GB

NATIONAL STANDARD OF THE

PEOPLE'S REPUBLIC OF CHINA

ICS 25.220.20

A 29

GB/T 11376-2020

Replacing GB/T 11376-1997

Metallic and other inorganic coatings - Phosphate conversion coating of metals

金属及其他无机覆盖层 金属的磷化膜

(ISO 9717:2017, MOD)

Issued on: June 02, 2020 **Implemented on: April 01, 2021**

Issued by: State Administration for Market Regulation;
Standardization Administration of the People's Republic of China.

Table of Contents

Metallic and other inorganic coatings - Phosphate conversion coating of metals

Warning — This Standard calls for the use of substances and/or procedures that could be injurious to health if adequate safety measures are not taken. This Standard does not address any health hazards, safety or environmental matters associated with its use. It is the responsibility of the producers, purchasers and/or users of this document to establish appropriate health, safety and environmentally acceptable practices and take appropriate actions.

1 Scope

This Standard specifies methods for determining the requirements for phosphate conversion coating.

This Standard applies to ferrous materials, aluminum, zinc, cadmium and their alloys (see Appendix A).

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB/T 3138, Metallic and other inorganic coatings - Surface treatment, metallic and other inorganic coatings - Vocabulary (GB/T 3138-2015, ISO 2080:2008, IDT)

GB/T 4955, Metallic coatings - Measurement of coating thickness - Coulometric method by anodic dissolution (GB/T 4955-2005, ISO 2177:2003, IDT)

GB/T 4956, Non-magnetic coatings on magnetic substrates - Measurement of coating thickness - Magnetic method (GB/T 4956-2003, ISO 2178:1982, IDT)

GB/T 9792, Conversion coatings on metallic materials - Determination of coating mass per unit area - Gravimetric methods (GB/T 9792-2003, ISO 3892:2000, MOD)

GB/T 10125, Corrosion tests in artificial atmospheres - Salt spray tests (GB/T 10125-2012, ISO 9227:2006, IDT)

GB/T 12609, Electrodeposited metallic coatings and related finishes - Sampling procedures for inspection by attributes (GB/T 12609-2005, ISO 4519:1980, IDT)

GB/T 16921, Metallic coatings - Measurement of coating thickness - X-ray spectrometric methods (GB/T 16921-2005, ISO 3497:2000, IDT)

ISO 27830, Metallic and other inorganic coatings - Requirements for the designation of metallic and inorganic coatings

3 Terms and definitions

For the purposes of this document, the terms and definitions given in GB/T 3138 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/;

— ISO Online browsing platform: available at http://www.iso.org/obp.

4 Information to be supplied by the purchaser to the processor

The following information shall be provided by the purchaser.

a) A description of the phosphate conversion coating according to this document (see 5.2).

b) In cases of steel parts with tensile strength not less than 1 000 MPa, possibly also locally restricted, e.g. for case-hardened or cold-formed structures or in weld seam areas, the safety against hydrogen embrittlement is of primary importance. The phosphatising process shall be carried out in such a manner that any damage caused by hydrogen-induced brittleness is excluded. Technical measures to minimize the risk of hydrogen-induced brittleness shall be provided by the supplier and the customer. Heat treatment in accordance with any recommendations cannot guarantee full freedom from hydrogen embrittlement. The performance of the heat treatment shall be demonstrated by the supplier.

c) The sampling procedure, the acceptable quality limit or any other requirements and tests that deviate from GB/T 12609.

d) The surface treatment or phosphating.

e) The appearance of the surface.

f) The corrosion resistance.

g) a symbol, which indicates the function of the conversion coating as follows:

1) e – electrical insulation;

2) g – reduction of friction (sliding action);

3) r – adhesion promoter and/or corrosion protection;

4) z – simplification of cold forming.

h) a solidus "/".

i) a number, which indicates the surface-related mass per square meter, in g/m^2, with a measurement uncertainty of ±30%.

If the phosphate coating receives a supplementary treatment, the following information shall be added to the designation:

j) a solidus "/".

k) a symbol, which defines the supplementary treatment (see Table 2).

