



BSI Standards Publication

**Rare earth — Determination of rare earth
content in individual rare earth metals
and their oxides — Titration method**

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National foreword

This British Standard is the UK implementation of ISO 23597:2023.

The UK participation in its preparation was entrusted to Technical Committee REI/1, Rare Earths.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 298, *Rare earth*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

Individual rare earth metals and their oxides are both materials containing only one kind of rare earth element. They are refined and separated rare earth products, which are widely used as the feedstock for making downstream products in the rare earth industry. In the products, there exist trace non-rare earth impurities including some carbonates, oxalates and moisture. Some of them (such as Ca, Si, Fe) come from raw materials and others (such as Fe) come from industrial processes of rare earth metal from the electrolytic process.

Rare earth content refers to the mass fraction of all rare earth elements in the material. It is an important chemical composition index to determine the quality of the individual rare earth metals and their oxides. A scientific and standardized method to determine the rare earth content, which is used to price the product in trading, is helpful to reduce variability and to improve the consistency and comparability of interlaboratory results, consequently facilitating the fair trade of rare earth products.

The document aims to supply a classic titration method for the determination of rare earth content for individual rare earth metals and their oxides, which can be adopted by rare earth producers, consumers, traders and other stakeholders.

Rare earth — Determination of rare earth content in individual rare earth metals and their oxides — Titration method

WARNING — The use of this document can involve hazardous materials, operations and equipment. This document does not purport to address any safety problems associated with its use. It is the responsibility of the user of this document to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

1 Scope

This document specifies a titration method for the determination of rare earth content in 15 kinds of individual rare earth metals (lanthanum, cerium, praseodymium, neodymium, samarium, europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium, lutetium and yttrium) and their oxides.

The determination ranges for the rare earth content in mass fraction are as follows:

- rare earth metal: 98,0 % (mass fraction) to 99,5 % (mass fraction);
- rare earth oxide: 95,0 % (mass fraction) to 99,5 % (mass fraction).

It does not apply to individual rare earth metals and their oxides when:

- a) the relative rare earth purity is less than 99,5 % in mass fraction;
- b) the total content of various (non-rare earth) metallic elements is greater than 0,5 % in mass fraction;
- c) the content of thorium, scandium or zinc is greater than 0,1 % in mass fraction.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

rare earth content

total rare earth content

mass fraction of rare earths in the material

Note 1 to entry: For rare earth oxides and other compounds, the fraction is generally provided as a percentage of rare earth oxide, i.e. % REO or % TREO. For metals and alloys, the content is generally provided as a percentage of rare earth metal, i.e. % REM or % TREM.

Note 2 to entry: For rare earth oxides and other compounds, the formula of the rare earth content is RE₂O₃ except for CeO₂, Pr₆O₁₁ and Tb₄O₇.