

ICS 77.120.99

CCS H 65



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

GB/T 16476-2018

Replacing GB/T 16476-2010

Scandium metal

金属钪

Issued on: July 13, 2018

Implemented on: April 1, 2019

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

Table of Contents

- 1 Scope
- 2 Normative References
- 3 Requirements
- 4 Test Methods
- 4.1 Chemical Composition
- 5 Inspection Rules
- 5.1 Inspection and Acceptance Check
- 5.2 Group Batch
- 6 Marking, Packaging, Transportation, Storage and
- 6.1 Marking and Packaging

Foreword

This Standard is drafted in accordance with stipulations in GB/T 1.1-2009. This Standard serves as a replacement of GB/T 16476-2010 Scandium Metal. In comparison with GB/T 16476-2010, there are the following main technical changes.

---Normative reference GB/T 17803 is added (please refer to Chapter 2);

3.1 Product Nameplate" is added (please refer to 3.1);

---Character nameplates Sc-5N5, Sc-5N, Sc-4N5 and Sc-4N are added (please refer to

---The method of expressing rare earth impurity content is modified; "(La + Ce + Pr + Nd + Sm + Eu + Gd + Tb + Dy + Ho + Er + Tm + Yb + Lu +Y)" is replaced by "rare earth impurity" (please refer to 3.2;

3.1 in Version 2010);

---The assessment index of aluminum (Al) in nameplate Sc-4N is adjusted from 0.0050% to 0.0070% (please refer to 3.2;

3.1 in Version 2010);

---The assessment index of copper (Cu) in nameplate Sc-4N is adjusted from 0.0025% to 0.0050% (please refer to 3.2;

3.1 in Version 2010);

---The assessment index of tantalum (Ta) in nameplate Sc-5N5, Sc-5N, Sc-4N5 and Sc-4N is adjusted respectively from 0.0020%, 0.0050% and 0.0080% to 0.0050% (please refer to

3.2;

3.1 in Version 2010);

---The assessment index of zirconium (Zr) in nameplate Sc-5N5, Sc-5N, Sc-4N5 and Sc-4N is adjusted respectively from 0.0010%, 0.0025% and 0.0040% to 0.0010% (please refer to 3.2;

3.1 in Version 2010);

1 Scope

China's national product standard for scandium metal. It specifies the requirements, the test methods, the inspection rules, and the packaging, marking, transport, storage and quality certificate for scandium metal, and it applies to scandium metal produced by metallothermic reduction or by the intermediate alloy route followed by vacuum distillation, for use in aviation, aerospace, electronic technology - electronics, nuclear, laser and electric light sources - and metallurgy. Scandium is the rare earth that behaves least like the others and costs the most. It is not concentrated in the usual rare earth ores; it is recovered in small quantities as a by-product of titanium, uranium, tungsten and aluminium processing, and world production is measured in tonnes. What it buys is remarkable: a fraction of a per cent of scandium in an aluminium alloy suppresses recrystallisation and refines the grain to give a weldable high-strength alloy that no other addition produces, and scandium in a sodium vapour lamp gives it the colour rendering that plain sodium lacks. Both applications are ruined by impurities, which is what the standard is about. The grades run from Sc-4N5 upward to Sc-5N5, and the requirement tables set the maximum content of each rare earth and non-rare-earth impurity for each grade. The 2018 edition tightened several of these against the 2010 edition it replaces, among them the limits on tantalum and zirconium in the higher grades - both of which come from the crucibles and the equipment used in distillation, not from the feed. The test methods, the sampling and acceptance rules, and the certificate that must accompany a lot complete the document. Issued on 13 July 2018 and in force since 1 April 2019.

This Standard specifies the requirements, test methods, inspection rules, packaging, marking, transportation, storage and quality certificate of scandium metal. This Standard is applicable to scandium metal that is manufactured with the method of metallothermic reduction or the method of intermediate alloy, and then, the method of vacuum distillation. The scandium metal shall be applied to aviation, aerospace (space navigation, rocket and missile), electronic technology (electronics, nuclear, laser, electric light source) and metallurgy, etc.

