ICS 77.100
CCS H 11

NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 3653.4-2025

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

硼铁 铝含量的测定 EDTA滴定法、铬天青S分光光度法和电感耦合等离子体发射光谱法

Issued on: August 29, 2025 **Implemented on: March 1, 2026**

Issued by: State Administration for Market Regulation;
Standardization Administration of the PRC

Table of Contents

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 Ferroboron 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 Ferroboron. 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).

This document was drafted by: Shandong Metallurgical Research Institute Co., Ltd., Wuxi Zhuolang Materials Technology Co., Ltd., and Fangtongzhou Holdings.

Limited Liability Company, Jiangsu Binxin Steel Group Co., Ltd., China Certification & Inspection Group Hebei Co., Ltd., Liaoyang International Boron Alloy Co., Ltd.

Inner Mongolia Xintaiyuan New Materials Co., Ltd., Hebei Jinxi Steel Group Co., Ltd., Jilin Iron & Steel Ferroalloy Co., Ltd., Metallurgical Industry Information Standards Research Institute.

The main drafters of this document are: Zhang Li, Wu Lijuan, Gao Hongji, Li Jing, Sun Yongfen, Cui Xiaocui, Ding Xiaotong, Liu Junli, Wu Zhifeng, and Zhao Lixin.

Lin Tao, Chen Wanfeng, Zhou Ruidong, Wang Yingying, Tao Zhi, Wang Chao, Cao Fawei, Li Jinglin, Wang Lixia, Xu Zhibin, Meng Lili, Jiang Hongjiao, Sun Fengxiao Chu Yanshun, Ye Junying, Du Qianqian, Liu Fei, Zheng Haidong, Zheng Hongning, Wang Hao, Lu Chunsheng, Cheng Zhaoyang.

This document was first published in 1983, revised for the first time in 1988, revised for the second time in 2008, and this is the third revision.

Introduction

Because the detection of ferroborone 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 China, 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

GB/T 4010

GB/T 6379.1

GB/T 6379.2

GB/T 6682

GB/T 7729

GB/T 8170

GB/T 12805

GB/T 12806

GB/T 12807

GB/T 12808

JJG768

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,