

ICS 77.120.99

CCS H 14



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

GB/T 43358-2023

**Rare earth minerals and rare earth products - Determination of
gross alpha and beta radioactivity - Thick source method**

稀土矿及稀土产品 总 α 、总 β 放射性的测定 厚源法

Issued on: November 27, 2023

Implemented on: June 1, 2024

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

Table of Contents

- 1 Scope
- 2 Normative reference documents
- 3 Terms and definitions
- 4 Method summary
- 5 Reagents and materials

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: Please note that some content in this document may be subject to patents: The publisher of this document assumes no responsibility for identifying patents: This document is proposed and coordinated by the National Rare Earth Standardization Technical Committee (SAC/TC229): This document was drafted by: Jiangxi Tungsten and Rare Earth Product Quality Supervision and Inspection Center, Hunan Rare Earth Metal Materials Research Institute Co., Ltd: Division, Baotou Rare Earth Research Institute, Dingnan Dahua New Materials Resources Co., Ltd:, Fujian Changting Jinlong Rare Earth Co., Ltd:, Jiangyin Jiahua New Materials Resources Co., Ltd: Source Co., Ltd:, Qiandong Rare Earth Group Co., Ltd:, Hubei Yuanyuan Environmental Protection Technology Co., Ltd:, Baotou Rare Earth New Material Technology R&D Center, Tianjin Baotou Steel Rare Earth Research Institute Co., Ltd: The main drafters of this document: Li Ping, Tang Ying, Chen Wen, Xu Na, Wang Guichao, Liu Chun, Tao Qing, Wang Jinfeng, Wen Bin, Yao Jingbi, Rong Wenna, Jin Zhenjun, Jia Weiqiang, Luo Mian, Li Ligang, Wang Baohua, Sun Linjing, Fan Chengmei, Jiang Yuan, Mou Di, Luo Caifen, Zhang Jing:

Rare earth minerals are mostly associated radioactive minerals, which are associated with natural radioactive substances such as thorium and uranium above specified levels: in its development In the process of using and preparing various rare earth products, natural radioactive substances in associated ores will also be migrated and enriched: Total alpha, total beta radioactive water Flat refers to the sum of the equivalent values of the total alpha and total beta radioactivity of various nuclides in the medium, which is a reflection of the overall radioactivity level in the medium: It is given by Because of its simple and rapid detection, it has long been one of the preferred methods for radioactive monitoring: This document utilizes low background total alpha and total beta radioactivity measurements Through a large number of conditions and verification tests, every detail in the testing process has been standardized, and a standardized, easy-to-operate, and comparable test instrument has been established: Measurement standards: Rare earth minerals and rare

earth products Determination of total alpha and total beta radioactivity by thick source method Warning

---Personnel using this document must have practical experience in regular laboratory work: This document does not address all possible safety question: The reagents (nitric acid, sulfuric acid) used in this document are highly oxidizing and corrosive: The operation process must strictly abide by the experimental conditions and regulations: Instrument operating instructions and pay attention to safety precautions:

1 Scope

China's national method for determining gross alpha and beta radioactivity in rare earth minerals and products by the thick source technique. The measurement exists because rare earth ores carry radioactivity as an inseparable companion: monazite in particular contains thorium in percentage quantities, and bastnasite carries less but not none. The thorium follows the rare earths through parts of the separation process and concentrates in the residues, which makes rare earth processing one of the few civil industries that routinely handles naturally occurring radioactive material in bulk. Measuring the gross activity - rather than identifying each nuclide - is the practical screening test: it establishes whether a concentrate, a product or a residue falls above or below the thresholds that determine how it must be handled, transported and disposed of, which is a regulatory question asked of every batch.

This document describes the use of the thick source method to analyze the total content of rare earth products such as rare earth ores and rare earth compounds, rare earth metals and their oxides, and rare earth alloys: A method for measuring alpha and total beta radioactivity: This document is applicable to the determination of total alpha and total beta radioactivity in rare earth ores and rare earth products: Lower limit of determination range: total alpha radioactivity, 0:1Bq/g; total Beta radioactivity, 0:1Bq/g:

2 Normative reference documents

The contents of the following documents constitute essential provisions of this document through normative references in the text: Among them, the dated quotations For undated referenced documents, only the version corresponding to that date applies to this document; for undated referenced documents, the latest version (including all amendments) applies to this document:

GB/T 6682 Specifications and test methods for water used in analytical laboratories

GB/T 8170 Numerical rounding rules and expression and determination of limit values

JJG853 low background alpha, beta measuring instrument

3 Terms and definitions

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

4 Method summary

Prepare the sample into a powder sample suitable for spreading on a plate, use the thick source method to evenly spread the sample in the measuring plate, and place it in a low background alpha and beta measurement. The count rate of total alpha and total beta is measured on the instrument to calculate the radioactive activity concentration of total alpha and total beta in the sample:

Note 1: According to measuring disks with different diameters, when the thickness of the disk reaches the effective saturation thickness of radiation, the corresponding sampling volume is the "minimum sampling volume" of the disk quantity: This paving method is the Houyuan method:

Note 2: The emissivity of a certain radioactive ray increases as the thickness of the radioactive material increases: When the radioactive thickness reaches a certain level, the emissivity of the ray will no longer be. As the thickness of the radioactive material increases, the thickness is the effective saturation thickness of the radioactive ray:

5 Reagents and materials

Unless otherwise stated, only reagents confirmed to be of analytical grade or above and grade three water complying with GB/T 6682 are used in the analysis:

---²⁴¹Am standard material, baked at $(105 \pm 5)^{\circ}\text{C}$ for 1 hour:

---Potassium chloride standard material, baked at $(105 \pm 5)^{\circ}\text{C}$ for 1 hour and ground to:200 mesh (0:074mm):