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

GB/T 42513.9-2025

**Methods for chemical analysis of nickel alloys - Part 9:
Determination of total boron content - Curcumin molecular
absorption spectrometric method**

镍合金化学分析方法 第9部分：总硼含量的测定 姜黄素分光光度法

(English Translation)

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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 9 of GB/T 42513 "Chemical analysis methods for nickel alloys". GB/T 42513 has been published in the following parts.

--- Part 1: Determination of chromium content - Ammonium ferrous sulfate potentiometric titration method;

--- Part 2: Determination of phosphorus content-Molybdenum blue spectrophotometric method;

--- Part 3: Determination of aluminum content - Nitrous oxide flame atomic absorption spectrometry and inductively coupled plasma atomic emission spectrometry Spectral method;

--- Part 4: Determination of silicon content - Nitrous oxide flame atomic absorption spectrometry and molybdenum blue spectrophotometry;

--- Part 5: Determination of vanadium content - Nitrous oxide flame atomic absorption spectrometry and inductively coupled plasma atomic emission spectrometry Spectral method;

--- Part 6: Determination of molybdenum content - Inductively coupled plasma atomic emission spectrometry;

--- Part 7: Determination of cobalt, chromium, copper, iron and manganese content - Flame atomic absorption spectrometry;

--- Part 8: Determination of niobium content - Inductively coupled plasma atomic emission

spectrometry;

--- Part 9: Determination of total boron content in curcumin-spectrophotometric method.

This document is modified to adopt ISO 11436:1993 "Nickel and nickel alloys-Determination of total boron content-Spectrophotometric method using curcumin".

Compared with ISO 11436:1993, this document has many structural adjustments.

See Appendix A.

This document has many technical differences compared with ISO 11436:1993.

A table of these technical differences and their causes is given in Appendix B.

The following editorial changes have been made to this document.

--- To coordinate with the existing standard, the name of the standard is changed to "Chemical Analysis Methods of Nickel Alloys Part 9: Determination of Total Boron Content" Flavin spectrophotometry.

Introduction

Nickel alloys are widely used in instruments, electronic communications, pressure vessels, corrosion-resistant devices, aerospace and high-end special-purpose Nickel alloy chemical analysis methods have been around for decades.

With the progress of my country's industry, the demand for the production, import and export of high-end metal materials nickel alloys has increased. To this end, the international standards have been converted into national standards.

GB/T 42513 "Chemical Analysis of Nickel Alloys" is of great significance to the development and upgrading of the non-ferrous metal industry and the development of domestic manufacturing.

The purpose of this paper is to establish a complete and feasible standard method for the detection of chromium, phosphorus, niobium, molybdenum, aluminum, vanadium, silicon, cobalt, copper, boron and other elements in nickel alloys.

Method, transform the following international standards.

---ISO 7592:2017 Nickel alloys-Determination of chromium content-Ammonium ferrous sulfate potentiometric titration method;

---ISO 9388:1992 Nickel alloys-Determination of phosphorus content-Molybdenum blue molecular absorption spectrometry;

--- ISO 7530-7:1992 Nickel alloys - Flame atomic absorption spectrometric analysis - Part 7: Determination of aluminium content;

- ISO 7530-8:1992 Nickel alloys - Flame atomic absorption spectrometric analysis - Part 8: Determination of silicon content;
 - ISO 7530-9:1993 Nickel alloys - Flame atomic absorption spectrometric analysis - Part 9: Determination of vanadium content;
 - ISO 11435:2011 Nickel alloys-Determination of molybdenum content-Inductively coupled plasma atomic emission spectrometry;
 - ISO 7530-1:2015 Nickel alloys - Flame atomic absorption spectrometric analysis - Part 1: Determination of cobalt, chromium, copper, iron and manganese contents Determination;
 - ISO 22033:2011 Nickel alloys-Determination of niobium content-Inductively coupled plasma atomic emission spectrometry;
 - ISO 11436:1993 Nickel and nickel alloys-Determination of total boron content-Turmeric molecular absorption spectrometry;
 - ISO 23166:2018 Nickel alloys-Determination of tantalum content-Inductively coupled plasma atomic emission spectrometry method.
- GB/T 42513 "Chemical analysis methods for nickel alloys" is intended to consist of 13 parts.
- Part 1: Determination of chromium content - Ammonium ferrous sulfate potentiometric titration method;
 - Part 2: Determination of phosphorus content-Molybdenum blue spectrophotometric method;
 - Part 3: Determination of aluminum content - Nitrous oxide flame atomic absorption spectrometry and inductively coupled plasma atomic emission spectrometry Spectral method;
 - Part 4: Determination of silicon content - Nitrous oxide flame atomic absorption spectrometry and molybdenum blue spectrophotometry;
 - Part 5: Determination of vanadium content - Nitrous oxide flame atomic absorption spectrometry and inductively coupled plasma atomic emission spectrometry Spectral method;
 - Part 6: Determination of molybdenum content - Inductively coupled plasma atomic emission spectrometry;
 - Part 7: Determination of cobalt, chromium, copper, iron and manganese content - Flame atomic absorption spectrometry;
 - Part 8: Determination of niobium content - Inductively coupled plasma atomic emission spectrometry;
 - Part 9: Determination of total boron content - Curcumin spectrophotometric method;

- Part 10: Determination of trace element content - Glow discharge mass spectrometry;
- Part 11: Determination of silicon, manganese, phosphorus, chromium, nickel, copper, molybdenum, cobalt, iron, aluminum, vanadium, titanium, tungsten and niobium content - X-ray fluorescence spectrometry (conventional method);
- Part 12: Determination of tantalum content - Inductively coupled plasma atomic emission spectrometry;
- Part 13: Determination of oxygen, nitrogen and hydrogen content - Inert gas fusion - thermal conductivity method/infrared absorption method.

This document will help promote the progress of nickel alloy testing technology in my country and ensure that industry practitioners can follow standards to follow, which fills the gap in chemical analysis methods for determining boron content in nickel alloys in my country.

Chemical analysis methods for nickel alloys Part 9: Determination of total boron content Curcumin spectrophotometry Warning. Personnel using this document should have practical experience in regular laboratory work. This document does not address all possible safety issues.

The user is responsible for taking appropriate safety and health protection measures and complying with the conditions stipulated by relevant national laws and regulations.

1 Scope

This document describes a method for the spectrophotometric determination of total boron in nickel alloys using curcumin.

This document is applicable to the determination of total boron content in nickel alloys. Determination range (mass fraction). 0.0010%~0.030%.

2 Normative references

This document has no normative references.

3 Terms and Definitions

There are no terms or definitions that require definition in this document.

4 Principles

Dissolve the sample in hydrochloric acid and nitric acid, and fumigate the solution with phosphoric acid and sulfuric acid for 30 minutes at a temperature not lower than 290°C to decompose the inert boron.