# GB

NATIONAL STANDARD OF THE

PEOPLE'S REPUBLIC OF CHINA

ICS 77.100

H 42

# GB/T 25049-2010

# Ferronickel

镍铁

(ISO 6501:1988, Ferronickel - Specification and delivery requirements, MOD)

**Issued on: September 02, 2010** **Implemented on: June 01, 2011**

**Issued by: General Administration of Quality Supervision, Inspection and Quarantine of PRC;**

**Standardization Administration of PRC.**

# Table of Contents

# Ferronickel

## 1 Scope

This standard specifies the delivery technical requirements for different forms of ferronickel (ingots, blocks, pellets), for steelmaking and casting.

## 2 Normative references

The provisions in following documents become the provisions of this Standard through reference in this Standard. For the dated references, the subsequent amendments (excluding corrections) or revisions do not apply to this Standard; however, parties who reach an agreement based on this Standard are encouraged to study if the latest versions of these documents are applicable. For undated references, the latest edition of the referenced document applies.

GB/T 21931.1 Nickel ferronickel and nickel alloys - Determination of carbon content - Infrared absorption method after induction furnace combustion (GB/T 21931.1-2008, ISO 7524:1985, IDT)

GB/T 21931.2 Nickel ferronickel and nickel alloys - Determination of sulfur content - Infrared absorption method after induction furnace combustion (GB/T 21931.2-2008, GB/T 21931.1-2008, ISO 7526:1985, IDT)

GB/T 21931.3 Nickel ferronickel and nickel alloys - Determination of phosphorus content - Phosphovanoclonolybeate molecular absorption spectrometric method (GB/T 21931.3-2008, ISO 11400:1992, IDT)

GB/T 21932 Nickel and ferronickel - Determination of sulphur content - Barium sulfate gravimetric method after alumina chromatographic separation

GB/T 21933.1 Ferronickel - Determination of nickel content - The dimethylglyoxime gravimetric method (GB/T 21933.1-2008, ISO 6352:1985, IDT)

GB/T 21933.2 Ferronickel - Determination of silicon content - Gravimetric method (GB/T 21933.2-2008, ISO 8343:1985, MOD)

GB/T 21933.3 Ferronickel - Determination of cobalt content - Flame atomic absorption spectrometric method (GB/T 21933.3-2008, ISO 7520:1985, IDT)

GB/T 24198 Ferronickel - Determination of nickel silicon phosphorus manganese cobalt chromium and copper contents - Wavelength dispersive

#### 4.2.1 Ingot-shaped ferronickel

The maximum mass is 100 kg; the thickness range is 30 mm ~ 150 mm; the length does not exceed 800 mm.

There are two group-batching methods for ingot-shaped ferronickel: group-batching of single-fired ferronickel, group-batching of multi-fired ferronickel. Unless specifically agreed, group-batching of single-fired ferronickel select ferronickel, which has a nickel content in the range of K% ~ (K + 1)%.

#### 4.2.2 Block-shaped ferronickel

Block-shaped ferronickel is cast OR cut from ingot-shaped ferronickel. The delivery batch can only be constituted by either of the above two block-forming methods. The size of block-shaped ferronickel is 25 mm ~ 100 mm. The size of the blocks shall be the same in a batch.

There are two group-batching methods for block-shaped ferronickel: group-batching of single-fired ferronickel, group-batching of multi-fired ferronickel. Unless specifically agreed, group-batching of multi-fired ferronickel shall select ferronickel, which has a nickel content in the range of K% ~ (K + 1)%.

#### 4.2.3 Pellet-shaped ferronickel

Pellet-shaped ferronickel, which is produced by liquid granulation, has a particle size range of 2 mm ~ 50 mm. The particle size inspection of pellet-shaped ferronickel is carried out, in accordance with GB/T 13247.

According to the agreement between the supplier and the buyer, the pellet-shaped ferronickel may be delivered after drying.

There are three group-batching methods for pellet-shaped ferronickel: group-batching of single-fired ferronickel, mixed group-batching of multi-fired ferronickel, non-mixed group-batching of multi-fired ferronickel. Unless specifically agreed, mixed group-batching of multi-fired ferronickel shall select ferronickel, which has a nickel content ranging from K% ~ (K + n)%, wherein n can be up to 5; non-mixed group-batching of multi-fired ferronickel shall select ferronickel, which has a nickel content ranging from K% ~ (K + n)%, wherein n is less than 1; in this case, products may not be mixed uniformly, during group-batching.

### 4.3 Pollution

There shall be no visible debris, such as slag and ore sand, inside and on the surface of the ferronickel.

# Appendix A

## (Informative)

### Analysis results and dispute resolution

**A.1** The analysis results can be obtained by the following three methods. In the event of a dispute, both parties can arbitrate the analysis or sample preparation, in accordance with the provisions of this Appendix A.2.

Method I: obtained from certificate which is provided by the supplier

The certificate of analysis, which is provided by the supplier, shall provide the content of other elements, which are specified in Table 1 OR agreed upon by the supplier and the buyer.

Method II: obtained through on-site sampling and analysis by the buyer

The buyer's on-site sampling and analysis shall be carried out, in accordance with the requirements of the standard methods in the normative references.

Method III: obtained through exchanging analysis by both parties

For the exchange of analysis by both parties, it shall carry out sample preparation and chemical analysis, in accordance with the requirements of the standard method in the normative references; the obtained analysis results of nickel (or other elements) in ferronickel shall be exchanged.

If the difference, between the analysis results of both parties, does not exceed the allowable deviation, which is agreed by both parties, the average value of the analysis results of both parties shall be accepted by both parties.

