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

GB/T 4701.13-2024

**Ferrotitanium - Determination of silicon, manganese,
phosphorus, chromium, aluminium, magnesium, copper,
vanadium and nickel by ICP-AES**

钛铁硅、锰、磷、铬、铝、镁、铜、钒、镍含量的测定 电感耦合等离子体原子
发射光谱法

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Foreword

This document is in accordance with the provisions of GB/T 1:1-2020 "Guidelines for standardization work Part 1: Structure and drafting rules for standardization documents" Drafting: This document is Part 13 of GB/T 4701: GB/T 4701 has been published in the following parts:

- Determination of ferrotitanium content by ammonium ferric sulfate titration method;
- Determination of ferrotitanium silicon content-Sulfuric acid dehydration gravimetric method;
- Determination of titanium, iron and copper content by copper reagent photometry and flame atomic absorption spectrometry;
- Determination of titanium, iron and manganese content by arsenite-nitrite titration and periodate photometry;
- Determination of titanium, iron and aluminum content-EDTA titration method;
- Determination of phosphorus content in titanium iron-bismuth phosphide-molybdenum blue spectrophotometry and molybdenum blue spectrophotometry;
- Determination of carbon content in ferrotitanium-infrared absorption method;
- Determination of sulfur content in ferrotitanium by infrared absorption method and combustion neutralization titration method;
- Determination of titanium content by diantipyrine methane spectrophotometry;
- Determination of titanium, iron, silicon, manganese, phosphorus, chromium, aluminum, magnesium, copper, vanadium and nickel content by inductively coupled plasma atomic emission spectrometry: Please note that some of the contents of this document may involve patents: The issuing organization of this document does not assume the 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 for Standardization of Pig Iron and Ferroalloys (SAC/TC318): This document was drafted by: Hebei Hesteel Material Technology Research Institute Co., Ltd., Ansteel Group Beijing Research Institute Co., Ltd., Qingdao Bozheng Inspection Verification Technology Co., Ltd.,

Guangdong Zhongnan Iron and Steel Co., Ltd., Jitie Ferroalloy Co., Ltd., Jinzhou Vanadium Co., Ltd., Qingdao Dehong Jinxin Technology Co., Ltd., Inner Mongolia Xintai Industrial Group Co., Ltd., and Metallurgical Industry Information Standards Research Institute: The main drafters of this document are: Zhang Caidong, Ren Lingling, An Zhiguo, Zhai Yongzhen, Tan Shengnan, Liu Jie, Ge Jingjing, Wang Ying, Qi Zhennan, Yang Huixian, Qiu Wensheng, Yao Jitan, Wang Lihui, Zhou Ruidong, Xue Feng, Bi Lian, Teng Aijun, Wu Chaochao, Liu Bing, Fan Yu, Liu Jinfeng, Liu Fei, Liu Kun, and Lu Chunsheng:

Since there are many detection elements involved in the titanium iron detection process, the applicable scope and application methods of the elements are different: The convenience and accuracy of ferro-titanium testing standards: We have established a national standard system to support ferro-titanium testing for the analysis of different elements in ferro-titanium: GB/T 4701 series of titanium iron analysis methods is the basic standard for titanium iron detection in my country, and is intended to consist of the following parts:

--- Part 1: Determination of titanium content in ferrotitanium - ammonium ferric sulfate titration method: The purpose is to measure the titanium content in ferrotitanium using sulfuric acid Ammonium iron titration method:

--- Part 2: Determination of silicon content in ferrotitanium - Sulfuric acid dehydration gravimetric method: The purpose is to measure the silicon content in ferrotitanium using sulfuric acid Dehydrated weight method:

1 Scope

China's national method for determining nine elements in ferrotitanium by inductively coupled plasma atomic emission spectrometry. Ferrotitanium is the alloy through which titanium enters steel, and it is added for two quite different purposes: in microalloyed and interstitial-free steels titanium is a deliberate alloying element that fixes carbon and nitrogen and controls grain size, while in stainless steel it stabilises the carbon against sensitisation at the weld. Both uses are sensitive to what else the ferroalloy brings. Much ferrotitanium is made from titanium scrap, so its residual content is variable by nature, and aluminium in particular is present at up to twelve per cent because it is the reductant. Determining all nine elements simultaneously by ICP-AES replaces a set of separate wet methods with one analysis. The document covers silicon, manganese, phosphorus, chromium, aluminium, magnesium, copper, vanadium and nickel, each over its own defined range.

This document describes the determination of silicon, manganese, phosphorus, chromium, aluminum, magnesium, copper, vanadium and nickel in ferrotitanium by inductively coupled plasma atomic emission spectrometry: (ICP-AES): This document is applicable to the determination of silicon, manganese, phosphorus, chromium, aluminum, magnesium, copper, vanadium and nickel in ferrotitanium: The determination range of each element is shown in Table 1: Table

1 Determination range of each element element Content range (mass fraction) Si 0:100~6:

00 Mn 0:050~3:00 P 0:005~0:100 Cr 0:020~0:400 Al 0:200~12:

50 Mg 0:010~0:080 Cu 0:010~0:600 V 0:010~0:800 Ni 0:010~0:300

2 Normative references

The contents of the following documents constitute the essential clauses of this document through normative references in this document: For referenced documents without a date, only the version corresponding to that date applies to this document; for referenced documents without a date, the latest version (including all amendments) applies to This document:

GB/T 4010 Sampling and preparation of samples for chemical analysis of ferroalloys GB/T 6379:

1 Accuracy (trueness and precision) of measurement methods and results Part 1: General principles and definitions GB/T 6379:

2 Accuracy (trueness and precision) of measurement methods and results Part 2: Determination of repeatability of standard measurement methods Basic methods of sex and reproducibility

GB/T 6682 Specifications and test methods for water used in analytical laboratories

GB/T 8170 Rules for rounding off values and expression and determination of limit values