If necessary, mark additional information according to the following principles:

Solidi "/" shall be used to separate data fields in the designation corresponding to the different sequential processing steps. Double separators or solidi indicate that a step in the process is either not required or has been omitted (see ISO 27830).

6 Phosphate conversion coating

6.1 Appearance

Zinc phosphate, zinc calcium phosphate and manganese phosphate coatings shall evenly cover the metal surface and shall not show any white stains, corrosion products or fingerprints.

Note: Slight fluctuations in the appearance of phosphate coatings because of contact with frames, properties of the base material or through minor contact inside the drum do not constitute any reason for claim.

6.2 Coating mass per unit area

The coating mass is measured in accordance with the procedures specified in GB/T 9792.

Appendix B

(Informative)

Identification of phosphate conversion coating

B.1 General

This Appendix describes methods for identifying the type of phosphate conversion coating. The methods are applicable to coatings containing phosphorus, iron, manganese, zinc and calcium. They are not applicable to the detection of iron or zinc if these metals are present in the basis material.

B.2 Method 1

B.2.1 Principle

Removal of the phosphate conversion coating from a test specimen by treatment with sodium hydroxide solution. Detection of the elements present in the solution by any suitable instrumental analytical technique, e.g., atomic absorption spectrometry.

B.2.2 Reagents

During the analysis, use only reagents of recognized analytical grade and deionized water (or water of equivalent purity).

B.2.2.1 Sodium hydroxide solution, 50 g/L.

B.2.3 Apparatus

Use ordinary laboratory apparatus and any appropriate instrument suitably equipped for the detection of phosphorus, manganese, zinc and calcium, e.g., an atomic absorption spectrometer for metals.

B.2.4 Test specimen

Use a test specimen having a total coated surface area of approximately 100 cm^2.

B.2.5 Procedure

Immerse the test specimen, of which the specifications are defined in B.2.4, in 100 mL of the sodium hydroxide solution (B.2.2.1) maintained at a temperature of 80 °C ~ 90 °C, until the coating has been removed or has at least undergone obvious attack. If necessary, remove the coating by rubbing it with a rubber squeegee. Using the appropriate analytical instrument (B.2.3), detect whether the elements, such as phosphorus, manganese, zinc and calcium, are present in the test solution.

the liquid, semi-solid or waxy film which forms on the phosphated surface is free from air bubbles and discontinuities.

Before testing, suspend the test pieces for at least 24 h at a temperature of 23 °C ± 5 °C and a relative humidity not exceeding 65%, in a dust and draught-free atmosphere, so as to allow the surplus of oil to drip off and the solvents to evaporate.

C.3.2.2 Comparative testing

Suspend the phosphated test pieces (previously dried at a temperature of 100 °C ~ 120 °C and cooled to room temperature) from suitable plastic hooks or plastic-coated steel hooks and immerse them vertically in the oil for 1 min at a temperature of 25 °C ± 2 °C. During this time, move the test panels gently to and fro and then withdraw them gradually from the oil in about 30 s. The oil film that forms on the phosphated surface shall be free from air bubbles and discontinuities.

Suspend the test panels for at least 24 h at a temperature of 23 °C ± 5 °C and a relative humidity not exceeding 65%, in a dust and draught-free atmosphere, prior to testing.

C.3.3 Salt spray test

Subject the post-treated components or test panels (see C.3.2) to the neutral salt spray test (see GB/T 10125).

This test determines the exposure times attainable by a specific corrosion-protecting system before the first evidence of corrosion of metal becomes visible.

For this purpose, take test pieces from the test chamber at predetermined intervals and examine them visually for evidence of corrosion. Whether or not the after-treatment film (or layer) is to be removed before visually examining the components or test panels is subject to agreement.

For a specific phosphate coating, considerable scatter occurs in the exposure times up to the first occurrence of corrosion, depending on the composition of the supplementary treatment medium (corrosion-preventing oils, greases and waxes) category, composition and mass per unit of the phosphate conversion coating.

This is an excerpt of the PDF (Some pages are marked off intentionally)

------ The End ------