2 Normative References

The following documents are indispensable to the application of this Standard. In terms of

references with a specified date, only versions with a specified date are applicable to this Standard. The latest version (including all the modifications) of references without a specified date is also applicable to this Standard.

GB/T 8170 Rules of Rounding off for Numerical Values & Expression and Judgement of Limiting Values

GB/T 13219-2018 Scandium Oxide

GB/T 17803 Designation System for Rare Earth Products

3 Requirements

3.1 Product Nameplate In terms of chemical composition, products shall be divided into 4 nameplates, namely, Sc-5N5, Sc-5N, Sc-4N5 and Sc-4N. The designation method for product nameplates shall comply with the stipulation in GB/T 17803.

3.2 Chemical Composition Product nameplate and chemical composition shall comply with the stipulation in Table 1. If the demand side has special requirements, the demand side and the supply side can have further negotiation.

4.1 Chemical Composition

4.1.1 The method of analyzing the total amount of rare earth (RE) shall comply with the stipulation in Appendix A in GB/T 13219-2018. When the total amount of rare earth being measured is above 99%, take subtraction method to calculate the practical value of the total amount of rare earth, namely, $(100\% - \text{non-rare earth impurity content})$.

4.1.2 The method of analyzing rare earth impurity content shall comply with the stipulation in Appendix B in GB/T 13219-2018.

4.1.3 The method of analyzing non-rare earth impurity content shall comply with the stipulation in Appendix C in GB/T 13219-2018.

4.1.4 The absolute purity of scandium (Sc) can be obtained through calculation, namely, $[100\% - (\text{rare earth impurity content} + \text{non-rare earth impurity content})]$.

4.1.5 The relative purity (Sc/RE) of scandium (Sc) can be obtained through calculation, namely, $(100\% - \text{rare earth impurity content}/\text{RE})$.

4.2 Rounding-off of Numerical Value The rounding-off of numerical value shall comply with the stipulation in GB/T 8170.

4.3 Appearance Quality Under the natural scattering light, conduct visual inspection to inspect the appearance quality.

5.1 Inspection and Acceptance Check

5.1.1 The supply side's quality inspection department shall inspect products and guarantee that product quality complies with the stipulation in this Standard. In addition, a quality certificate shall be filled out.

5.1.2 The demand side shall inspect the received products. If the inspection result is inconsistent with the stipulation in this Standard, the demand side shall propose it to the supply side within 2 months after receiving the products. The demand side and the supply side shall negotiate and reach a solution. If arbitration is needed, an organization that is acknowledged by both parties can be authorized; samples shall be taken jointly with the demand side.

6 Marking, Packaging, Transportation, Storage and

Quality Certificate

6.1 Marking and Packaging

6.1.1 Outside the package, there shall be an obvious moisture-proof mark that will not become decolorized. Outside each package (bottle, case and bucket), it shall at least indicate.

- a) Name of the supply side;
- b) Name of raw material manufacturer;
- c) Name of product manufacturer;
- d) Name and nameplate of product;
- e) Batch number;
- f) Gross weight and net weight;
- g) Date of packaging;
- h) Mark or sign of "moisture-proof".

6.1.2 Products shall be sub-packed into a double-layer plastic bag or plastic bottle. The net weight of each bag (bottle) shall be

0.1 kg,

0.25 kg,

0.5 kg and 1 kg. Then, place the bag (bottle) in a sealed metal bucket (wooden case, carton or plastic case) that adopts anti-oxidation measures. The net weight of each metal bucket (wooden case, carton or plastic case) shall be

0.5 kg, 1 kg, 5 kg and 10 kg. If the demand side has any special requirements towards the packaging, the demand side and the supply side shall negotiate.