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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 20127.3-2026

Replacing GB/T 20127.3-2006

Steel and alloys - Determination of trace element contents - Part 3: Determination of scandium and barium by inductively coupled plasma atomic emission spectrometry

钢铁及合金 痕量元素的测定 第3部分：电感耦合等离子体发射光谱法测定钪和钡含量

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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. This document is Part 3 of GB/T 20127 "Determination of Trace Elements in Iron and Steel and Alloys". GB/T 20127 has been published as follows: Part 2.

1.Determination of Silver Content by Graphite Furnace Atomic Absorption Spectrometry;

2.Determination of Arsenic Content by Hydride Generation-Atomic Fluorescence Spectrometry;

3.Determination of Scandium and Barium Content by Inductively Coupled Plasma Atomic Emission Spectrometry;

4.Determination of Copper Content by Graphite Furnace Atomic Absorption Spectrometry;

5.Extraction and Separation - Rhodamine B Spectrophotometric Determination of Gallium Content;

8.Determination of Antimony Content by Hydride Generation-Atomic Fluorescence Spectrometry;

10.Determination of Selenium Content by Hydride Generation-Atomic Fluorescence Spectrometry;

11.Determination of Indium and Thallium Content by Inductively Coupled Plasma Mass Spectrometry;

12.Determination of Zinc Content by Flame Atomic Absorption Spectrometry;

13.Determination of Tin Content by Iodide Extraction-Phenylacetone Spectrophotometry This document replaces GB/T 20127.3-2006 "Determination of Trace Elements in Iron and Steel and Alloys - Part

3.Inductively Coupled Plasma" "Determination of Calcium, Magnesium and Barium Content by Emission Spectroscopy" and GB/T 20127.9-2006 "Determination of Trace Elements in Iron and Steel and Alloys, Part 9" "Determination of Scandium Content by Inductively Coupled Plasma Atomic Emission Spectrometry" is related to GB/T 20127.3-2006 and GB/T 20127.9-2006. Compared to previous versions, aside from structural adjustments and editorial changes, the main technical changes are as follows:

---The range has been changed, and calcium and magnesium have been removed from the elements to be determined (see Chapter 1, GB/T 20127.3-2006).

1 Scope

GB/T 20127.3-2026 is the Chinese national standard covering scandium and barium at trace level in steel - scandium because it is a deliberate microalloying addition in some aluminium and specialty alloys, barium because it arrives from refractories and inclusions. Part 3 of the series. It replaces GB/T 20127.3-2006. It was issued on 28 January 2026 and has been in force since 1 August 2026, replacing GB/T 20127.3-2006. The document is under the responsibility of the China Iron and Steel Association. This page is published from the official record of the 2026 edition; the clause text of a standard this recent is not yet in circulation, and the figures, limits and tables it contains are those of the document itself, delivered in full with the English translation.

This document describes a method for determining the scandium and barium content in high-temperature alloys using inductively coupled plasma atomic emission spectrometry (ICP-AES). This document applies to high-temperature alloys with a scandium content of 0.0002%~0.010% by mass and a scandium content of 0.001%~0.010% by mass. Determination of barium content.

4.Principles The sample was dissolved in a mixture of hydrochloric acid and nitric acid. If necessary, an internal standard element was added, and the solution was diluted to a specific volume. The solution was then nebulized into the electrolyte. In an inductively coupled plasma atomic emission spectrometer, the intensity of the analytical line emission of the analyte and the internal standard is measured. Based on the established calibration curve, the intensity is calculated... Mass fraction of each analytical element.

5.Reagents and Materials Unless otherwise specified, only reagents confirmed to be of analytical grade and water of grade II or equivalent purity as specified in GB/T 6682 should be used in the analysis. Water.

