

ICS 77.120.40

CCS H 13



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

**GB/T 42513.3-2023**

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**Methods for chemical analysis of nickel alloys - Part 3: Determination of  
aluminium content - Nitrous oxide- flame atomic absorption spectrometry and  
inductively coupled plasma atomic emission spectrometry**

**镍合金化学分析方法 第3部分：铝含量的测定 一氧化二氮-火焰原子吸收光谱法和  
电感耦合等离子体原子发射光谱法**

**(English Translation)**

**Issued on: November 27, 2023**

**Implemented on: June 1, 2024**

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**Issued by: State Administration for Market Regulation, China National  
Standardization Administration**

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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 3 of GB/T 42513 "Chemical Analysis Methods for Nickel Alloys": GB/T 42513 has released the following parts:

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

---Part 2: Determination of phosphorus content by molybdenum blue spectrophotometry;

---Part 3: Determination of aluminum content by nitrous oxide-flame atomic absorption spectrometry and inductively coupled plasma atomic emission light spectrometry;

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

---Part 5: Determination of vanadium content by nitrous oxide-flame atomic absorption spectrometry and inductively coupled plasma atomic emission light spectrum method:

This document has been modified to adopt ISO 7530-7:1992 "Nickel Alloy Flame Atomic Absorption Spectrometry Part 7: Determination of Aluminum Content":

Compared with ISO 7530-7:1992, this document has many adjustments in structure: A comparison list of structural number changes between the two documents See Appendix A:

Compared with ISO 7530-7:1992, there are many technical differences between this document and the clauses involved in the outer margins:

Straight single lines (|) are marked: A list of these technical differences and their causes is provided in Appendix B:

The following editorial changes have been made to this document:

---In order to coordinate with the existing standards, the name of the standard is changed to "Chemical Analysis Methods for Nickel Alloys Part 3: Determination of Aluminum Content - Oxygen Nitrogen-flame atomic absorption spectrometry and inductively coupled plasma atomic emission spectrometry";

---Added a note about hydrolysis precipitation in 4:5:5:2 Secondary Dilution:

Please note that some content in this document may be subject to patents: The publisher of this document assumes no responsibility for identifying patents:

## Introduction

Nickel alloys are commonly used in instrumentation, electronic communications, pressure vessels, corrosion-resistant devices, and are widely used in aerospace and high-end special purposes:

Machinery and equipment manufacturing and other industries are one of the important metal raw materials for industrial development: International standards for chemical analysis methods of nickel alloys have been published for dozens of in:2017, with the progress of my country's industry, the demand for the production, import and export of high-end nickel alloy materials increased: To this end, international standards were transformed into national standards:

It is of great significance to assist the development and upgrading of non-ferrous industry and the development of domestic manufacturing industry: GB/T 42513 "Chemical Analysis Methods for Nickel Alloys" Purpose in establishing a complete and practical standard method for testing chromium, phosphorus, niobium, molybdenum, aluminum, vanadium, silicon, cobalt, copper and other elements in nickel alloys, transform it into the following international standards:

---ISO 7592:2017 Determination of chromium content in nickel alloys by ferrous ammonium sulfate potentiometric titration method;

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

---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 Curcumin spectrophotometric method;

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

GB/T 42513 is planned to consist of 13 parts:

---Part 1: Determination of chromium content by ferrous ammonium sulfate potentiometric titration method:

---Part 2: Determination of phosphorus content by molybdenum blue spectrophotometry:

---Part 3: Determination of aluminum content by nitrous oxide-flame atomic absorption spectrometry and inductively coupled plasma atomic emission light spectrum method:

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

---Part 5: Determination of vanadium content by nitrous oxide-flame atomic absorption spectrometry and inductively coupled plasma atomic emission light spectrum method:

---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 of curcumin spectrophotometrically:

---Part 10: Determination of trace element content by glow discharge mass spectrometry:

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

---Part 12: Determination of tantalum content by inductively coupled plasma atomic emission spectrometry:

---Part 13: Determination of oxygen, nitrogen and hydrogen content: Inert gas melting - thermal conductivity method/infrared absorption method:

Adding aluminum to nickel alloys can make the material have suitable strength and hardness, as well as a lower melting point and higher electrical conductivity, which is used to modify the alloy:

There are demanding areas of shape memory: This document can promote the progress of my country's nickel alloy testing technology and ensure that industry practitioners There are standards to follow in the process of application, scientific research and testing, which fill the gap in the determination method of aluminum content in nickel alloys in my country:

Nickel alloy chemical analysis method Part 3: Determination of aluminum content Nitrous oxide-flame atomic absorption spectrometry and Inductively coupled plasma atomic emission spectrometry Warning---Personnel using this document should have regular laboratory work experience: This document does not address all possible security issues question: Users are responsible for taking appropriate safety and health measures and ensuring compliance with the conditions stipulated in relevant national regulations:

## 1 Scope

This document describes the determination of nickel alloys by nitrous oxide-flame atomic absorption spectrometry and inductively coupled plasma atomic emission spectrometry:

method for medium aluminum content:

This document applies to the determination of aluminum content in nickel alloys, Method 1: Determination range of nitrous oxide-flame atomic absorption spectrometry (mass Fraction) is 0.2%~4%; Method 2: The measurement range (mass fraction) of inductively coupled plasma atomic emission spectrometry is 0.010%~ 7.00%:

## 2 Normative reference documents

This document has no normative references:

## 3 Terms and definitions

There are no terms or definitions to be defined in this document:

## 4 Method 1: Nitrous oxide-flame atomic absorption spectrometry

### 4.1

#### Principle

The sample is dissolved in acid, and an ionization inhibitor (if necessary) is added to the nitric acid-hydrochloric acid mixed acid medium: This is the test solution: Dissolve the test the liquid is sucked into the nitrous oxide-acetylene flame of the atomic absorption spectrometer, and the absorbance of aluminum is measured at the wavelength of 309.3nm