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Replacing GB/T 17445-2009

Cast grinding balls

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Table of Contents

1 Scope

GB/T 17445-2022 is the Chinese national standard on cast grinding balls, 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 9 March 2022 by the State Administration for Market Regulation; Standardization Administration of China, and has been in force since 1 October 2022. Classification: ICS 77.140.80, CCS J31. 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 Document specifies the designations and codes, technical requirements, test methods, inspection rules, markings, certificates, packaging and transportation of chromium alloy white cast iron grinding balls and ductile iron grinding balls for drum mills. This Document is applicable to chromium alloy white cast iron grinding balls and ductile iron grinding balls (hereinafter referred to as "grinding balls") used for crushing and grinding ore, coal, cement and other related materials in the metallurgical, electric power, building materials and chemical industries.

2 Normative References

The provisions in following documents become the essential provisions of this Document through reference in this Document. For the dated documents, only the versions with the

dates indicated are applicable to this Document; for the undated documents, only the latest version (including all the amendments) is applicable to this Document.

GB/T 223.3 Methods for chemical analysis of iron, steel and alloy; The diantipyrylmethane phosphomolybdate gravimetric method for the determination of phosphorus content

GB/T 223.4 Alloyed steel - Determination of manganese content - Potentiometric or visual titration method

GB/T 223.11 Iron, Steel and Alloy - Determination of Chromium Content - Visual Titration or Potentiometric Titration Method

GB/T 223.18 Methods for Chemical Analysis of Iron, Steel and Alloy - The Sodium Thiosulfate Separation Iodometric Method for the Determination of Copper Content

GB/T 223.23 Iron, Steel and Alloy-Determination of Nickel Content - The Dimethylglyoxime Spectrophotometric Method

GB/T 223.26 Iron, Steel and Alloy - Determination of Molybdenum Content - The Thiocyanate Spectrophotometric Method

GB/T 223.60 Methods for chemical analysis of iron, steel and alloy - The perchloric acid dehydration gravimetric method for the determination of silicon content

GB/T 223.63 Methods for chemical analysis of iron, steel and alloy - The sodium (potassium) periodate photometric method for the determination of manganese content

GB/T 223.71 Methods for Chemical Analysis of Iron, Steel and Alloy - The Gravimetric Method after Combustion in the Pipe Furnace for the Determination of Carbon Content

GB/T 223.72 Iron, Steel and Alloy - Determination of Sulfur Content - Gravimetric Method

GB/T 230.1 Metallic materials - Rockwell hardness test - Part 1:Test method

GB/T 5611 Foundry terminology

GB/T 5612 Code for representing cast iron

3 Terms and Definitions

For the purposes of this Document, the following terms and definitions given in GB/T 5611 apply.

3.1 Chromium alloy white cast iron grinding ball Grinding balls that are cast from white cast iron with chromium as the main alloying element.

3.2 Ductile iron grinding ball Grinding balls that are made of ductile iron.

3.3 Breakage ratio of ball The percentage of the total weight of broken balls to the total weight of used balls. NOTE: Broken balls refer to grinding balls whose broken area exceeds

1/3 of the surface area of the grinding balls during normal production operation of the mill.

3.4 Impact fatigue life of grinding ball The number of impacts that a grinding ball sustains, when it fails due to impact fatigue, measured in a drop ball test.

5.3.4 Whether the Impact fatigue life of grinding ball and ball consumption are used as acceptance items shall be agreed upon by the supplier and the purchaser.

5.4 Surface quality Grinding balls should not have cracks and casting defects such as slag inclusions, sand holes, shrinkage cavities, shrinkage, pores, cold shuts, etc. that affect the performance.

5.5 Metallographic structure

5.5.1 The metallographic structure of chromium alloy white cast iron grinding balls and ductile iron grinding balls is not used as an acceptance item for products. If there are special needs, it shall be agreed upon by the supplier and the purchaser.

5.5.2 The graphite spheroidization level of ductile iron grinding balls shall be no lower than Level-3 specified in GB/T 9441-2009. The number of graphite balls shall be no less than 100 piece/mm2. If there are special requirements, the spheroidization level shall be agreed upon by the supplier and the purchaser. Other metallographic structures are not accepted as acceptance items of the product. If there are special needs, they shall be agreed upon by the supplier and the purchaser.

6 Test Method

6.1 The diameter of the grinding balls shall be measured with a measuring tool with an accuracy of no less than 0.1mm.

6.2 The chemical composition analysis method shall be carried out in accordance with the provisions of GB/T 223.3, GB/T 223.4, GB/T 223.11, GB/T 223.18, GB/T 223.23, GB/T 223.26, GB/T 223.60, GB/T 223.63, GB/T 223.71 and GB/T 223.72.

6.3 The preparation and sampling methods of specimens for chemical composition analysis shall comply with the provisions of GB/T 20066. The preparation and sampling of spectral analysis specimens shall comply with the provisions of GB/T 24234.

6.4 The Rockwell hardness test shall be carried out in accordance with the provisions of GB/T 230.1. The surface hardness is allowed to be tested with a portable hardness tester.

6.5 The surface hardness shall be tested 2mm~3mm below the surface of the grinding ball. The hardness test surface shall be machined, wire cut or electrospark machined; and the wire cut or electrospark machined surface shall be machined to remove the heat affected zone.

6.6 Conduct impact fatigue test of grinding ball according to Appendix A.

6.7 The determination and calculation of breakage ratio of ball shall comply with the provisions of Appendix B.

6.8 The calculation of ball consumption shall comply with the provisions of Appendix C.

7 Inspection Rules

7.1 Inspection batch One of the following situations constitutes an inspection batch:

a) Chemical composition inspection batch: when electric furnace smelting is adopted, each furnace is regarded as a batch; when cupola furnace smelting is adopted, every 2 h is regarded as a batch;

b) Grinding ball diameter and hardness inspection batch: grinding balls of the same designation cast in multiple furnaces under the condition of stable smelting process and subjected to the same heat treatment process (if heat treatment is required), heat-treated in intermittent heat treatment furnace, with the same nominal diameter in each furnace are regarded as a batch; grinding balls heat-treated in continuous heat treatment furnace, with the same nominal diameter every 10t are regarded as a batch.

7.2 Judgment rules

7.2.1 Take one specimen from each batch for chemical composition inspection. When sampling by taking chips, chips at least 6mm below the casting surface shall be removed. If the inspection result is unqualified, double sampling can be carried out for reinspection. If one specimen is still unqualified, the chemical composition of the batch of grinding balls shall be judged as unqualified.

7.2.2 Three grinding balls are randomly selected from each batch for inspection of diameter and hardness. If the diameter or hardness of one grinding ball fails to meet the standards, the same number of grinding balls are randomly selected for reinspection. If the number of grinding balls that fail to meet the standards in the two inspections is greater than or equal to 2, the diameter or hardness of the batch of grinding balls shall be determined to be unqualified. If the diameter or hardness of two grinding balls fails to meet the standards in the first sampling, the diameter or hardness of the batch of grinding balls shall be determined to be unqualified. If the hardness of the grinding balls fails to meet the standards, re-heat treatment shall be allowed.

7.2.3 The inspection results of chemical composition, hardness and diameter shall be rounded off in accordance with the provisions of GB/T 8170.

Appendix A

(Normative) Test Method of Impact Fatigue Life of Grinding Ball A.1 Test principle The impact fatigue life test of grinding ball of ball drop method (hereinafter referred to as the