

ICS 77.120.40

CCS H 13



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

GB/T 42513.8-2025

**Methods for chemical analysis of nickel alloys - Part 8:
Determination of niobium content - Inductively coupled plasma
atomic emission spectrometric method**

镍合金化学分析方法 第8部分：铌含量的测定 电感耦合等离子体原子发射光谱法
(English Translation)

Issued on: August 29, 2025

Implemented on: March 1, 2026

Issued by: State Administration for Market Regulation

Table of Contents

- Foreword
- Introduction
- 1 Scope
- 2 Normative references
- 3 Terms and Definitions
- 4 Principles

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 8 of GB/T 42513, "Chemical Analysis Methods for Nickel Alloys". GB/T 42513 has the following parts published.

- Part 1: Determination of Chromium Content by Ferrous Ammonium Sulfate Potentiometric Titration;
- Part 2: Determination of Phosphorus Content by Molybdenum Blue Spectrophotometry;
- Part 3: Determination of Aluminum Content Nitrous oxide-flame atomic absorption spectrometry and inductively coupled plasma atomic emission spectrometry Spectroscopy;
- Part 4: Determination of Silicon Content by 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 Spectroscopy;
- Part 6: Determination of Molybdenum Content by Inductively Coupled Plasma Atomic Emission Spectrometry;
- Part 7: Determination of Cobalt, Chromium, Copper, Iron and Manganese Content by Flame Atomic Absorption Spectrometry;
- Part 8: Determination of Niobium Content by Inductively Coupled Plasma Atomic Emission Spectrometry;
- Part 9: Determination of Total Boron Content by Curcumin Spectrophotometry this document is modified to adopt ISO 22033:2011 "Determination of Niobium Content in

Nickel Alloys - Inductively Coupled Plasma Atomic Emission Spectrometry".

Compared with ISO 22033:2011, this document has undergone many structural adjustments. A comparison table of the structural numbering changes between the two documents is provided.

See Appendix A.

This document differs from ISO 22033:2011 in some technical aspects. The relevant clauses are indicated by vertical markings on the outer margin.

Single lines (|) are indicated. A summary of these technical differences and their causes can be found in Appendix B.

The following editorial changes have been made to this document.

---To harmonize with existing standards, the standard title has been changed to "Chemical Analysis Methods for Nickel Alloys - Part 8: Determination of Niobium Content and Inductance".

Coupled Plasma Atomic Emission Spectrometry;

---Appendix C (Informative) "Information on Test Samples" has been added;

---Added Appendix D (Informative) "Precision Test Raw Data".

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 Nonferrous Metals Industry Association.

This document is under the jurisdiction of the National Technical Committee on Standardization of Nonferrous Metals (SAC/TC243).

Introduction

Nickel alloys are widely used in instruments, electronic communications, pressure vessels, corrosion-resistant equipment, and are also extensively used in aerospace and high-end special applications.

Industries such as machinery and equipment manufacturing rely heavily on nickel as a crucial metal raw material for industrial development. International standards for chemical analysis methods of nickel alloys have been published for decades.

In 1990, with the progress of my country's industry, the demand for the production and import/export of high-end nickel alloy materials increased. Therefore, international standards were transformed into national standards.

Accurate chemical analysis of nickel alloys is of great significance for promoting the development and upgrading of the non-ferrous metals industry and the development of

domestic manufacturing. GB/T 42513 "Chemical Analysis Methods for Nickel Alloys" the "Law" aims to establish a complete and practical set of standard methods for detecting elements such as chromium, phosphorus, niobium, molybdenum, aluminum, vanadium, silicon, cobalt, and copper in nickel alloys.

The following international standards are adopted.

---ISO 7592:2017 Determination of Chromium Content in Nickel Alloys by Ferrous Ammonium Sulfate Potentiometric Titration;

---ISO 9388:1992 Determination of phosphorus content in nickel alloys by molybdenum blue spectrophotometry;

---ISO 7530-7:1992 Flame atomic absorption spectrometry analysis of nickel alloys-Part 7: Determination of aluminum content;

---ISO 7530-8:1992 Flame atomic absorption spectrometry analysis of nickel alloys-Part 8: Determination of silicon content;

---ISO 7530-9:1993 Flame atomic absorption spectrometry analysis of nickel alloys-Part 9: Determination of vanadium content;

---ISO 11435:2011 Determination of molybdenum content in nickel alloys by inductively coupled plasma atomic emission spectrometry;

---ISO 7530-1:2015 Flame atomic absorption spectrometry analysis of nickel alloys-Part 1: Content of cobalt, chromium, copper, iron and manganese Measurement;

---ISO 22033:2011 Determination of niobium content in nickel alloys by inductively coupled plasma atomic emission spectrometry;

---ISO 11436:1993 Determination of total boron content in nickel and nickel alloys by curcumin spectrophotometry;

---ISO 23166:2018 Determination of tantalum content in nickel alloys by inductively coupled plasma atomic emission spectrometry.

GB/T 42513 "Chemical Analysis Methods for Nickel Alloys" is proposed to consist of 13 parts.

---Part 1: Determination of Chromium Content by Ferrous Ammonium Sulfate Potentiometric Titration;

---Part 2: Determination of Phosphorus Content by Molybdenum Blue Spectrophotometry;

---Part 3: Determination of Aluminum Content Nitrous oxide-flame atomic absorption spectrometry and inductively coupled plasma atomic emission spectrometry Spectroscopy;

---Part 4: Determination of Silicon Content by 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 Spectroscopy;

---Part 6: Determination of Molybdenum Content by Inductively Coupled Plasma Atomic Emission Spectrometry;

---Part 7: Determination of Cobalt, Chromium, Copper, Iron and Manganese Content by Flame Atomic Absorption Spectrometry;

---Part 8: Determination of Niobium Content by Inductively Coupled Plasma Atomic Emission Spectrometry;

---Part 9: Determination of Total Boron Content by Curcumin Spectrophotometry;

---Part 10: Determination of Trace Element Content by Glow Discharge Mass Spectrometry;

---Part 11: Determination of the content of silicon, manganese, phosphorus, chromium, nickel, copper, molybdenum, cobalt, iron, aluminum, vanadium, titanium, tungsten and niobium by X-ray fluorescence spectrometry (Conventional method);

---Part 12: Determination of Tantalum Content by 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 advancement of nickel alloy testing technology in my country and ensure that industry practitioners have access to testing services throughout the production, application, research, and testing processes.

There are existing standards to follow, filling the gap in my country's chemical analysis methods for determining niobium content in nickel alloys.

Chemical Analysis Methods for Nickel Alloys Part 8: Determination of Niobium Content Inductively Coupled Plasma Atomic Emission Spectrometry Warning---Personnel using this document should have practical experience working in a formal laboratory. 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 a method for determining the niobium content in nickel alloys using inductively coupled plasma atomic emission spectrometry.

This document applies to the determination of niobium content in nickel alloys.

Determination range (mass fraction). 0.10%~10.00%.