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

GB/T 16484.3-2009

Replacing GB/T 16484.3-1996

**Chemical analysis methods of rare earth chloride and light rare earth
carbonate - Part 3: Determination of fifteen REO relative contents -
Inductively coupled plasma atomic emission spectrometry**

氯化稀土、碳酸轻稀土化学分析方法 第3部分：15个稀土元素氧化物配分量的测定 电感耦合等离子体发射光谱法

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Foreword

GB/T 16484-2009 Chemical Analysis Methods of Rare Earth Chloride and Light Rare Earth Carbonate is divided into 22 parts in total:

- Part 1: Determination of Cerium Oxide Content - Ammonium Ferrous Sulfate Titrimetry;
- Part 2: Determination of Europium Oxide Content - Inductively Coupled Plasma Mass Spectrometry;
- Part 3: Determination of Fifteen REO Relative Contents - Inductively Coupled Plasma Atomic Emission Spectrometry;
- Part 4: Determination of Thorium Oxide Content - Arsenazo III Spectrophotometry;
- Part 5: Determination of Barium Oxide Content - Inductively Coupled Plasma Atomic Emission Spectrometry;
- Part 6: Determination of Calcium Oxide Content - Flame Atomic Absorption Spectrometry;
- Part 7: Determination of Magnesium Oxide Content - Flame Atomic Absorption Spectrometry;
- Part 8: Determination of Sodium Oxide Content - Flame Atomic Absorption Spectrometry;

---Part 9: Determination of Nickel Oxide Content - Flame Atomic Absorption Spectrometry;

---Part 10: Determination of Manganese Oxide Content - Flame Atomic Absorption Spectrometry;

---Part 11: Determination of Lead Oxide Content - Flame Atomic Absorption Spectrometry;

---Part 12: Determination of Sulfate Radical;

---Part 13: Determination of Ammonium Chloride Content - Distillation-titrimetry;

1 Scope

GB/T 16484.3-2009 is the Chinese national standard on chemical analysis methods of rare earth chloride and light rare earth carbonate - part 3: determination of fifteen rare earth relative contents - inductively coupled plasma atomic emission spectrometry, 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 30 October 2009 by the General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China; Standardization Administration of China, and has been in force since 1 May 2010. 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 Part of GB/T 16484 stipulates the determination method for 15 rare earth oxide relative contents in rare earth chloride and light rare earth carbonate. This Part is applicable to the determination of 15 rare earth oxide relative contents in rare earth chloride and light rare earth carbonate. The range of determination is shown in Table 1. Table 1

2 Methods and Principles

Use hydrochloric acid to dissolve sample. In diluted hydrochloric acid medium, directly use argon plasma light source for excitation; conduct spectrometry. Adopt coefficient correction method to correct spectral interference among the elements being determined. Elements Determination Range (mass fraction)/% Determination Range (mass fraction)/% Elements
Yttrium Oxide Lanthanum Oxide Cerium Oxide Praseodymium Oxide Neodymium Oxide
Samarium Oxide Europium Oxide Gadolinium Oxide Terbium Oxide Dysprosium Oxide
Holmium Oxide Erbium Oxide Thulium Oxide Ytterbium Oxide Lutetium Oxide Transfer it into a 100 mL volumetric flask; use water to dilute to the scale, mix it up. 1 mL of this solution contains 1 mg of dysprosium oxide.

3.15 Holmium oxide standard stock solution: weigh-take 0.1000 g of holmium oxide, which

is burned at 950 °C for 1 h. Place it in a 100 mL beaker; add 10 mL of hydrochloric acid (3.8). At a low temperature, heat it up, till it completely dissolves, then, cool it down to the room temperature. Transfer it into a 100 mL volumetric flask; use water to dilute to the scale, mix it up. 1 mL of this solution contains 1 mg of holmium oxide.

3.16 Erbium oxide standard stock solution: weigh-take 0.1000 g of erbium oxide , which is burned at 950 °C for 1 h. Place it in a 100 mL beaker; add 10 mL of hydrochloric acid (3.8). At a low temperature, heat it up, till it completely dissolves, then, cool it down to the room temperature. Transfer it into a 100 mL volumetric flask; use water to dilute to the scale, mix it up. 1 mL of this solution contains 1 mg of erbium oxide.

3.17 Thulium oxide standard stock solution: weigh-take 0.1000 g of thulium oxide , which is burned at 950 °C for 1 h. Place it in a 100 mL beaker; add 10 mL of hydrochloric acid (3.8). At a low temperature, heat it up, till it completely dissolves, then, cool it down to the room temperature. Transfer it into a 100 mL volumetric flask; use water to dilute to the scale, mix it up. 1 mL of this solution contains 1 mg of thulium oxide.

3.18 Ytterbium oxide standard stock solution: weigh-take 0.1000 g of ytterbium oxide , which is burned at 950 °C for 1 h. Place it in a 100 mL beaker; add 10 mL of hydrochloric acid (3.8). At a low temperature, heat it up, till it completely dissolves, then, cool it down to the room temperature. Transfer it into a 100 mL volumetric flask; use water to dilute to the scale, mix it up. 1 mL of this solution contains 1 mg of ytterbium oxide.

3.19 Lutetium oxide standard stock solution: weigh-take 0.1000 g of lutetium oxide , which is burned at 950 °C for 1 h. Place it in a 100 mL beaker; add 10 mL of hydrochloric acid (3.8). At a low temperature, heat it up, till it completely dissolves, then, cool it down to the room temperature. Transfer it into a 100 mL volumetric flask; use water to dilute to the scale, mix it up. 1 mL of this solution contains 1 mg of lutetium oxide.

3.20 Yttrium oxide standard stock solution: weigh-take 0.1000 g of yttrium oxide , which is burned at 950 °C for 1 h. Place it in a 100 mL beaker; add 10 mL of hydrochloric acid (3.8). At a low temperature, heat it up, till it completely dissolves, then, cool it down to the room temperature. Transfer it into a 100 mL volumetric flask; use water to dilute to the scale, mix it up. 1 mL of this solution contains 1 mg of yttrium oxide.

3.21 Mixed rare earth standard solution: respectively transfer-take

5.00 mL of the various rare earth oxide standard stock solutions (3.11 ~ 3.20). Respectively place them into 100 mL volumetric flask; add 10 mL of hydrochloric acid (3.8); use water to dilute to the scale; mix it up. 1 mL of this solution respectively contains 50.0 µg of the various individual rare earth oxides.

3.22 Argon, purity > 99.99%.

4.1 Inductively coupled plasma atomic emission spectrometer, resolution ratio < 0.006 nm (at 200 nm).

4.2 Light source: argon plasma source.

5 Test Samples

5.1 Preparation of rare earth chloride sample: smash the sample to pieces; promptly place them into a weighing bottle; immediately weigh it.

5.2 Preparation of light rare earth carbonate: after sample is unsealed, immediately weigh it.

6.1 Test Portion Weigh-take

2.00 g of the sample (5), accurate to 0.0001 g.

6.2 Times of Determination Weigh-take two test portions for parallel determination; take the average value.

6.3 Blank Test Conduct blank test along with the test portions.

6.4 Preparation of Analytical Test Solutions

6.4.1 Place the test portion (6.1) in a 200 mL beaker; add 10 mL of hydrochloric acid (3.8). Heat it up, till it completely dissolves (if necessary, dropwise add hydrogen peroxide (3.6) to facilitate the dissolution). Evaporate it, till it reaches near dryness. Then, cool it down, transfer it into a 500 mL volumetric flask. Use water to dilute to the scale, mix it up.