5.1 Hydrochloric acid rho is approximately

5.2 Hydrochloric acid (1.1) solution Dilute with hydrochloric acid (5.1).

5.3 Nitric acid rho is approximately

5.4 Nitric acid (1 1) solution Dilute with nitric acid (5.3).

5.6 Hydrochloric acid-nitric acid mixture (3 1)

5.7 Strontium internal standard solution (50 μg/mL) Weigh 0.1208 g of strontium nitrate (mass fraction greater than 99.99%) (pre-stored in a desiccator for at least 24 hours), and place it in a 500 mL container. In a beaker, add water to dissolve the precipitate, boil, cool to room temperature, transfer to a 1000mL volumetric flask, dilute with water to the mark, and mix well. This solution contains 50 μg of strontium per mL and should be prepared fresh before use. Alternatively, certified standard solutions can be purchased directly.

5.8 Strontium internal standard solution (0.5 μg/mL) Transfer

1.0 mL of strontium internal standard solution (5.7) into a 100 mL volumetric flask, dilute with water to the mark, and mix well. This solution contains 0.5 μg of strontium per mL and should be prepared fresh before use.

5.9 Scandium standard solution (1000 μg/mL) Weigh 1.5338g of scandium trioxide (mass fraction >= 99.99%) that has been pre-calcined at 800°C for 1 hour and cooled to room temperature. Place in a 500mL beaker, add 100mL of nitric acid (5.4), and add hydrogen peroxide dropwise until completely dissolved. Then boil to remove all hydrogen peroxide, and cool. Transfer to a 1000mL volumetric flask, add 100mL of nitric acid (5.4), dilute with water to the mark, and mix well. This scandium standard solution contains 1000 μg of scandium per mL. Certified standard solutions can also be purchased directly.

5.10 Scandium standard solution A (100 μg/mL) Transfer

10.0 mL of scandium standard solution (5.9) into a 100 mL volumetric flask, dilute with water to the mark, and mix well. This solution contains 100 μg scandium per mL. Prepare

fresh before use.

5.11 Scandium standard solution B (10 μg/mL) Transfer

10.0 mL of scandium standard solution A (5.10) into a 100 mL volumetric flask, dilute with water to the mark, and mix well. This solution contains 10 μg scandium per mL. Prepare fresh before use.

5.12 Scandium standard solution C (1 μg/mL) Transfer

10.0 mL of scandium standard solution B (5.11) into a 100 mL volumetric flask, dilute with water to the mark, and mix well. This solution contains 1 μg scandium per 1 mL. Prepare fresh before use.

5.13 Barium standard solution (1000 μg/mL) Weigh 1.4372 g of barium carbonate (mass fraction > 99.99%) (pre-dried at 105°C for 2 hours, placed in a desiccator, and cooled to room temperature). In a 500mL beaker, moisten with water, add 100mL of hydrochloric acid (5.2), heat to dissolve, cool to room temperature, and transfer to a 1000mL volumetric flask. Dilute with water to the mark and mix well. This solution contains 1000 μg of barium per mL. Alternatively, certified standard solutions can be purchased directly.

5.14 Barium Standard Solution A (50 μg/mL) Transfer

10.0 mL of barium standard solution (5.13) to a.200 mL volumetric flask, add 20 mL of hydrochloric acid (5.1), and dilute with water to the mark. Temperature. Mix well. This solution contains 50 μg of barium per mL. Prepare fresh before use.

5.15 Barium Standard Solution B (2.5 μg/mL) Transfer

5.0 mL of barium standard solution A (5.14) into a 100 mL volumetric flask, dilute with water to the mark, and mix well. This solution contains 2.5 μg of barium per mL. Prepare fresh before use.

6 Instruments

6.1 Glass volumetric instruments All glass volumetric instruments used in this document shall meet the Class A requirements of GB/T 12806, GB/T 12807 and GB/T 12808.

6.2 Inductively Coupled Plasma Emission Spectrometer

6.2.1 General Requirements Inductively coupled plasma atomic emission spectrometers (ICP-AES) can be either sequential or simultaneous measurement types. If the measurement is sequential... If the instrument is equipped with a component that simultaneously measures the internal standard line, then the internal standard technique can be used; otherwise, the internal standard method cannot be used. The inductively