

ICS 77.120.99

CCS H14



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

GB/T 12690.11-2025

Replacing GB/T 12690.11-2003

**Chemical analysis methods for non-rare earth impurities of rare earth
metals and their oxides - Part 11: Determination of magnesium content
- Flame atomic absorption spectrometric method**

稀土金属及其氧化物中非稀土杂质化学分析方法 第11部分：镁含量的测定 火焰
原子吸收光谱法

Issued on: August 1, 2025

Implemented on: February 1, 2026

**Issued by: State Administration for Market Regulation;
Standardization Administration of China**

Table of Contents

- 1 Scope
- 2 Normative references
- 3 Terms and Definitions
- 4 Principles
- 5 Reagents or materials
- 5.5 Magnesium standard solution A. Pipette
- 7 Determination of silicon content; --Part
- 8 Determination of sodium content; -- Part
- 9 Determination of chloride content - Silver nitrate turbidimetric method; -- Part
- 11 Determination of magnesium content Flame atomic absorption spectrometry
- 14 Determination of titanium content; --Part
- 15 Determination of calcium content; -- Part
- 16 Determination of fluoride content - Ion selective electrode method; -- Part
- 17 Determination of niobium and tantalum in rare earth metals; -- Part
- 18 Determination of zirconium content; -- Part
- 19 Determination of arsenic and mercury content; -- Part

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 is required. This document is Part 11 of GB/T 12690 "Chemical analysis of non-rare earth impurities in rare earth metals and their oxides". The following parts have been published. -- Part

1. Determination of carbon and sulfur content - High-frequency infrared absorption method; -- Part

2. Determination of loss on ignition of rare earth oxides - Gravimetric method; -- Part

3. Determination of water content in rare earth oxides - Gravimetric method; -- Part

4. Determination of oxygen and nitrogen content - Pulse-infrared absorption method and pulse-thermal conductivity method; -- Part

5. Determination of cobalt, manganese, lead, nickel, copper, zinc, aluminum, chromium, magnesium, cadmium, vanadium and iron content; -- Part

6.Determination of iron content - Potassium thiocyanate and 1,10-phenanthroline spectrophotometric method; --Part

1 Scope

GB/T 12690.11-2025 is the Chinese national standard on chemical analysis methods for non-rare earth impurities of rare earth metals and their oxides - part 11: determination of magnesium content - flame atomic absorption spectrometric method, in the field of metallurgy. The /T suffix marks it as a recommended standard: it is not compulsory by itself, but it becomes binding as soon as a contract, a tender or a customer specification calls it up - which in practice is how most foreign buyers meet it. It was issued on 1 August 2025 by the State Administration for Market Regulation; Standardization Administration of China, and has been in force since 1 February 2026. Classification: ICS 77.120.99, CCS H14. This page is published from the official record of the standard held by the Chinese standards administration: the identification, the dates, the classification and the issuing body are taken from there. The clause text, the tables and the numeric limits are in the document itself, which is delivered complete in English translation.

This document describes a method for the determination of magnesium in rare earth metals and their oxides by flame atomic absorption spectrometry. This document is applicable to the determination of magnesium content in rare earth metals and their oxides. The measurement range (mass fraction) is. 0.000 5%~0.30%.

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 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
JJG 694 Atomic Absorption Spectrophotometer

3 Terms and Definitions

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

4 Principles

The sample is dissolved in hydrochloric acid or nitric acid and measured in a dilute acid medium using an air-acetylene flame at a wavelength of 285.2 nm using an atomic absorption spectrometer. Measure the absorbance of magnesium and calculate the magnesium content using the standard addition method or standard curve method.

5 Reagents or materials

Unless otherwise specified, only reagents of confirmed premium grade or higher and water of grade II or higher that conform to GB/T 6682 were used in the analysis. Use distilled water or water of equivalent purity. Certified standard solutions are preferred as liquids.

5.1 Hydrogen peroxide [$w(\text{H}_2\text{O}_2) \geq 30\%$].

5.2 Hydrochloric acid (1:1).

5.3 Nitric acid (1:1).

5.4 Magnesium standard stock solution. weigh 0.4146 g of magnesium oxide ($w(\text{MgO}) \geq 99.95\%$) calcined at 800 °C to constant weight and add to 100 mL of calcined Add 10 mL of water and 10 mL of hydrochloric acid (5.2) to the cup and heat to dissolve. Boil to remove all carbon dioxide, cool to room temperature, and transfer to a 500 mL volumetric flask. Dilute to volume with water and mix thoroughly. 1 mL of this solution contains 500 µg of magnesium.

5.5 Magnesium standard solution A. Pipette

5.00 mL of magnesium standard stock solution (5.4) into a 500 mL volumetric flask, dilute to the mark with water, and mix thoroughly.

9 Determination of chloride content - Silver nitrate turbidimetric method; -- Part

10.Determination of phosphorus content - Molybdenum blue spectrophotometric method; -- Part

11.Determination of magnesium content - Flame atomic absorption spectrometry; -- Part

12.Determination of thorium and uranium content - Inductively coupled plasma mass spectrometry; -- Part

13.Determination of molybdenum and tungsten content - Inductively coupled plasma spectrometry and inductively coupled plasma mass spectrometry; -- Part

19 Determination of arsenic and mercury content; -- Part

20.Determination of trace amounts of fluorine and chlorine in rare earth oxides - Ion chromatography; -- Part

21.Determination of sulfate content in rare earth oxides-Barium sulfate turbidimetric method. This document replaces GB/T 12690.11-2003 "Chemical analysis of non-rare earth impurities in rare earth metals and their oxides - Determination of magnesium content" Compared with GB/T 12690.11-2003, the main technical changes are as follows, except for the structural adjustment and editorial changes. The following.

- a) Added magnesium standard solution A (see 5.5);
- b) The concentration of magnesium standard solution B has been changed (see 5.6, 3.5 of the.2003 edition);
- c) The sample pretreatment conditions have been changed (see Chapter 7, 5.1 of the.2003 edition);
- d) The sample amount and constant volume of the measured elements have been changed (see 8.1, 6.1 of the.2003 edition);
- e) Added the standard curve method (see 8.4.2.2);
- f) "Precision" was changed and "allowable deviation" was changed to "reproducibility" (see 10.3, 8.2 of the.2003 edition);
- g) Quality assurance and control (see Chapter 9 of the.2003 edition) has been deleted;
- h) The instrument operating conditions (see Appendix A of the.2003 edition) have been deleted. 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 and coordinated by the National Rare Earth Standardization Technical Committee (SAC/TC 229). This document was drafted by: Jiangyin Jiahua New Materials Resources Co., Ltd., China Rare Earth (Liangshan) Co., Ltd., Jiangxi Tungsten and Rare Earth Products Co., Ltd. Quality Supervision and Inspection Center (Jiangxi Tungsten and Rare Earth Research Institute), Dingnan Dahua New Materials Resources Co., Ltd., Guorui Kechuang Rare Earth Functional Materials (Ganzhou) Co., Ltd., Baotou Sanlong Rare Metal Materials Co., Ltd., and Baotou Hongbote Technology Co., Ltd. The main drafters of this document are. Xie Jianwei, Jiang Haibo, Yao Jingbi, Fan Chengmei, Ji Qixia, Xu Na, Kang Yaxian, Zeng Qingping, Miao Fengmei, Wang Weisheng, Wang Hao, Lü Nannan, and Yang Dawei. This document was first published