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

GB/T 42513.11-2026

Methods for chemical analysis of nickel alloys - Part 11: Determination of silicon, manganese, phosphorus, chromium, nickel, copper, molybdenum, cobalt, iron, aluminium, vanadium, titanium, tungsten and niobium - X-ray fluorescence spectrometry (routine method)

镍合金化学分析方法 第11部分：硅、锰、磷、铬、镍、铜、钼、钴、铁、铝、钒、钛、钨和铌含量的测定 X射线荧光光谱法（常规法）

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Standardization Administration of the PRC**

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1 Scope

1.00 Ti 0.020~

2 Normative references

3.00 V 0.015~

3.30 Nb 0.050~5.00

3.50 W 0.060~

3.60 Mn 0.050~

5.40 P 0.005~

18.0 Fe 0.50~

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

1.Determination of Chromium Content by Ferrous Ammonium Sulfate Potentiometric Titration;

2.Determination of Phosphorus Content by Molybdenum Blue Spectrophotometry;

3.Determination of Aluminum Content using Nitrous Oxide-Flame Atomic Absorption Spectrometry and Inductively Coupled Plasma Atomic Emission Spectrometry Spectroscopy;

4.Determination of Silicon Content by Nitrous Oxide-Flame Atomic Absorption Spectrometry and Molybdenum Blue Spectrophotometry;

5.Determination of Vanadium Content by Nitrous Oxide-Flame Atomic Absorption Spectrometry and Inductively Coupled Plasma Atomic Emission Spectrometry Spectroscopy;

6.Determination of Molybdenum Content by Inductively Coupled Plasma Atomic Emission Spectrometry;

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

8.Determination of Niobium Content by Inductively Coupled Plasma Atomic Emission Spectrometry;

9.Determination of Total Boron Content by Curcumin Spectrophotometry;

10.Determination of Trace Element Content by Glow Discharge Mass Spectrometry;

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) 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). This document was drafted by: Jiuquan Iron & Steel (Group) Co., Ltd., Shanghai Nonferrous Metals Industry Technology Monitoring Center Co., Ltd., and other organizations. Metal Technology and Economic Research Institute Co., Ltd., Steel Research Nake Testing Technology Co., Ltd., Guangdong Huao Alloy New Materials Co., Ltd. Jinchuan Group Co., Ltd., Shanxi Taigang Stainless Steel Co., Ltd., Guangdong Corrosion Science and Technology Innovation Research Institute, National Standard (Beijing) Inspection and Certification Co., Ltd., Guohe General (Qingdao) Testing and Evaluation Co., Ltd., China Certification & Inspection Group Guangdong Co., Ltd., Tongling Nonferrous Metals Group It belongs to the Group Co., Ltd., Jiangxi Copper Lead-Zinc Metal Co., Ltd., and Shenzhen Zhongjin Lingnan Nonferrous Metals Co., Ltd. Danxia Smelting Factory. Xi'an Hantang Analysis and Testing Co., Ltd. The main drafters of this document are. Wang Huaming, Zhang Diankai, Wu Shuaijin, Sun Xiaofei, Wang Yanchen, Wang Jun, Zang Tao, Zhu Yun, Qian Jiang, Kang Kaibin, and Liu Xiaoli. Jia Yunhai, Chen Xianni, Yu Lei, Liu Kai, Ning Wei, Wang Xiangde, Wu Yuyan, Lu Fei, Feng Lei, Zhou Wanzhu, Gao Yiai, Xie Peng, Wu Dezhen, Luo Yun Hu Lingling and Wang Hao.

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. Machinery and equipment manufacturing and other industries rely heavily on nickel alloys as a crucial metal raw material for industrial development. With my country's industrial progress, the demand for high-end nickel alloys has increased. With increasing demand for production and import/export, converting international standards into national standards will help upgrade the non-ferrous metals industry and boost domestic manufacturing. Development is of great significance. GB/T 42513 aims to establish a complete and practical system for determining chromium, phosphorus, niobium, molybdenum, aluminum, vanadium, and other elements in nickel alloys. Standard methods for elements such as silicon, cobalt, copper, and boron are converted into the following international standards.

1 Scope

GB/T 42513.11-2026 is the Chinese national standard covering fourteen elements in a nickel alloy from one XRF measurement - the routine control method for superalloys, where the alloy is most of the periodic table and every element has to be within a narrow band. Part 11 of the series, first edition of this part. It was issued on 28 January 2026 and has been in force since 1 August 2026, as a first edition. The document is under the responsibility of the China Nonferrous Metals Industry Association. This page is published from the official record of the 2026 edition; the clause text of a standard this recent is not yet in circulation, and the figures, limits and tables it contains are those of the document itself, delivered in full with the English translation.

This document describes the use of wavelength dispersive X-ray fluorescence spectrometry to determine silicon, manganese, phosphorus, chromium, nickel, copper, molybdenum, cobalt, iron, and aluminum in nickel alloys. Methods for determining the content (mass fraction) of vanadium, titanium, tungsten, and niobium. This document applies to smelted, cold-cast, and forged nickel alloy samples with a carbon content of less than 0.3% and other non-analytical element content of less than 0.2%. Analysis of sample preparation; applicable to the analysis of silicon, manganese, phosphorus, chromium, nickel, copper, molybdenum, cobalt, iron, aluminum, vanadium, titanium, tungsten and niobium content (mass fraction) in the above nickel alloys. The determination of the number of elements is shown in Table 1. Table

1.Determination range of analytical elements Elemental determination range /% Si 0.020~

2 Normative references

The contents of the following documents, through normative references within the text, constitute essential provisions of this document. Dated citations are not included. For references to documents, only the version corresponding to that date applies to this document; for undated references, the latest version (including all amendments) applies. This document.

5.40 P 0.005~

0.040 Cr 0.30~