5). The purpose is to measure the sulfur content in ferrous boron.

The sulfur content was determined by the barium sulfate gravimetric method using chromatographic separation.

---Chemical Analysis Method for Boron-Iron. Determination of Phosphorus Content by Antimony-Phosphorus-Molybdenum Blue Spectrophotometry (GB/T 3653.6). The purpose is to measure the phosphorus content in ferroboron.

The measurement was performed using the antimony-phosphorus-molybdenum blue spectrophotometric method.

---Determination of Sulfur Content in Ferroboron by Infrared Absorption Spectroscopy (GB/T 3653.7). The purpose is to measure the sulfur content in ferroboron using infrared absorption spectroscopy.

Infrared absorption method.

Determination of boron, iron, and aluminum content EDTA titration, chromium azure S spectrophotometry and Inductively Coupled Plasma Emission Spectroscopy

Warning---Personnel using this document should have formal laboratory work experience. This document does not address all possible safety issues.

Users are responsible for taking appropriate safety and health measures and ensuring compliance with relevant national regulations.

1 Scope

This document describes the determination of boron-iron compounds using EDTA titration, chromium azurite S spectrophotometry, and inductively coupled plasma atomic emission spectrometry.

Aluminum content.

This document applies to the determination of aluminum content in ferroboron, with a determination range (mass fraction) of 0.02% to 8.00%. Method 1.EDTA titration Method

1.Determination range (mass fraction). 1.00%~8.00%; Method 2.Chromium Azure S spectrophotometric method determination range (mass fraction). 0.02%~ 1.00%; Method 3.Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES) determination range (mass fraction). 0.02%~1.00%.

2 Normative references

The contents of the following documents, through normative references within the text, constitute essential provisions of this document. Dated citations are not included.

For references to documents, only the version corresponding to that date applies to this document; for undated references, the latest version (including all amendments) applies.

This document.

GB/T 4010 Sample collection and preparation for chemical analysis of ferroalloys GB/T 6379.1 Accuracy (Correctness and Precision) of Measurement Methods and Results - Part 1: General Principles and Definitions GB/T 6379.2 Accuracy (correctness and precision) of measurement methods and results - Part 2: Determining the repeatability of standard measurement methods Basic methods of sex and representation GB/T 6682 Specifications and test methods for water used in analytical laboratories GB/T 7729 General Rules for Chemical Analysis of Metallurgical Products - Spectrophotometric Method GB/T 8170 Rules for rounding off numerical values and the representation and determination of limiting values GB/T 12805 Burettes for Laboratory Glassware GB/T 12806 Laboratory Glassware - Single-mark volumetric flasks GB/T 12807 Graduated Pipettes for Laboratory Glassware GB/T 12808 Laboratory Glassware - Single-mark Pipettes JJG768 Verification Procedure for Emission Spectrometer

3 Terms and Definitions

This document does not contain any terms or definitions that need to be defined.

4.1 Principle

The sample was dissolved in nitric acid and hydrofluoric acid. After filtering out the residue, the filtrate was dissolved in hydrochloric acid medium, and iron ions were removed using methyl isobutyl ketone. The residue was then...

Sodium pyrosulfate is melted, leached, and combined with the main liquid. Then, sodium hydroxide is used to separate impurities such as aluminum, manganese, and residual iron. An excess of sodium hydroxide is added.

EDTA was titrated with copper sulfate standard solution at pH 5.5 using PAN as an indicator, followed by the addition of sodium fluoride.

Release the EDTA complexed with aluminum, then back titrate with a standard copper