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

GB/T 12690.21-2024

**Chemical analysis methods for non-rare earth impurities of rare earth
metals and their oxides - Part 21: Determination of sulfate radical
content in rare earth oxides - Barium sulfate turbidimetry**

稀土金属及其氧化物中非稀土杂质化学分析方法 第21部分：稀土氧化物中硫酸根
含量的测定 硫酸钡比浊法

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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 is required. This document is Part 21 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

1 Scope

GB/T 12690.21-2024 is the Chinese national standard on chemical analysis methods for non-rare earth impurities of rare earth metals and their oxides - part 21: determination of sulfate radical content in rare earth oxides - barium sulfate turbidimetry, 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 26 October 2024 by the State Administration for Market Regulation; Standardization Administration of China, and has been in force since 1 May 2025. 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 sulfate content in rare earth oxides. This document is applicable to the determination of sulfate content in rare earth oxides. Determination range (mass fraction). 0.010% to 0.20%.

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 latest version (including all amendments) applies to this document. In this document.

GB/T 6379.2 Accuracy (trueness and precision) of measurement methods and results Part

2. Determination of the 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 178 UV, Visible, and Near-Infrared Spectrophotometer

3 Terms and Definitions

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

4 Principles

The sample is dissolved in acid (or after acid dissolution, excess sodium hydroxide solution is added to form rare earth hydroxide precipitation, which is filtered to allow sulfate to react with Rare earth separation), in the presence of glycerol stabilizer in dilute hydrochloric acid medium, add barium chloride to form a barium sulfate suspension, and then The absorbance was measured at 400 nm using a photometer, and the sulfate mass fraction was calculated.

5 Reagents or materials

Unless otherwise specified, only reagents of analytical grade or higher and grade II water that complies with the laboratory standard GB/T 6682 were used in the analysis. Certified standard solutions are preferred.

5.1 Hydrogen peroxide [w (H₂O₂) ≥ 30%].

5.2 Perchloric acid (rho =

5.3 Nitric acid (1 1).

5.4 Hydrochloric acid (1 1).

5.5 Ammonia (1 4).

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 optical emission 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. 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: Fujian Jinlong Rare Earth Co., Ltd., National Standard (Beijing) Inspection and Certification Co., Ltd., Baotou Rare Earth Research Institute, Sichuan Leshan Ruifeng Metallurgical Co., Ltd., Ganzhou Chenguang Rare Earth New Materials Co., Ltd., Baotou Huamei Rare Earth Hi-Tech Co., Ltd., Dingnan Dahua New Materials Resources Co., Ltd. The main drafters of this document are: Wang Baohua, Wang Jinfeng, Huang Rongxing, Fang Xiongzhou, Liu Liyuan, Li Jingyan, Liu Pengyu, Quan Longhai, Ye Guifang, Ling Lejiu, Xue Jianping, Miao Fengmei, Mu Yuanyuan, Xie Baoping, Hu Gaixia, and Sun Linjing.

In the field of chemical composition analysis of rare earth products, my country has established a relatively large number of detection systems for the total amount of rare earths, non-rare earth impurities, and rare earth impurities. GB/T 12690 Chemical analysis of non-rare earth impurities in rare earth metals and their oxides GB/T 12690.12GB/T 12690.26-1990 "Chemical analysis methods for rare earth metals and their oxides" is the basis, and GB/T 8762.3- 1988 "Determination of Acid-Soluble Silica in Fluorescent Yttrium Oxide by Molybdenum Blue Spectrophotometry", GB/T 8762.4-1988 "Fluorescent Yttrium Oxide Determination of the amount of iron oxide, lead oxide, nickel oxide and copper oxide in yttrium by emission spectrometry" GB/T 8762.6-1988 "Determination of the amount of iron oxide, lead oxide, nickel oxide and copper oxide in yttrium by emission spectrometry" Determination of the amount of lead oxide, nickel oxide, iron oxide and copper oxide by emission spectrometry" GB/T 11074.3 ~ GB/T 11074.7-1989 "Oxygen The standards such as Chemical Analysis Method of Samarium Chloride and others were finally formed into comprehensive analysis standards for non-rare earth impurities in all rare earth metals and their oxides. The combined series of method standards reference advanced detection methods and basically cover all rare earth metals and their rare earth oxide matrices, providing a reference for rare earth The method provides a fast and accurate method for determining the content of non-rare earth impurities in metals and their oxides, and has good operability. According to the differences in test objects, test methods and the differences between rare earth metals and rare earth oxide matrices, GB/T 12690 is proposed to be 21 parts. Part

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