If the difference, between the analysis results of both parties, exceeds the allowable deviation, which is agreed by both parties, the provisions of "A.2 Dispute resolution" in this Appendix shall be implemented.

**A.2 Dispute resolution**

The negotiation plan and the arbitration plan are applicable to the dispute resolution of sample preparation and chemical analysis. They can be used independently or sequentially.

The acceptable analysis results of the negotiation plan and the arbitration plan shall be within the limits specified below:

Low limit - The low content value, between the two parties in dispute, minus the

Weigh 0.1320 g of arsenic trioxide (spectrally pure). Place it in a 100 mL beaker. Slowly add 10 mL of nitric acid (B.3.2). Heat to dissolve it. When it is completely dissolved, add 2 mL of sulfuric acid (2.5 mol/L). Slowly heat it. After evaporating most of the nitric acid, move it into a high temperature place to smoke. Remove it and cool it slightly. Add 10 mL of water. Heat to dissolve the salt. Remove it after all dissolved. Cool to room temperature. Transfer it into a 1000 mL volumetric flask. Use water to dilute it to the mark. Mix well. 1 mL of this solution contains 100 μg of arsenic.

**B.3.4.2** Arsenic standard solution, 10 μg/mL.

Pipette 10.00 mL of arsenic standard solution (B.3.4.1), in a 100 mL volumetric flask. Use water to dilute it to the mark. Mix well. 1 mL of this solution contains 10 μg of arsenic.

**B.3.4.3** Tin standard solution, 100 μg/mL.

Weigh 0.1000 g of high-purity metal tin (mass fraction greater than 99.9%), accurate to 0.0001 g. Place it in a 200 mL beaker. Add 20 mL of hydrochloric acid (1 + 1). Heat to dissolve it. Cool it to room temperature. Transfer it into a 1000 mL volumetric flask. Use hydrochloric acid (1 + 9) to dilute it. Mix well. 1 mL of this solution contains 100 μg of tin.

**B.3.4.4** Tin standard solution, 10 μg/mL.

Take 10.00 mL of tin standard solution (B.3.4.3) in a 100 mL volumetric flask. Use hydrochloric acid (1 + 19) to dilute it to the mark. Mix well. 1 mL of this solution contains 10 μg of tin.

**B.3.4.5** Antimony standard solution, 100 μg/mL.

Weigh 0.1000 g of metal antimony (mass fraction greater than 99.9%), accurate to 0.0001 g. Dissolve it in 20 mL of hydrochloric acid. Transfer it into a 1000 mL volumetric flask. Use diluted hydrochloric acid (1 + 9) to dilute it to the mark. Mix well. 1 mL of this solution contains 100 μg of antimony.

**B.3.4.6** Antimony standard solution, 10 μg/mL.

Pipette 10 mL of antimony standard solution (B.3.4.5) to a 100 mL volumetric flask. Use hydrochloric acid (1 + 19) to dilute it to the mark. Mix well. 1 mL of this solution contains 10 μg of antimony.

**B.3.4.7** Bismuth standard stock solution, 100 μg/mL.

Weigh 0.1000 g of pure metallic bismuth (mass fraction greater than 99.9%), accurate to 0.0001 g. Place it in a 100 mL beaker. Slowly add 20 mL of nitric acid (1 + 1). Heat to dissolve it. Remove to cool it slightly. Transfer it into a 1000

mL volumetric flask. Use diluted nitric acid (1 + 4) to dilute it to the mark. Mix well. 1 mL of this solution contains 100 μg of bismuth.

**B.3.4.8** Bismuth standard solution, 10 μg/mL.

Pipette 10.00 mL of bismuth standard solution (B.3.4.7), in a 100 mL volumetric flask. Use diluted nitric acid (2 + 98) to dilute it to the mark. Mix well. 1 mL of this solution contains 10 μg of bismuth.

**B.3.4.9** Lead standard solution, 100 μg/mL.

Weigh 0.1000 g of pure metallic lead to dissolve (mass fraction greater than 99.9%), accurate to 0.0001 g. Place it in a 100 mL beaker. Slowly add 20 mL of (1 + 1) nitric acid. Boil to remove the nitrogen oxides. Transfer it into a 1000 mL volumetric flask after cooling. Use water to dilute it to the mark. Mix well. 1 mL of this solution contains 100 μg/mL of lead.

**B.3.4.10** Lead standard solution, 10 μg/mL.

Pipette 10 mL of lead standard stock solution (B.3.4.9), into a 100 mL volumetric flask. Use diluted nitric acid (2 + 98) to dilute it to the mark. Mix well. 1 mL of this solution contains 10.0 μg/mL of lead.

**B.3.5** High-purity nickel: the content of the element to be tested is less than 0.001% (mass fraction).

**B.3.6** High-purity iron: the content of the element to be tested is less than 0.001% (mass fraction).

**B.4 Instruments**

**B.4.1** Single-scale pipettes and single-scale volumetric flasks.

**B.4.2** Analytical balance, which can be accurately weighed to 0.0001 g.

**B.4.3** Inductively coupled plasma emission spectrum analyzer

**B.4.3.1** General requirements

Any type of inductively coupled plasma emission spectrometer can be used. Before the measurement, the inductively coupled plasma emission spectrometer can be adjusted initially, according to the recommendations of the manufacturer's instrument manual AND the laboratory's quantitative analysis operations; meanwhile the performance test shall be performed. The short-term stability of the instrument does not exceed 1.0% AND the long-term stability does not exceed 1.5%.

**B.4.3.2 Analytical spectral line**

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